1226002

Department of Energy

Richland Operations Office
P.O. Box 550
Richland, Washington 99352

14-ESQ-0081

MAY 27 2014

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

RECEIVED
JUN 03 2014
EDMC

Dear Ms. Hedges:

TRANSMITTAL OF APPROVED CLASS 2 RESOURCE CONSERVATION AND RECOVERY ACT PERMIT MODIFICATIONS TO PERMIT CONDITIONS, PERMIT ATTACHMENTS 8 AND 10, AND GROUNDWATER MONITORING AT THE HANFORD FACILITY LIQUID EFFLUENT RETENTION FACILITY AND 200 AREA EFFLUENT TREATMENT FACILITY (LERF/ETF) AND AN EXTENSION FOR THE REMAINING PROPOSED CLASS 2 MODIFICATION

References: (1) Ecology ltr. to M. McCormick, RL, and J. Fulton, CHPRC, from S. Dahl, "Department of Ecology's Response to the Transmittal of Proposed Class 2 Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit, Modifications to Permit Conditions, Permit Attachments 8 and 10, and Groundwater Monitoring at the Hanford Facility Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility (LERF/ETF)," 14-NWP-079, dtd. April 29, 2014.

1223947

1223612

(2) RL ltr. to J. A. Hedges, Ecology, from M. McCormick, "Letter 14-NWP-044 and Extension of Decision of Class 2 Resource Conservation and Recovery Act Permit Modification to Permit Attachment 10," 14-ESQ-0072, dtd. April 16, 2014.

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The State of Washington Department of Ecology (Ecology) approved, with changes, proposed Class 2 permit modifications in accordance with Washington Administrative Code (WAC) 173-303-830(4)(b)(vi)(A)(I), Reference (1). Modifications were approved to Permit Conditions II.F, Permit Attachment 8, and Revisions to the Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility (LERF/ETF) permit.

As required by the approval letter, the U.S. Department of Energy Richland Operations Office as owner/operator and CH2M HILL Plateau Remediation Company as the co-operator are submitting clean copies of the Addenda with all changes incorporated within thirty days of receipt of the letter. Attached to this letter are two copies of the updated specific

MAY 2 7 2014

Addenda of the LERF/ETF permit, in addition to updated permit conditions for LERF/ETF noting the updated date of the Addenda. The electronic copies of the same addenda were also submitted to Andrea Prignano of your staff as required.

Included in these enclosures is a typographical correction in the LERF/ETF conditions that Ecology included in their revised conditions. As discussed with Andrea Prignano of your staff, the intended WAC citation in Section III.3.R.3.c, sub-item 3 of the LERF/ETF Conditions document was WAC 173-303-645(8)(a)(i)(A) and not WAC 173-303-645(8)(a)(i)(A)(I); this citation does not exist in the regulation.

On April 8, 2014, representatives from Ecology and the Permitees met and agreed to extend the decision period for the remaining proposed Class 2 modification to delete Permit Attachment 10 (Purgewater Management Plan). The Permittees are granting an indefinite extension or until such time as an agreement can be worked out in accordance with WAC 173-303-830(4)(b)(vi)(G). This indefinite extension supersedes the original 30 day extension granted in Reference (2).

If you have any questions, please contact me, or your staff may contact Stacy L. Charboneau, Assistant Manager for Safety and Environment, on (509) 373-3841.

Sincerely,

Matt McCormick
Manager

ESQ:ACM

Enclosures

cc w/encls:
Administrative Record, TSD S-2-8/H6-08
Ecology NWP Library (Hardcopy)
Environmental Portal, LMSI, A3-01
HF Operating Record (J. K. Perry, MSA, H7-28)

cc w/o encls:
F. W. Bond, Ecology
S. L. Dahl-Crumpler, Ecology
A. L. Prignano, Ecology
J. R. Seaver, CHPRC
E. R. Skinnarland, Ecology

HNF-56398
Revision 1

Hanford Well Maintenance and Inspection Plan

Previously BHI-01265, Revision 0

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

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

CH2MHILL
Plateau Remediation Company
P.O. Box 1600
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

HNF-56398
Revision 1

Hanford Well Maintenance and Inspection Plan

Previously BHI-01265, Revision 0

Document Type: PLAN Program/Project: S&GRP

R. L. Cathel
CH2M HILL Plateau Remediation Company

Date Published
April 2014

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

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

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APPROVED
By GE Bratton at 10:11 am, Apr 10, 2014

Release Approval Date

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Terms

WAC

TSD

RCRA

RCW

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Table D-1. Constituent Results for 242-A Process Condensate Characterization Results and Basin 42 Characterization Results

Sample Location	2009 Basin 42 Characterization Results					Basin 42 Average[b]		Process Condensate to LERF[c]		Process Condensate Cold Run[c]	Process Condensate to LERF[c]		Process Condensate to LERF[c]		Regional Groundwater Background Concentration[d]		Constituents
Sample Date	Units	Wtd Avg[a]		Max[b]		2009 - 2010		6/16/2009			8/31/2010		10/5/2010			Units	
Volume	gal	6.76E+06		6.87E+06		5.19E+06		5.36E+05		3.14E+05	3.61E+05		3.61E+05				
Nitrogen in ammonium	mg/L	111.41		140.00		127		140		0.02	26.3		22.1		NL	mg/L	Nitrogen in ammonium
Bromide	mg/L	0.07	U	0.09	U	0.08	U	0.05	U	0.05	0.05	U	0.05	U	0.151	mg/L	Bromide
Chloride	mg/L	5.37		7.75		6.91		0.04	U	1.30	0.04	U	0.04	U	19.58	mg/L	Chloride
Fluoride	mg/L	0.05		0.06		0.05	U	0.03	U	0.03	0.06		0.04	U	1.298	mg/L	Fluoride
Nitrogen in Nitrate	mg/L	0.08		0.10		0.09		0.03	U	0.12	0.0097	U	0.01		9.42	mg/L	Nitrogen in Nitrate
Nitrogen in Nitrite	mg/L	0.03	U	0.04	U	0.03	U	0.02	U	0.02	0.02	U	0.02	U	0.045	mg/L	Nitrogen in Nitrite
Phosphorus in phosphate	mg/L	0.19		0.27		0.22		0.07	U	0.07	0.07	U	0.07	U	0.072	mg/L	Phosphorus in phosphate
Sulfate	mg/L	55.36		80.20		71.50		0.07	U	10.10	0.08	U	0.08	U	54.95	mg/L	Sulfate
Aluminum	µg/L	17.78	U	34.00	U	17.00	U	34	U	0.15	19	U	19	U	170	µg/L	Aluminum
Antimony	µg/L	0.29	U	0.30	U	0.30	U	0.3	U		0.3	U	0.3	U	69.8	µg/L	Antimony
Arsenic	µg/L	3.59		5.20		4.55		0.4	U	0.60	0.4	U	0.4	U	11.8	µg/L	Arsenic
Barium	µg/L	9.43		12.30		10.90		8	U		4	U	4	U	149	µg/L	Barium
Beryllium	µg/L	0.05	U	0.05	U	0.05	U	0.05	U		0.05	U	0.05	U	3.38	µg/L	Beryllium
Cadmium	µg/L	0.10	U	0.10	U	0.10	U	0.1	U	0.10	0.1	U	0.1	U	1.29	µg/L	Cadmium
Calcium	µg/L	10,691.93		14,400.00		12830.00		78	U	18000.00	27	U	27	U	58389	µg/L	Calcium
Chromium	µg/L	5.52		7.90		7.06		0.5	U	0.09	0.5	U	0.5	U	3.17	µg/L	Chromium
Cobalt	µg/L	4.13	U	8.00	U	4.00	U	8	U		4	U	4	U	1.29	µg/L	Cobalt
Copper	µg/L	4.60		6.96		5.30		4.52		0.74	0.469		2.04		1.04	µg/L	Copper
Cyanide	µg/L	3.81	U	4.00	U	4.00	U	4	U		4	U	4	U	9.52	µg/L	Cyanide
Iron	µg/L	51.87		58.10		49.50		36	U	150.00	38	U	38	U	1104	µg/L	Iron
Lead	µg/L	1.33		9.01		0.30		9.01		1.60	3.52		2.32		1.3	µg/L	Lead

Table D-1. Constituent Results for 242-A Process Condensate Characterization Results and Basin 42 Characterization Results

Sample Location	2009 Basin 42 Characterization Results					Basin 42 Average[b]		Process Condensate to LERF[c]		Process Condensate Cold Run[c]	Process Condensate to LERF[c]		Process Condensate to LERF[c]		Regional Groundwater Background Concentration[d]		Constituents
Sample Date	Units	Wtd Avg[a]		Max[b]		2009 - 2010		6/16/2009			8/31/2010		10/5/2010			Units	
Magnesium	µg/L	2,533.13		3,380.0		2986.67		32	U	5100.0	14	U	14	U	31051	µg/L	Magnesium
Manganese	µg/L	5.69		8.00		5.27		8	U	8.00	6	U	6	U	86.4	µg/L	Manganese
Mercury	µg/L	0.09		0.12		0.11		0.1		0.05	0.05	U	0.05	U	0.006	µg/L	Mercury
Nickel	µg/L	7.53		10.60		8.40		8	U	0.55	4	U	4	U	1.98	µg/L	Nickel
Potassium	µg/L	1,498.00		2,060.0		1826.67		586		900.00	73	U	73	U	11089	µg/L	Potassium
Selenium	µg/L	0.60		0.87		0.69		0.3	U	0.32	0.3	U	0.3	U	20.7	µg/L	Selenium
Silicon	µg/L	3,453.02		4,610.0		4120.00		275		5300.0	43		388		43904	µg/L	Silicon
Silver	µg/L	5.38	U	10.00	U	5.00	U	10	U		7	U	7	U	5.98	µg/L	Silver
Sodium	µg/L	18,276.24		26,700.00		23633.33		260		2500.0	11	U	11	U	32919	µg/L	Sodium
Thallium	µg/L	43.83		148.00		35.00	U	148		0.02	49	U	49	U	1.87	µg/L	Thallium
Titanium	µg/L	4.13	U	8.00	U	4.00	U	8	U		4	U	4	U	30	µg/L	Titanium
Uranium	µg/L	8.54		13.40		11.12		0.05	U		0.05	U	0.05	U	14.4	µg/L	Uranium
Vanadium	µg/L	2.93	U	24.00	U	12.00	U	24	U		17	U	17	U	19.3	µg/L	Vanadium
Zinc	µg/L	12.93		17.60		14.97		12	U	1.40	4	U	4	U	48.9	µg/L	Zinc
Specific Conductance	µS/cm	430.52		583.00		533.00		113		168.00	45.1		42.6		TBD	µS/cm	Specific Conductance
pH Measurement	unitless	9.65		10.40		9.65		10.4		8.20	9.87		9.54		TBD	unitless	pH Measurement
Alkalinity	mg/L	490.00		500.00		473.33		ND		71.20	ND		ND		156367	mg/L	Alkalinity
Total dissolved solids	mg/L	113.17		162.00		136.33		10	U	100.00	31		27		277190	mg/L	Total dissolved solids
Total suspended solids	mg/L	2.49		10.00		2.20		2	U		10	U	2	U		mg/L	Total suspended solids
Total organic carbon	mg/L	7.10		9.59		7.69		9.59			3.78		4.39		TBD	mg/L	Total organic carbon
1-Butanol	µg/L	287.66		1,700.0		163.33		680			1700		330		0	µg/L	1-Butanol
2-Butanone	µg/L	6.17		10.00		6.83		8.0			4.4		1	U	0	µg/L	2-Butanone
2-Pentanone	µg/L	3.34		5.70		3.70		1	U		5.7		2.1		0	µg/L	2-Pentanone
Acetone	µg/L	220.09		1,700.0		83.33		1700			260		140		0	µg/L	Acetone

Table D-1. Constituent Results for 242-A Process Condensate Characterization Results and Basin 42 Characterization Results

Sample Location	2009 Basin 42 Characterization Results					Basin 42 Average[b]		Process Condensate to LERF[c]		Process Condensate Cold Run[c]	Process Condensate to LERF[c]		Process Condensate to LERF[c]		Regional Groundwater Background Concentration[d]		Constituents
Sample Date	Units	Wtd Avg[a]		Max[b]		2009 - 2010		6/16/2009			8/31/2010		10/5/2010			Units	
Benzene	µg/L	0.95	U	1.0	U	1.0	U	1.0	U		1.0	U	1.0	U	0	µg/L	Benzene
Carbon tetrachloride	µg/L	0.95	U	1.0	U	1.0	U	1.0	U		1.0	U	1.0	U	0	µg/L	Carbon tetrachloride
Chloroform	µg/L	0.95	U	1.0	U	1.0	U	1.0	U		1.0	U	1.0	U	0	µg/L	Chloroform
Methylene chloride	µg/L	1.16		1.60		1.27		1	U		1	U	1	U	0	µg/L	Methylene chloride
Tetrahydrofuran	µg/L	36.89		84.00		30.33		74			84		61		0	µg/L	Tetrahydrofuran
2-Butoxyethanol	µg/L	50.95		330.00		18.33		220			34		330		0	µg/L	2-Butoxyethanol
2-Methylphenol (cresol, o-)	µg/L	1.26		4.30		1.00		0.8	U		3.8		4.3		0	µg/L	2-Methylphenol (cresol, o-)
Benzyl alcohol	µg/L	3.06		23.00		0.70		23			6.7		6.4		0	µg/L	Benzyl alcohol
n-Nitrosodimethylamine	µg/L	176.61		290.00		190.00		290			67		79		0	µg/L	n-Nitrosodimethylamine
Total cresols	µg/L	0.95		4.30		0.60	U	0.5	U		4.3		4.2		0	µg/L	Total cresols
Tributyl phosphate	µg/L	47.73		72.00		62.00		0.5	U		1	U	1	U	0	µg/L	Tributyl phosphate
Formate	pCi/L	0.00	U	0.01		ND	U	0.00467	U		0.00467	U	0.00629		0	pCi/L	Formate
Gross alpha	pCi/L	136.24		190.00		176.67		4.7		0.60	2.3	U	2.3	U	0	pCi/L	Gross alpha
Gross beta	pCi/L	23,218.16		34,000.00		30000.00		930		2.80	2100		140		4.15	pCi/L	Gross beta

Note: Spreadsheet data were provided by Effluent Treatment Facility personnel.

a. Weighted average for Basin 42 based on samples collected in Risers 2, 4, and 7 from June 2009, August 2010, and October 2010, respectively.

b. Maximum and average results are derived from the three sample dates June 2009, August 2010, and October 2010.

c. Process condensate results are associated with characterization results collected at 242-A Evaporator.

d. Results based on Hanford Site Background: Part 3, Groundwater Background (DOE/RL-96-61).

gal = gallons
mg/L = milligrams per liter
µg/L = micrograms per liter
µS/cm = microSiemens per centimeter
U = less than detection
Wtd Ave = weighted average

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Table D-2. Basin 43 Constituent Characterization Results for Past 200-UP-1 and 200-ZP-1 Groundwater Waste Streams and Recent Waste Characterization Results For Basin 43

Constituent	Units	200-UP-1 and 200-ZP-1 Groundwater[a]		Basin 43 Characterization Results[c]		ERDF Leachate[d]		200-BP-5 Perched Water[e]	
Volume	gal	7.03E+7[b]		9.13E+05					
Added Vol.	gal			1.26E+06		5.62E+05		2.36E+04	
Ammonium (N)	mg/L	0.064		0.1		0.1			
Bromide	mg/L	0.4		1.2		1.5		1.2	
Chloride	mg/L	22.1		176.9		224.0		83.7	
Fluoride	mg/L	2.7		1.2		0.2		22	
Nitrate (N)	mg/L	101		63.8		64.6		219.7	
Nitrite (N)	mg/L	0.036	U	3.4	U	7.6	U	0.2	U
Phosphate (P)	mg/L	0.12	U	0.2	U	0.3	U	0.3	
Sulfate	mg/L	57.2		404.4		597.0		556.4	
Aluminum	µg/L	44		17.5		19.7	U	125	
Antimony	µg/L	0.3	U	3.3	U	6.0	U	31	U
Arsenic	µg/L	5.5		6.9		7.7		7.5	
Barium	µg/L	71.1		96.7		129.1		62.1	
Beryllium	µg/L	0.05	U	0.8	U	1.3	U	3	U
Cadmium	µg/L	0.1	U	0.5		0.3		4.4	
Calcium	µg/L	56861.5		181161.2		248000.0		167000	
Chromium	µg/L	121.1		36.1		29.2		143.9	
Cobalt	µg/L	4	U	67.7		145.0		9	
Copper	µg/L	0.15		121.1		145.0		21.7	
Hexavalent Chromium	µg/L	113							
Iron	µg/L	18	U	21.2		14.3		130.4	
Lead	µg/L	0.1	U	5.1		10.9			
Magnesium	µg/L	18361.5		44035.4		53750.0		71300	
Manganese	µg/L	4	U	7.1		6.9		129.7	
Mercury	µg/L	0.05	U	0.1		0.2	U		
Nickel	µg/L	4	U	6.7		6.3		19.9	U
Potassium	µg/L	5536.2		13579.6		17138.0		10100	
Selenium	µg/L	4.8		5.7		8.0			
Silicon	µg/L	21300		17465.4		21750.0			
Silver	µg/L	5	U	5.5		5.0		33	U
Sodium	µg/L	161846.2		187496.6		191250.0		391000	
Thallium	µg/L	36	U	27.7		5.0	U		
Titanium	µg/L	4	U	4.4		4.0			
Uranium	µg/L	25.6		2249.2		1100.6		43500	
Vanadium	µg/L	38.5		32.9		45.1		17.4	
Zinc	µg/L	37.5		25.5		27.2		92.2	
Specific Conductance	µS/cm	1206.2		2041.7		2483.8		2592	
pH Measurement	unitless	7.95		6.9		7.8		7.7	
Alkalinity	mg/L	151		224.9		296.0		231	
Total dissolved solids	mg/L	906.8		1351.1		1688.8			
Total suspended solids	mg/L	1.62		9.7		19.4			
Total organic carbon	mg/L	0.64		6.0		6.4			
Carbon tetrachloride	µg/L	490.7		12.1		5.0	U	1.0	U
Chloroform	µg/L	8.5		0.6	U			1.0	U
Tetrahydrofuran	µg/L	2	U	1.1	U			1.0	U
Gross alpha	pCi/L	29.4		1510.2		587.6		38800	
Gross beta	pCi/L	2830.8		8065.1		394.8		34600	

a. 200-UP-1 and 200-ZP-1 Average Groundwater Characterization Results Based on up to 14 samples collected between 2008 and 2011.

b. Total volume of 200-UP-1 and 200-ZP-1 groundwater received between 2008 and 2011.

c. Characterization results of the Basin 43 after removal of the 200-UP-1 and 200-ZP-1 groundwater from the basin.

d. Represents the dominant waste stream for Basin 43 since 200-UP-1 and 200-ZP-1 groundwater transfers have ceased (2012 total gallons to Basin 43 were 2,770,000).

e. Represents the third most dominant waste stream received at Basin 43 (2012 total gallons to Basin 43 were 130,000).

Notes: The second and fourth dominant waste streams were MODU-Tanks and Hanford purge water (2012 total gallons to Basin 43 were 291,500), which are the same streams and contain significantly less contaminant concentrations than the ERDF leachate and 200-BP-5 perched water. Spreadsheet data were provided by Effluent Treatment Facility Personnel.

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Table D-3. ERDF Leachate

CAS #	Constituent	Average Concentration between February 2000 and September 2012	Units	Regional Groundwater Background Concentration*	Units
7429-90-5	Aluminum	31	µg/L	170	µg/L
7440-36-0	Antimony	1	µg/L	69.8	µg/L
7440-38-2	Arsenic	9	µg/L	11.8	µg/L
7440-39-3	Barium	97	µg/L	149	µg/L
	Beryllium	0	µg/L	3.38	µg/L
7440-70-2	Calcium	213,735	µg/L	58,389	µg/L
7440-47-3	Chromium	27	µg/L	3.17	µg/L
7440-50-8	Copper	20	µg/L	1.04	µg/L
7439-89-6	Iron	35	µg/L	1,104	µg/L
7439-92-1	Lead	2.8	µg/L	1.3	µg/L
7439-95-4	Magnesium	69,580	µg/L	31,051	µg/L
7440-02-0	Nickel	13	µg/L	1.98	µg/L
7440-09-7	Potassium	20,573	µg/L	11,089	µg/L
7782-49-2	Selenium	5	µg/L	20.7	µg/L
7440-21-3	Silicon	20,063	µg/L	43,904	µg/L
7440-23-5	Sodium	254,237	µg/L	32,919	µg/L
7440-31-5	Tin	1	µg/L	23.6	µg/L
	Thallium	0	µg/L	1.87	µg/L
7440-62-2	Vanadium	26	µg/L	19.3	µg/L
7440-66-6	Zinc	14	µg/L	48.9	µg/L
56-23-5	Carbon Tetrachloride	0	µg/L	0	µg/L
67-56-1	Trichloroethene	0	µg/L	0	µg/L
75-69-4	Methyl Alcohol	0	µg/L	0	µg/L
	Trichlorofluoromethane	3.2	µg/L	0	µg/L
pH	pH	7 to 8	unitless	TBD	unitless
CONDUCT	Specific Conductance	2509	µmS/cm	TBD	µmS/cm
24959-67-9	Bromide	1242	µg/L	151	µg/L

Table D-3. ERDF Leachate

CAS #	Constituent	Average Concentration between February 2000 and September 2012	Units	Regional Groundwater Background Concentration*	Units
16887-00-6	Chloride	249,638	µg/L	19,580	µg/L
16984-48-8	Fluoride	521	µg/L	1,298	µg/L
14797-55-8	Nitrate	327,241	µg/L	41,723	µg/L
14797-65-0	Nitrite	500U	µg/L	130	µg/L
14808-79-8	Sulfate	473,776	µg/L	54,950	µg/L
TOC	Total Organic Carbon	13,148	µg/L	TBD	µg/L
OIL/GREASE	Oil and Grease	3,213	µg/L	0	µg/L
TDS	Total Dissolved Solids	1,926,897	µg/L	TBD	µg/L
TSS	Total Suspended Solids	15,686	µg/L	TBD	µg/L
12587-46-1	Alkalinity	264,813	µg/L	156,367	µg/L
12587-47-2	Gross alpha	965	pCi/L	0	pCi/L
14762-75-5	Gross beta	643	pCi/L	4.15	pCi/L

* Results are based on *Hanford Site Background: Part 3, Groundwater Background* (DOE/RL-96-61).

Note: Spreadsheet data were provided by Effluent Treatment Facility personnel.

TBD = to be determined

Table D-4. LERF Well Attributes

Wells	299-E26-9	299-E26-10	299-E26-11	299-E26-14	299-E26-77	299-E26-79	299-E35-2
Date Drilled	August, 1990	August, 1990	August, 1990	September, 2011	October, 2008	September, 2008	August, 1990
Top of Casing Elevation (m/ft)	184.854/606.48	184.418/605.05	183.88/603.281	183.224/601.129	184.782/606.24	183.115/600.771	184.611/605.679
Ground Surface Elevation (m/ft)	183.941/603.48	183.512/602.07	182.979/600.325	182.494/598.734	184.011/603.371	182.356/598.281	183.712/602.73
Total Depth Drilled (m/ft)	61.722/202.5	62.972/206.6	61.417/201.5	73.334/240.6	70.957/232.8	68.507/224.76	61.661/202.3
Elevation of Total Depth Drilled (m/ft)	122.219/400.98	120.54/395.47	121.562/398.825	109.16/358.134	113.054/370.571	113.849/373.521	122.051/400.43
Depth to Top of Basalt (m/ft)	61.271/201.02	62.271/204.3	60.35/198	67.361/221	62.636/205.5	63.094/207	60.991/200.1
Top of Basalt Elevation (m/ft)	122.67/402.46	121.241/397.77	122.629/402.325	115.133/377.734	121.375/397.871	119.262/391.281	122.722/402.63
Bottom of Sump Elevation (m/ft)	None	None	None	115.773/379.834	114.334/374.771	114.325/375.081	None
Fill Below Bottom of Sump/Screen	20-40 Sand	20-40 Sand	20-40 Sand	Bentonite Pellets/ 10-20 Sand[d]	10-20 Sand	10-20 Sand	20-40 Sand
Bottom of Screen Elevation (m/ft)	122.707/402.58	120.693/395.97	120.251/394.525	116.688/382.834	115.248/377.771	115.239/378.081	122.295/401.23
Top of Screen Elevation (m/ft)	125.937/413.18	125.448/411.57	121.958/400.125	122.784/402.834	122.792/402.521	122.859/403.081	125.526/411.83
Sand Pack	20-40 Sand	20-40 Sand	20-40 Sand	10-20 Sand	10-20 Sand	10-20 Sand	20-40 Sand
Water Table Elevation After Drilling (m/ft)	124.444/408.28[a]	124.594/408.773[b]	125.097/410.425[c]	121.922/400[e]	121.987/400.22[f]	121.976/400.184[g]	124.611/408.83[h]
Water Table Elevation 4/10/2013 (m/ft)	Dry	121.81/399.639	122.602/402.238	121.878/399.862	121.825/399.688	121.808/399.633	Dry
Water Height Across Screen 4/10/2013 (m/ft)	Dry	1.117/3.67	2.351/7.713	5.19/17.028	6.577/21.917	6.569/24.552	Dry
Water above Basalt 4/10/2013 (m/ft)	Dry	0.569/1.87	None	6.745/22.128	0.45/1.817	2.546/8.352	Dry
Ringold Present	No	No	Yes	Yes	No	Yes	Yes[i]
Depth to Top of Ringold (m/ft)	NA	NA	57.607/189	65.532/215	NA	62.789/206	Not Provided
Top of Ringold Elevation (m/ft)	NA	NA	125.372/411.325	116.962/383.734	NA	119.567/392.281	Uncertain
Thickness of Ringold Across Screen 4/10/2013 (m/ft)	NA	NA	NA	0.274/0.9	NA	0.3048/1	Uncertain
Best Estimate of Hydraulic Conductivity (m/day)	6 to 120	36.2 to 42.8	6.3	27.3	134		39.7

a. Date 8/1/1990
b. Date 9/4/1990
c. Date 8/13/1990
d. Bentonite pellets to 0.7 ft below bottom of sump
e. Date 12/29/2011
f. Date 11/26/2008
g. Date 11/26/2008
h. Date 8/2/1990
i. Basis: WHC-SD-EN-EV-024, *Site Characterization Report for the Liquid Effluent Retention Facility*
NA = not applicable

Table D-5. LERF Groundwater Gradient and Magnitude Calculations

Well Name	December, 2011	February, 2012	April, 2012	August, 2012	September, 2012	November, 2012	December, 2012	January, 2013
	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment	New RP, Gyro Correction & BP Adjustment
299-E26-10	121.838	121.834	121.816	121.808	121.809	121.828	121.830	121.825
299-E26-14	121.911	121.895	121.890	121.878	121.878	121.898	121.899	121.891
299-E26-77	121.844	121.843	121.824	121.820	121.822	121.839	121.841	121.835
299-E26-79	121.847	121.835	121.818	121.813	121.816	121.830	121.837	121.839
Range (m):	0.073	0.061	0.074	0.070	0.069	0.070	0.069	0.066
Gradient Magnitude (m/m):	2.75E-04	2.49E-04	2.98E-04	2.77E-04	2.69E-04	2.85E-04	2.67E-04	2.39E-04
Direction (azimuth):	195	186	188	188	189	186	190	198
R^2:	0.92	0.93	0.91	0.94	0.95	0.93	0.94	0.96
p-Value:	0.2858	0.2670	0.2928	0.2348	0.2132	0.2569	0.2355	0.2071
Statistically Significant?:	No	No	No	No	No	No	No	No

RP = Reference Point

BP = Barometric Pressure

In order to minimize the measurement error associated with the monitoring network, steps were taken that included deviation correction from vertical of the well bore, barometric corrections completed within each well and correlated with barometric conditions measured at weather station in 200 Areas; precision geodetic surveys to a common benchmark; dedicated e-tape measurements for depth-to-groundwater from the dedicated point associated with the precision survey at each well; dedicated person for measuring water levels all groundwater level measurements completed on same day per month. Further discussion on these corrections is provided in *Calculations in Support of the Low Hydraulic Gradient Evaluation Study for the 200 East Area Unconfined Aquifer* (ECF-200EAST-12-0086).

After these corrections have been applied, a least square regression of the plane to elevations associated with the well locations is completed to derive the gradient. The gradient, azimuth, R2 ratio, the p-value are provided in the lower part of the table. Briefly, the R2 ratio is the goodness of fit coefficient. Basically, it is the ratio of the sum of squares because of the regression to the total sum of squares. If the ratio of the two sums is close to 1, indicating unity, then the fit is considered good. Likewise, the p-value is the probability that the degree of an apparent spatially dependent trend observed in the data (or a trend of even greater degree) would occur solely by random chance. Thus, if the p-value is less than 0.05, the fitted trend surface is deemed statistically significant. Again, further details of this process calculation are provided in ECF-200EAST-12-0086.

Table D-6. Geochemical Constituent Evaluation for Groundwater

Constituent	Sample Frequency	Comment
• Major anions • Major cations • Alkalinity	Semiannually	Aid geochemical evaluation

Table D-7. Dangerous Constituents and Indicators to be Analyzed as Indicators of Groundwater Contamination at the LERF Basins

Constituent	Sample Frequency	Comment
• Carbon tetrachloride • pH • Specific conductance • Total organic carbon • Total organic halides	Samples collected semiannually for detection monitoring.	Subject to statistical evaluation, based on the standard sampling plan outlined in WAC 173-303-645(8)(g)(i) and WAC 173-303-645(8)(h)(i). Analyze hexavalent chromium as potential indicator parameter.

Source: WAC 173-303-645, "Dangerous Waste Regulations," "Releases from Regulated Units."

Notes: Wells 299-E26-14 and 299-E26-79 are sampled as upgradient and downgradient compliance wells semiannually.

Well 299-E26-77 will be sampled semiannually for geochemical and field parameters, but not used for background calculations.

Table D-8. Quality Control Samples

Sample Type	Primary Characteristics Evaluated	Frequency
Field Quality Control		
Full trip blank	Contamination from containers or transportation	One per 20 well trips
Field transfer blank	Airborne contamination from the sampling site	One each day volatile organic compound samples are collected
Equipment blank	Contamination from non-dedicated sampling equipment	As needed[a]
Duplicate samples	Reproducibility	One per 20 well trips
Laboratory Quality Control		
Method blank	Laboratory contamination	One per batch
Laboratory duplicates	Laboratory reproducibility	[b]
Matrix spike	Matrix effects and laboratory accuracy	[b]
Matrix spike duplicate	Laboratory reproducibility and	[b]

Table D-8. Quality Control Samples

Sample Type	Primary Characteristics Evaluated	Frequency
	accuracy	
Surrogates	Recovery/yield	[b]
Laboratory control sample	Method accuracy	One per batch

a. For portable Grundfos pumps, equipment blanks are collected 1 per 10 well trips. Whenever a new type of non-dedicated equipment is used, an equipment blank is collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the non-dedicated equipment.

b. As defined in the laboratory contract or quality assurance plan and/or analysis procedures.

1

Table D-9. Preservation Techniques, Analytical Methods Used, and Current Required Quantitation Limits for Chemical Constituents

Constituent	Collection & Preservation[a,b]	Analysis Methods[c]	Method Quantitation Limit (µg/L)[d]
Metals			
Calcium	P, HNO_3 to pH<2	SW-846[e] Method 6010,or EPA/600 Method 200.8	1,000
Magnesium			750
Potassium			4,000
Sodium			500
Anions by Ion Chromatography			
Nitrate	P, none	EPA/600 Method 300.0[f]	250
Sulfate			500
Chloride			200
Nitrite			250
Volatile Organics			
Carbon Tetrachloride	G, no headspace	SW-846 8260	2
Total Organic Halides			
Total Organic Carbon	G, no headspace	SW-846 9060A	140
Total Organic Halides			
Total Organic Halides	G, no headspace	SW-846 9020B	20
Hexavalent Chromium			
Hexavalent Chromium	P, none	EPA/7196A	10
Alkalinity			

Table D-9. Preservation Techniques, Analytical Methods Used, and Current Required Quantitation Limits for Chemical Constituents

Constituent	Collection & Preservation[a,b]	Analysis Methods[c]	Method Quantitation Limit (µg/L)[d]
Alkalinity	G/P, none	EPA Standard Method[g] 2320 EPA/600 Method 310.1 EPA/600 Method 310.2	5,000

a. P = plastic; G = glass.

b. All samples will be cooled to 4°C upon collection.

c. Constituents grouped together are analyzed by the same method, unless otherwise indicated.

d. Detection limit units, except where indicated.

e. SW-846, *Methods for Evaluation of Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

f. Analytical method adapted from Method 300.0, *Test Methods for Determination of Inorganic Anions in Water by Ion Chromatography* (EPA-600/4-84-017).

g. *Standard Methods for the Examination of Water and Wastewater* (APHA /AWWA/WEF, 2012).

EPA = U.S. Environmental Protection Agency

N/A = not applicable

Table D-10. Field and Laboratory Quality Control Elements and Acceptance Criteria

Constituent[a]	QC Element	Acceptance Criteria	Corrective Action
General Chemical Parameters			
Alkalinity	MB	<MDL	Flagged with "C"
	LCS	80-120% recovery[c]	Data reviewed[d]
	DUP	<20% RPD[c]	Data reviewed[d]
	MS[e]	75-125% recovery[c]	Flagged with "N"
	EB, FTB	<2 times MDL	Flagged with "Q"
	Field duplicate	<20% RPD[f]	Flagged with "Q"
Anions			
Anions by IC	MB	<MDL	Flagged with "C"
	LCS	80-120% recovery[c]	Data reviewed[d]
	DUP	<20% RPD[c]	Data reviewed[d]
	MS	75-125% recovery[c]	Flagged with "N"
	EB, FTB	<2 times MDL	Flagged with "Q"
	Field duplicate	<20% RPD[f]	Flagged with "Q"

Table D-10. Field and Laboratory Quality Control Elements and Acceptance Criteria

Constituent[a]	QC Element	Acceptance Criteria	Corrective Action
Metals			
ICP metals	MB	<CRDL	Flagged with "C"
	LCS	80-120% recovery[c]	Data reviewed[d]
	MS	75-125% recovery[c]	Flagged with "N"
	MSD	<20% RPD[c]	Data reviewed[d]
	EB, FTB	<2 times MDL	Flagged with "Q"
	Field duplicate	<20% RPD[f]	Flagged with "Q"
Volatile Organic Compounds			
Carbon tetrachloride	MB	<MDL	Flagged with "B"
	LCS	Statistically derived[g]	Data reviewed
	MS	Statistically derived[g]	Flagged with "N"
	MSD	Statistically derived[g]	Data reviewed[d]
	SUR	Statistically derived[g]	Data reviewed[d]
	EB, FTB, FXR	<2 times MDL	Flagged with "Q"
	Field duplicate	<20% RPD[f]	Flagged with "Q"
Hexavalent Chromium			
Hexavalent Chromium	MB	<2 times MDL	Flagged with "B"
	LCS	Statistically derived[g]	Data reviewed
	MS	Statistically derived[g]	Flagged with "N"
	MSD	Statistically derived[g]	Data reviewed[d]
	SUR	Statistically derived[g]	Data reviewed[d]
	EB, FTB	<2 times MDL	Flagged with "Q"
	Field duplicate	<20% RPD[f]	Flagged with "Q"

Table D-10. Field and Laboratory Quality Control Elements and Acceptance Criteria

Constituent[a]	QC Element	Acceptance Criteria	Corrective Action

a. Refer to Table D-7 for specific analytical methods.

c. Laboratory-determined, statistically derived control limits may also be used. Such limits are reported with the data.

d. After review, corrective actions are determined on a case-by-case basis. Corrective actions may include a laboratory recheck or flagging the data as suspect ("Y" flag) or rejected ("R" flag).

e. Applies to total organic carbon and total organic halides only.

f. Applies only in cases where one or both results are greater than 5 times the detection limit.

g. Determined by the laboratory based on historical data. Control limits are reported with the data.

Data flags:

B, C = possible laboratory contamination (analyte was detected in the associated method blank)

N = result may be biased (associated matrix spike result was outside the acceptance limits)

Q = problem with associated field QC sample (blank and/or duplicate results were out of limits)

Abbreviations:

CRDL = contract-required detection limit

DUP = laboratory matrix duplicate

EB = equipment blank

FTB = full trip blank

FXR = field transfer blank

GC = gas chromatography

ICP = inductively coupled plasma

LCS = laboratory control sample

MB = method blank

MDL = method detection limit

MS = matrix spike

MSD = matrix spike duplicate

QC = quality control

RPD = relative percent difference

SUR = surrogate

Table D-11. Blind-Standard Constituents and Schedule

Constituents	Frequency	Accuracy (%)[a]	Precision (% RSD)[a]
Carbon Tetrachloride	Quarterly	±25%	<25%
Total Organic Halides[b]	Quarterly	±25%	<25%

a. If the results are less than 5 times the required detection limit, then the criterion is that the difference of the results of the replicates is less than the required detection limit.

b. Two sets of spikes for total organic halides will be used. The spiking compound for one set should be 2,4, 5-trichlorophenol. The spiking compound for the second set should include the constituents used for the volatile organic compounds sample (carbon tetrachloride).

RSD = relative standard deviation

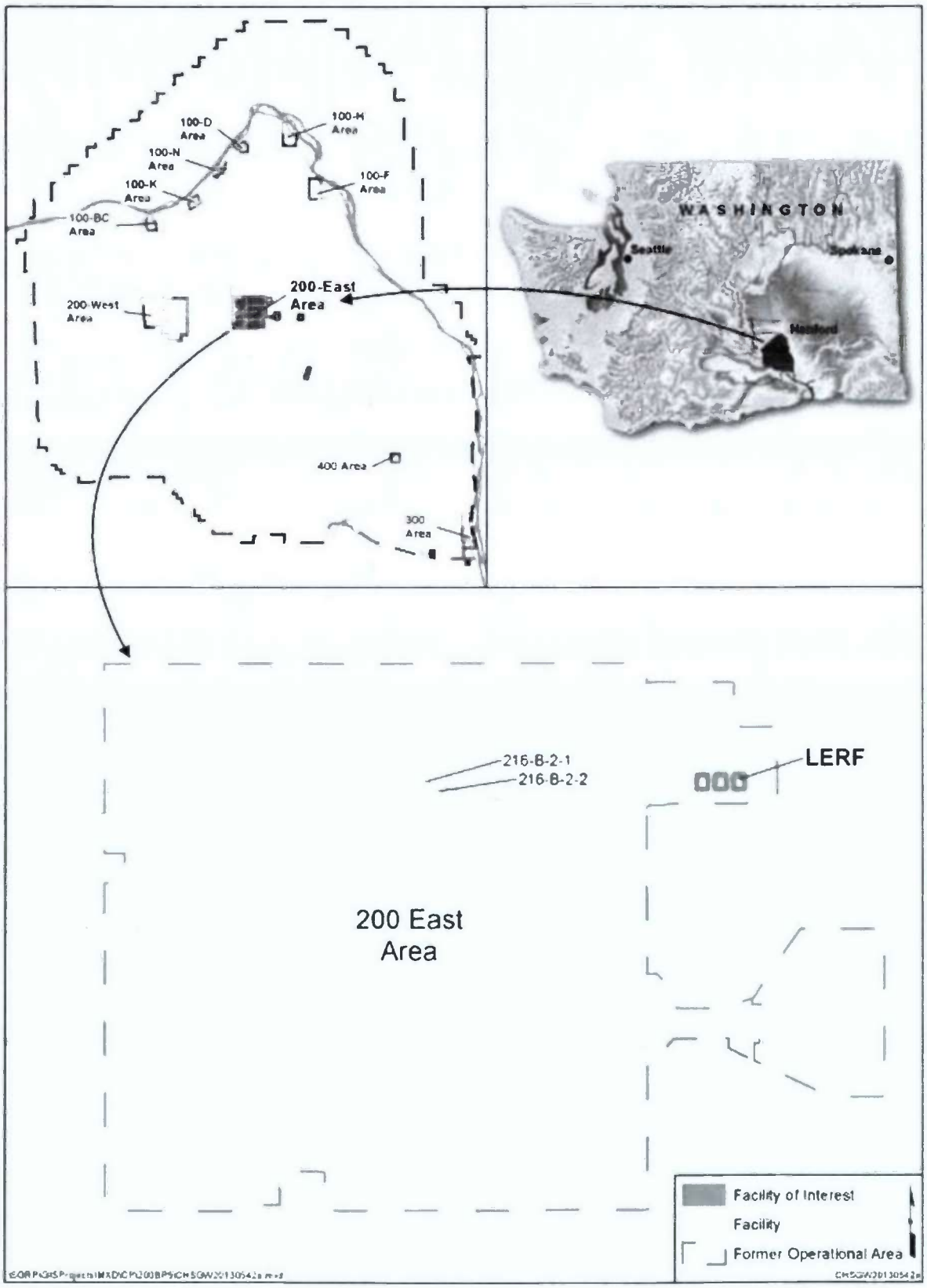

Figure D-1. LERF Location Map

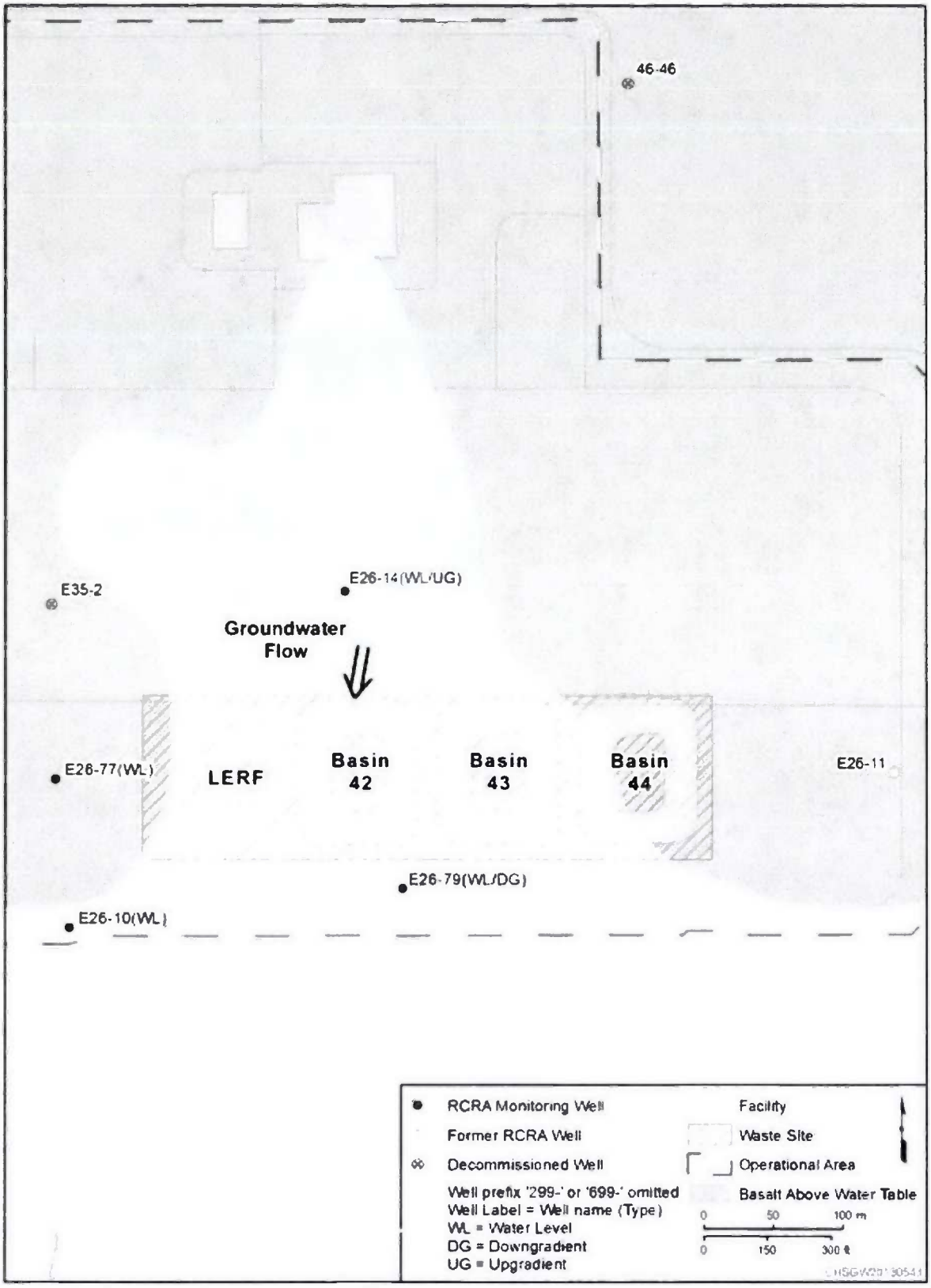

Figure D-2. LERF Well and Facility Description Map

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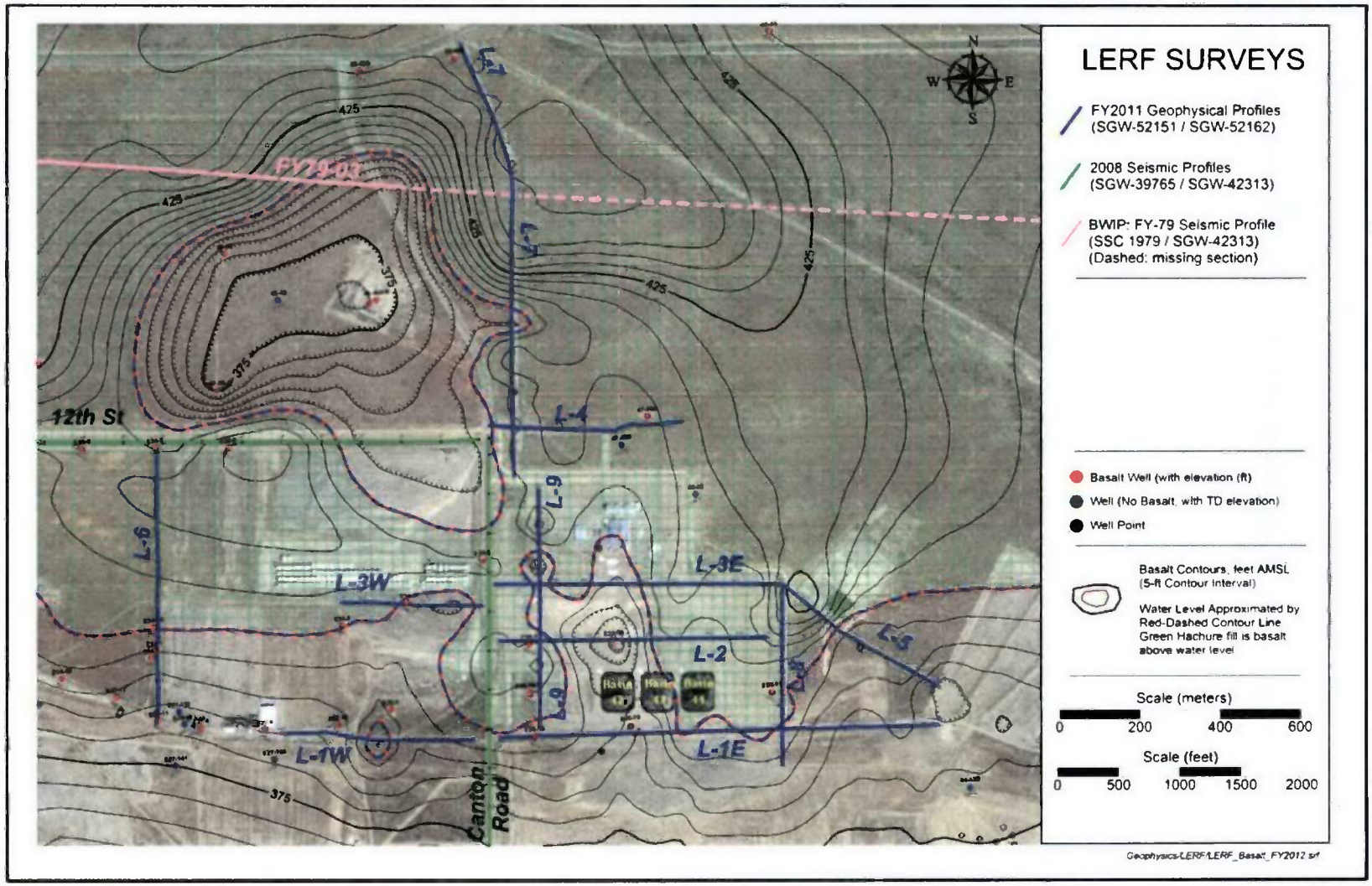

Figure D-3. LERF Location Map Showing Revised Unconfined Aquifer Thickness Based on Geophysical and Previous Borehole Data

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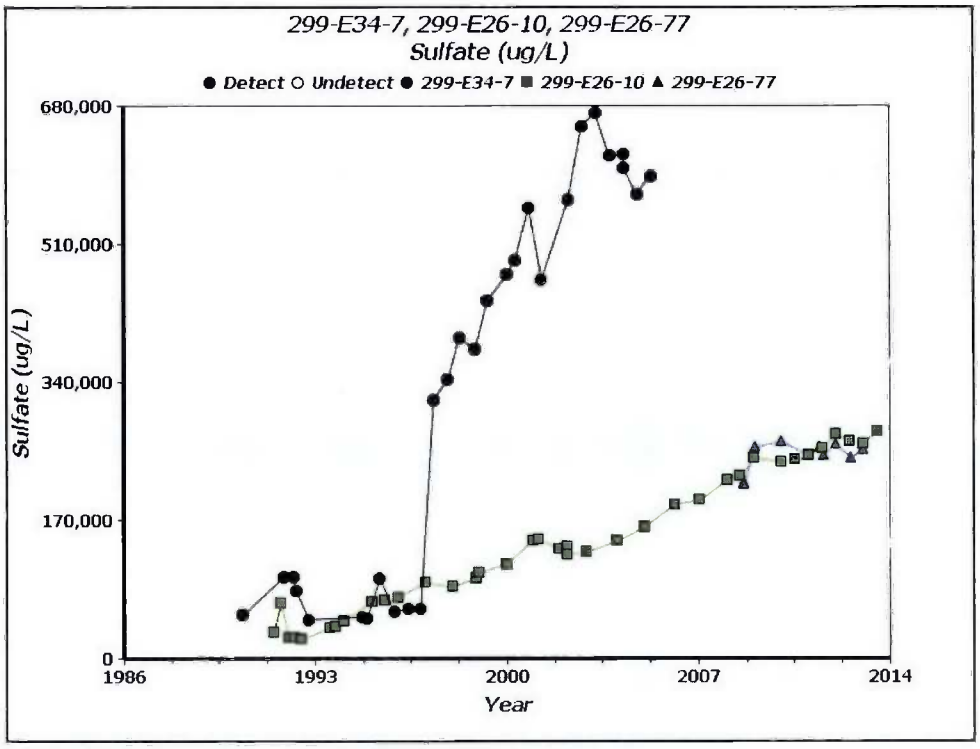

Figure D-4. Comparison of Sulfate at Wells 299-E34-7, 299-E26-14, and 299-E26-10

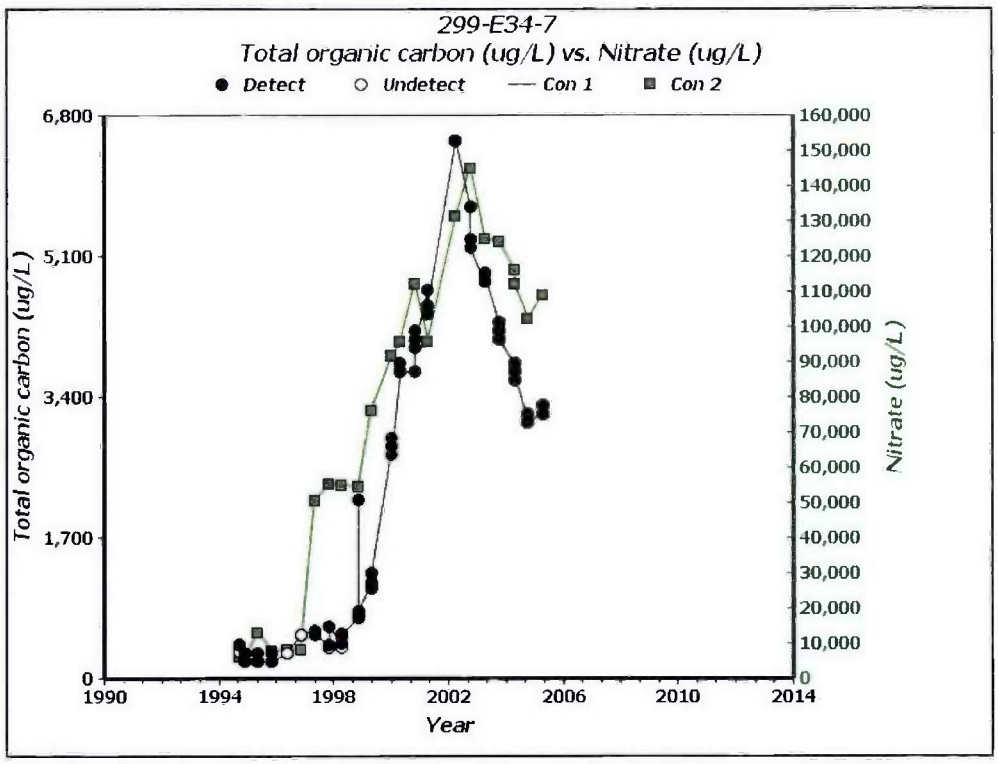

Figure D-5. History of Total Organic Carbon and Nitrate at Well 299-E34-7

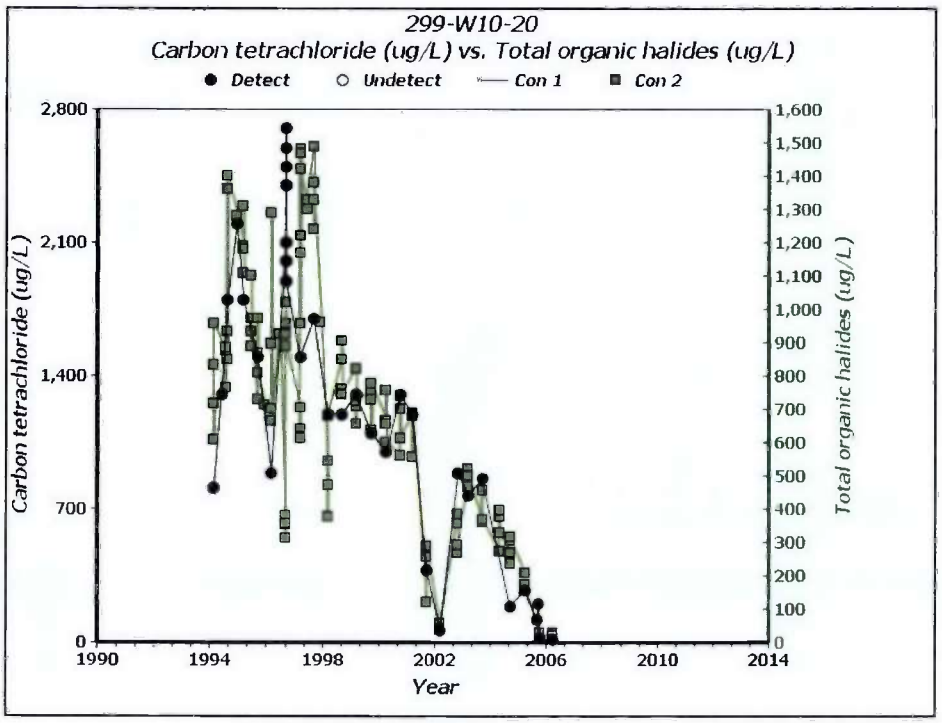

Figure D-6. Comparison of Carbon Tetrachloride to Total Organic Halides

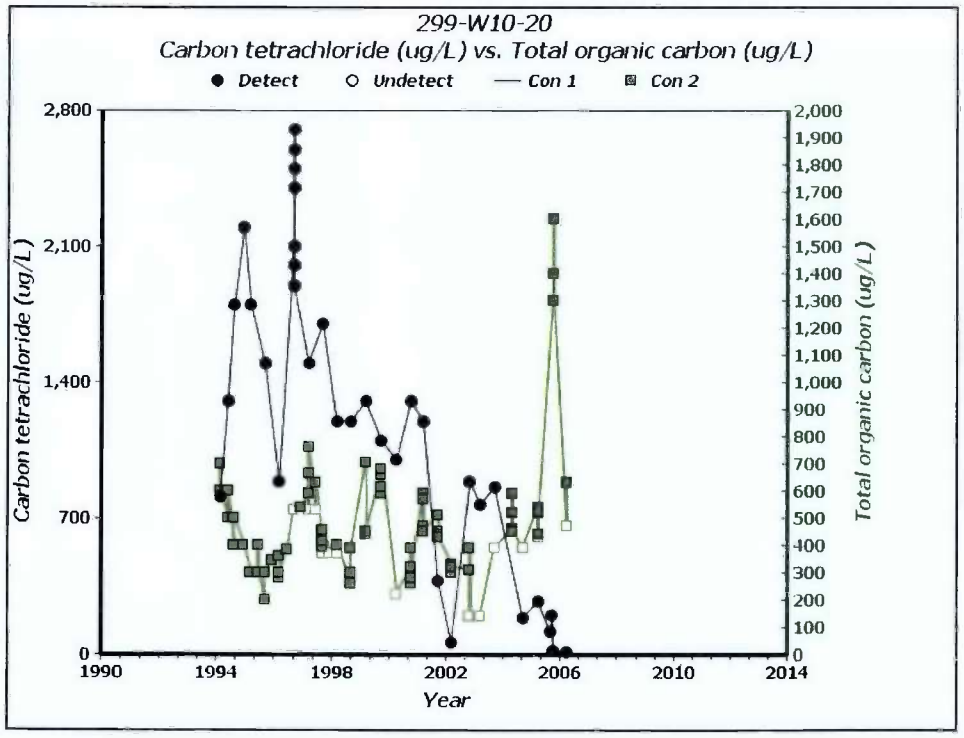

Figure D-7. Comparison of Carbon Tetrachloride to Total Organic Carbon

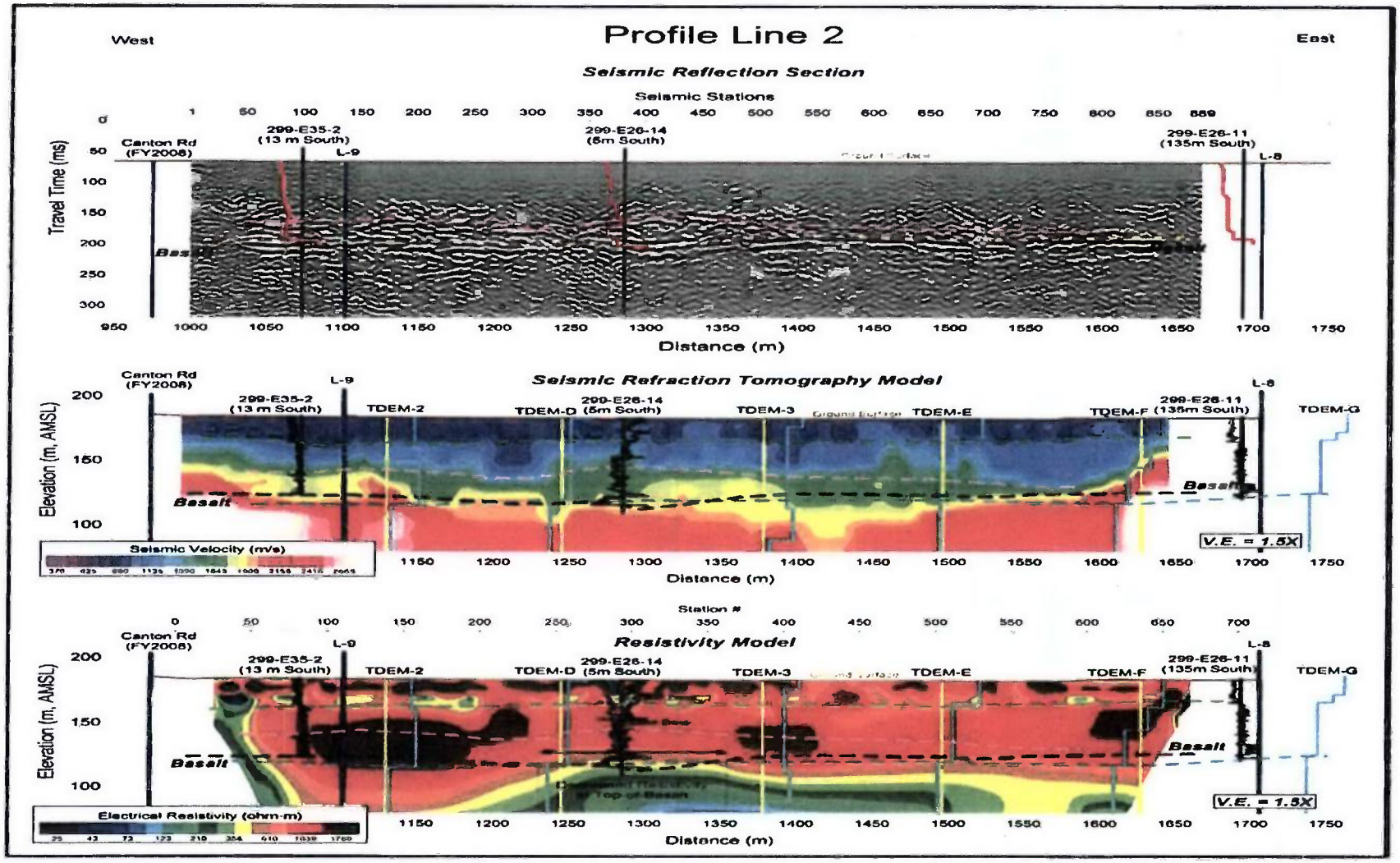

Figure D-8. Seismic Profile North of LERF extending from Well 299-E35-2 to Well 299-E26-11 and Including Well 299-E26-11

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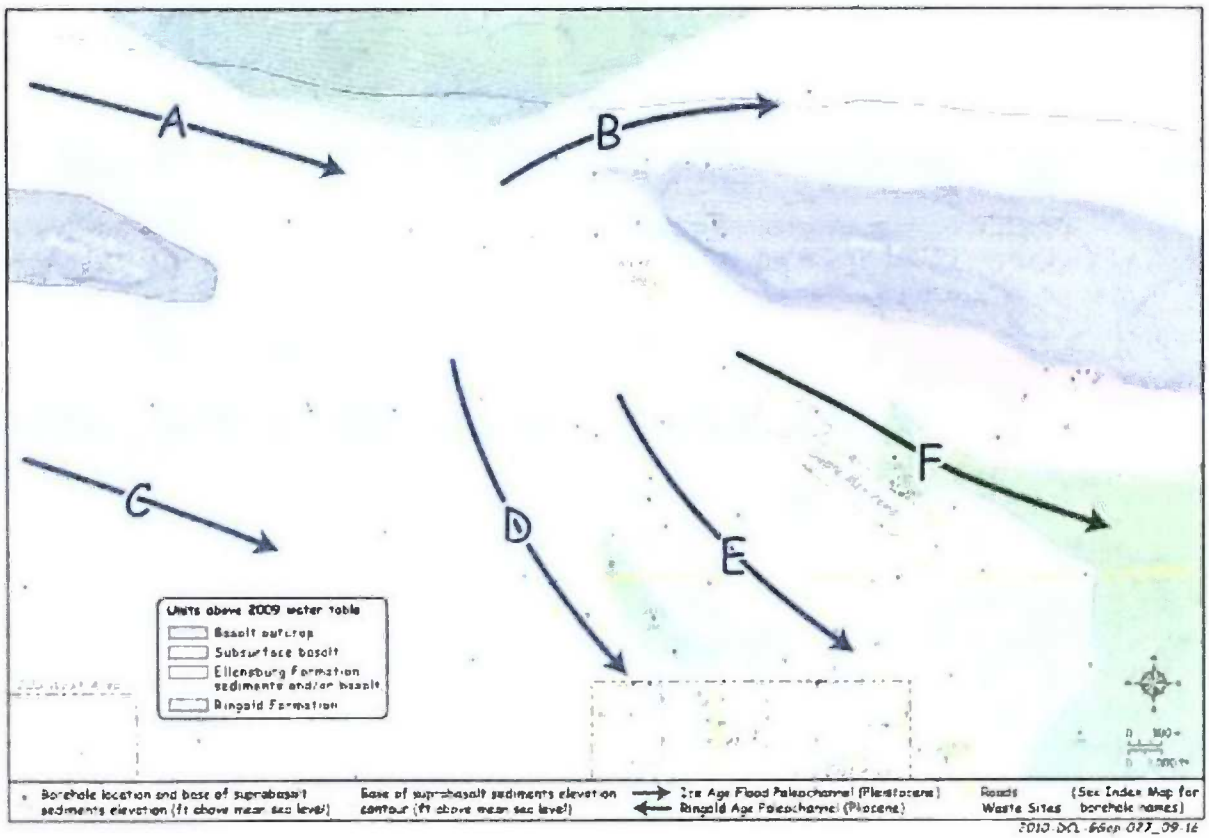

Figure D-9. Conceptual Model of Buried Paleochannels Extending Through Gable Gap

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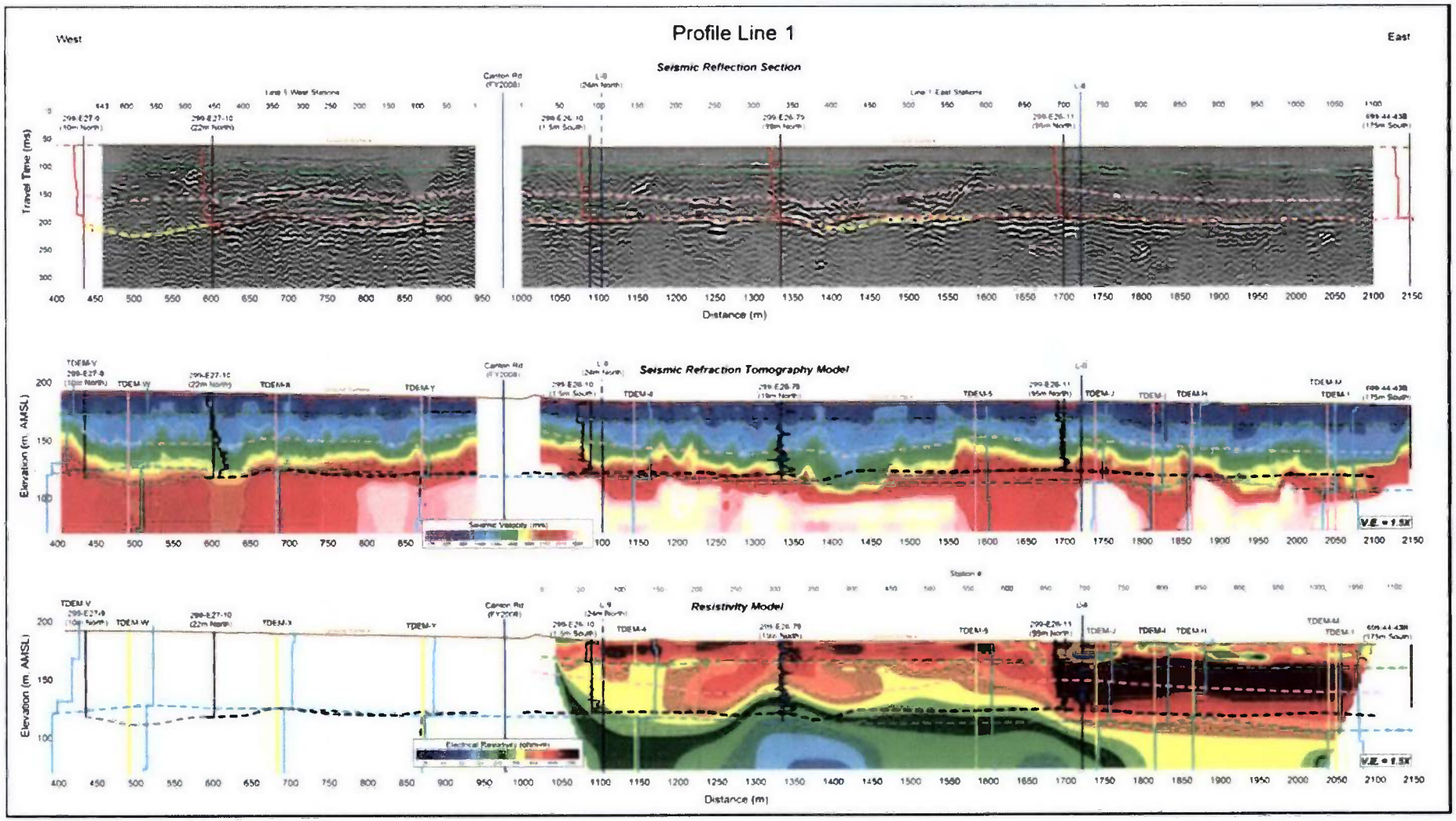

Figure D-10. Seismic Profile South of LERF with Focus on Area between Wells 299-E26-10 and 299-E26-11

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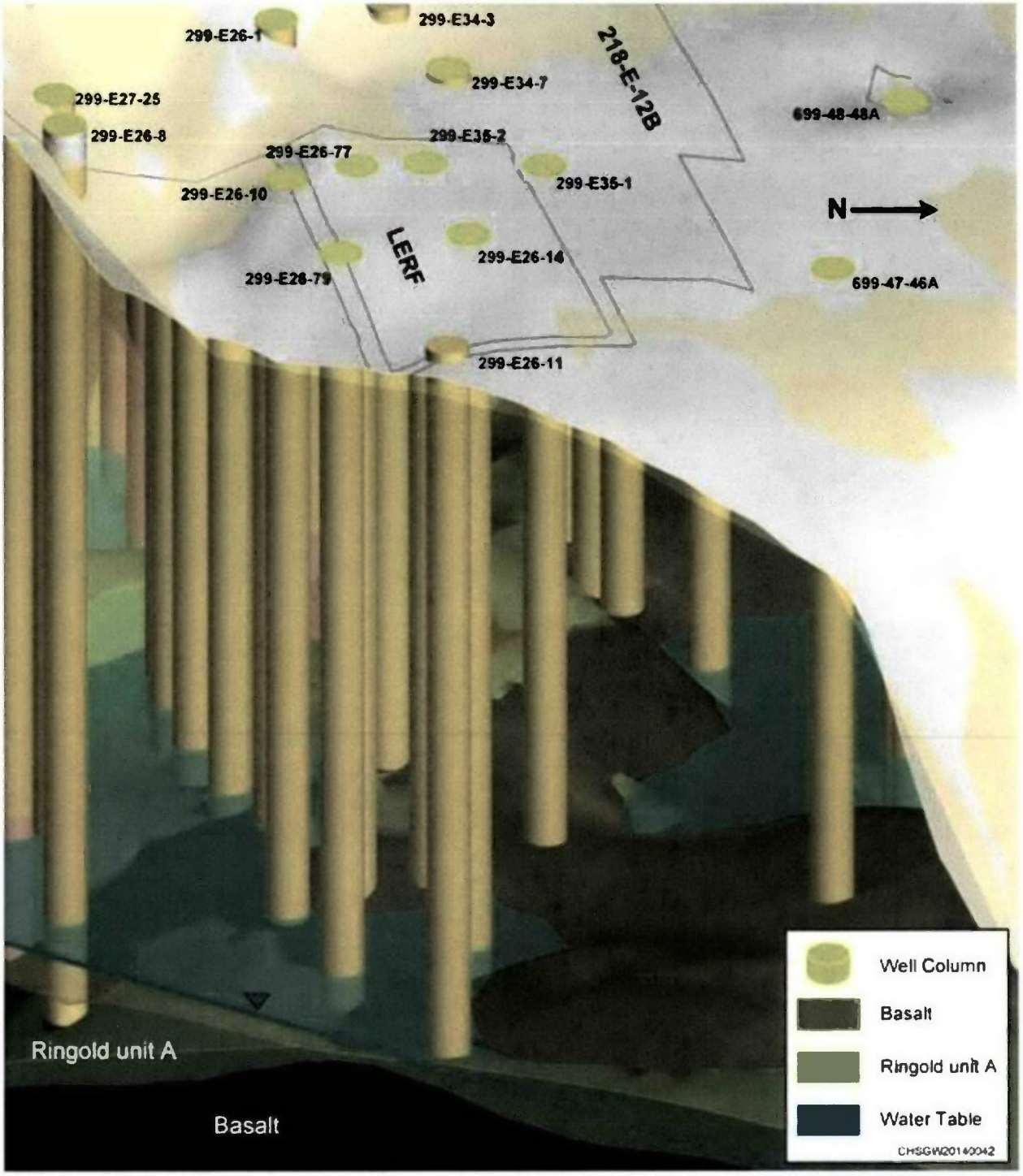
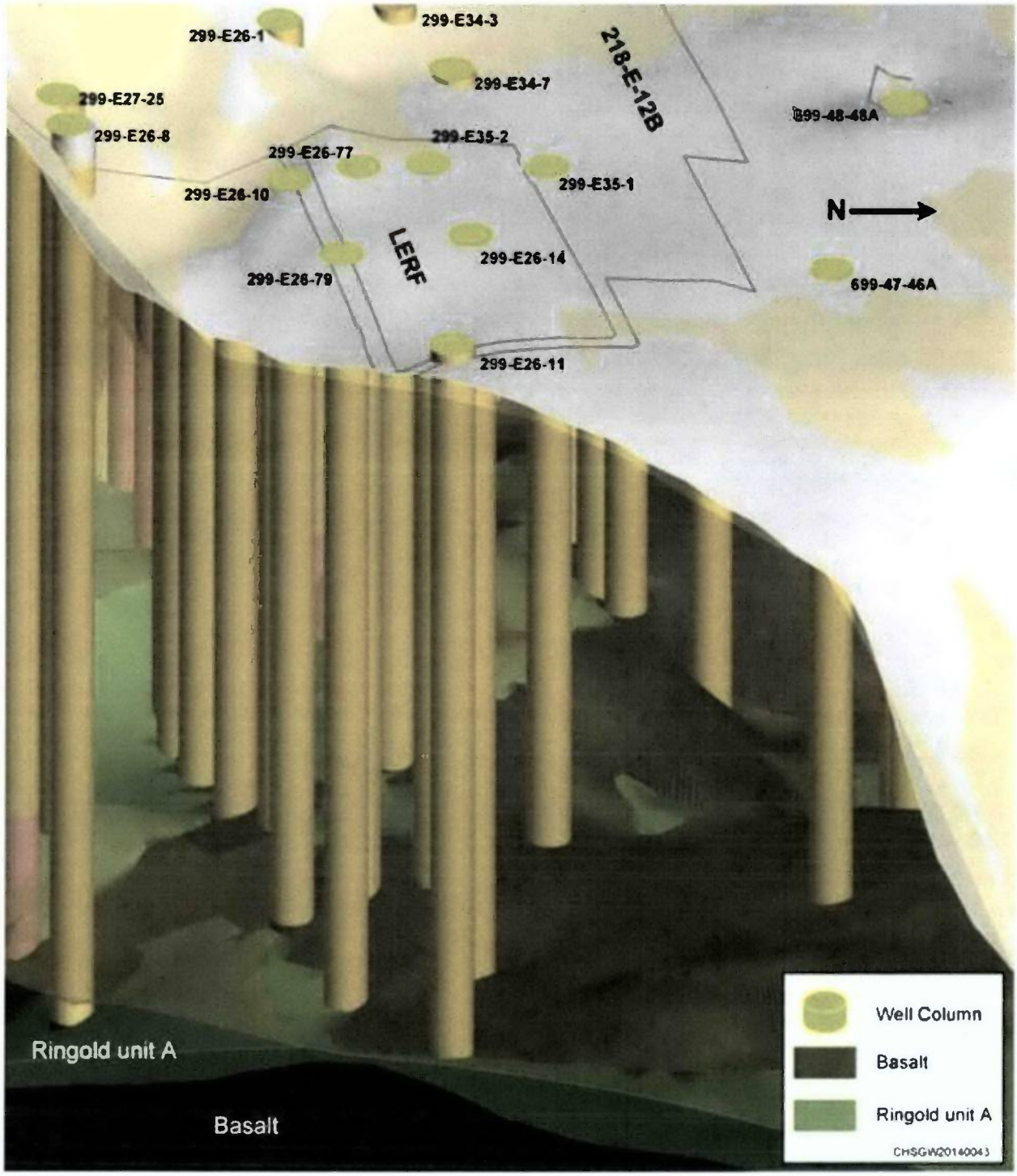


Note: The Hanford sediments have been removed to portray the basalt surface, remnant Ringold Formation, and groundwater elevation.

Figure D-11. Three Dimensional View from East of LERF Looking West-Northwest into the Soil Column



Note: The Hanford sediments and groundwater have been removed to portray the basalt surface and remnant Ringold Formation sediments.

Figure D-12. Three Dimensional View from East of LERF Looking West-Northwest into the Soil Column

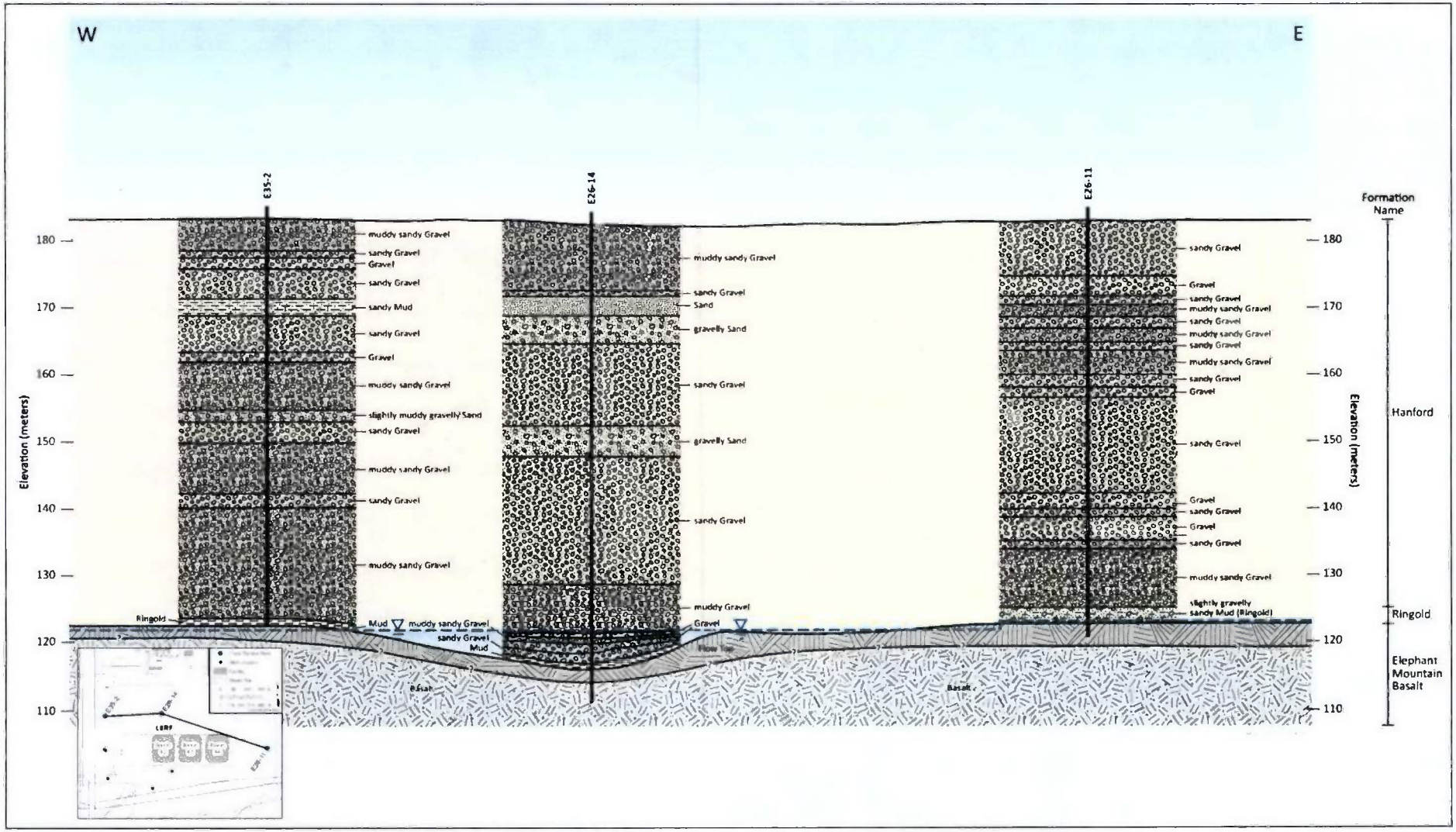


Figure D-13. West to East Geologic Cross Section Just North of LERF

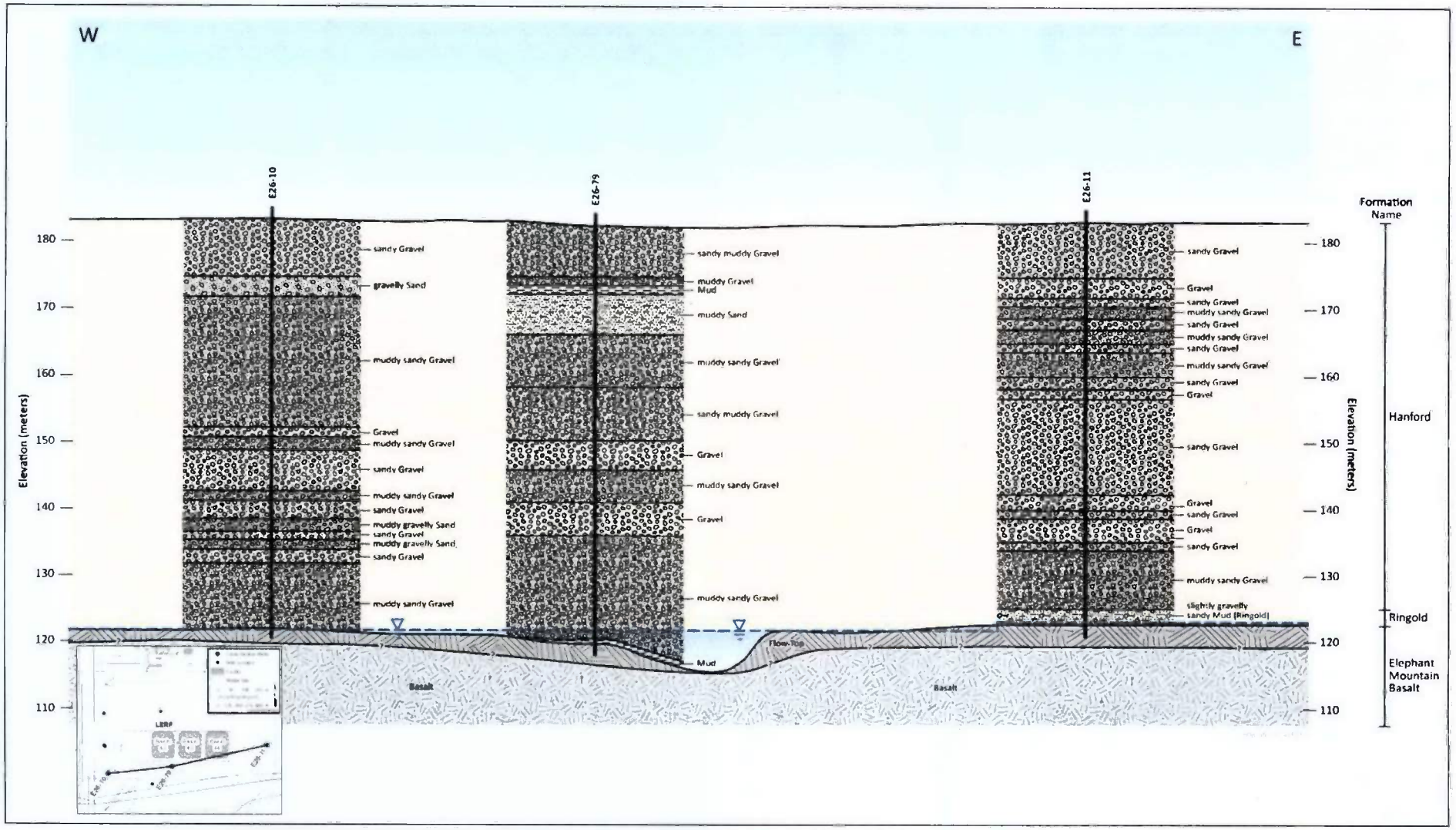
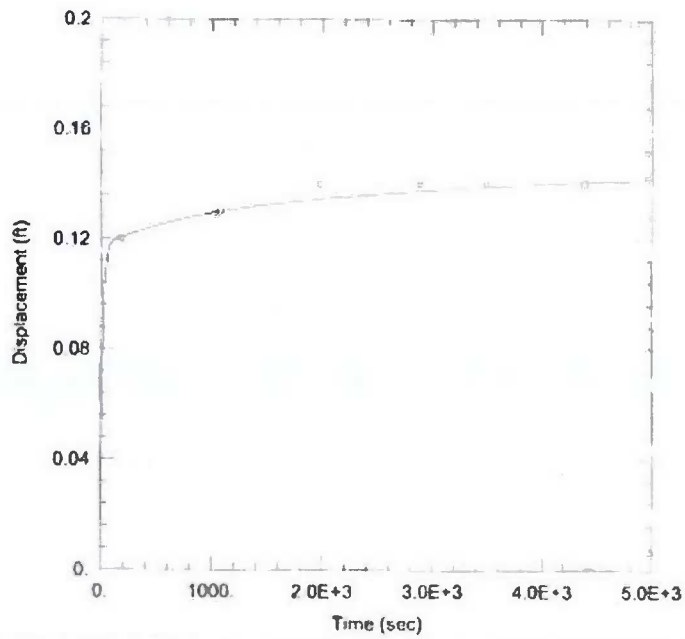


Figure D-14. West to East Geologic Cross Section Just South of LERF



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\h0091818\My Documents\E26-79\E26-79-2\E26-14.aqt
Date: 07/26/13 Time: 20:03:41

PROJECT INFORMATION

Company: CH2MHill
Client: DOE
Location: LERF
Test Well: 299-E26-14
Test Date: 9-27-2011

AQUIFER DATA

Saturated Thickness: 18. ft Anisotropy Ratio (Kz/Kr): 1.189E+4

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
299-E26-14	0	0	299-E26-14	0	0

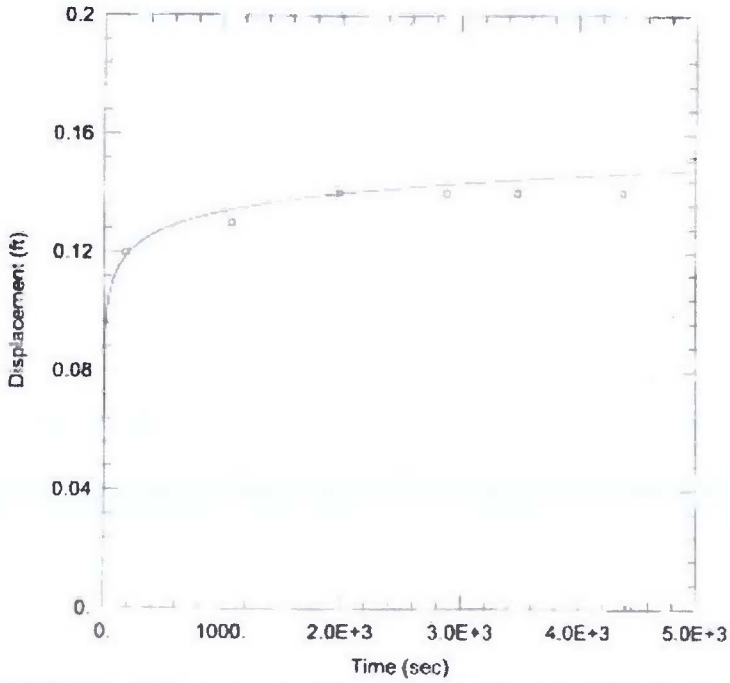
SOLUTION

Aquifer Model: Unconfined Solution Method: Moench

T = 56.97 cm^2/sec S = 1.109E-10
Sy = 0.001 β = 1.023
Sw = 0.6 r(w) = 0.167 ft
r(c) = 0.5043 ft alpha = 0.002512 sec^{-1}

α = empirical constant (fitting parameter, early part of curve matching) for noninstantaneous drainage
β = empirical constant (fitting parameter, late part of curve matching)
Kz = vertical hydraulic conductivity Kr = horizontal hydraulic conductivity
T = transmissivity S = storativity
Sy = specific conductance Sw = wellbore skin factor
r(c) = casing radius r(w) = well radius

Figure D-15. AQTESOLV Moench Unconfined Aquifer Pumping/Recovery Test for Type-Curve Match to Well 299-E26-14 with Wellbore Skin Affects and Delayed Gravity Response



WELL TEST ANALYSIS

Data Set: C:\Documents and Settings\h0091818\My Documents\E26-79\E26-79-2\E26-14.aqt
Date: 07/26/13 Time: 22:12:52

PROJECT INFORMATION

Company: CH2MHill
Client: DOE
Location: LERF
Test Well: 299-E26-14
Test Date: 9-27-2011

AQUIFER DATA

Saturated Thickness: 18. ft

WELL DATA

Pumping Wells			Observation Wells		
Well Name	X (ft)	Y (ft)	Well Name	X (ft)	Y (ft)
299-E26-14	0	0	299-E26-14	0	0

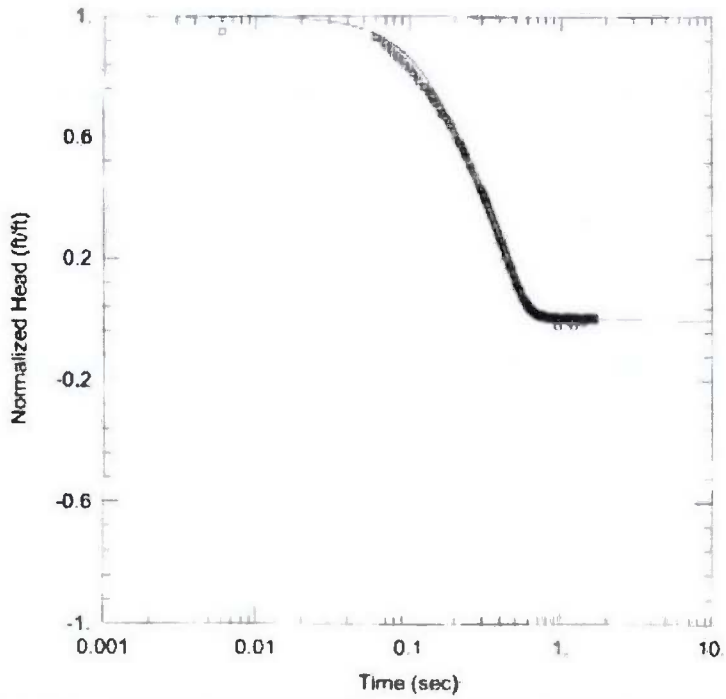
SOLUTION

Aquifer Model: Unconfined
Solution Method: Neuman

T = 50.78 cm^2/sec
S = 1.109E-10
Sy = 0.001
ß = 1.023

T = transmissivity
S = storativity
β = empirical constant (fitting parameter, late part of curve matching)
Sy = specific conductance

Figure D-16. AQTESOLV Neuman Unconfined Aquifer Pumping/Recovery Test for Type-Curve Match to Well 299-E26-14 with Delayed Gravity Response



WELL TEST ANALYSIS

Data Set:
Date: 07/26/13 Time: 11:38:17

PROJECT INFORMATION

Company: CH2MHill
Client: DOE
Location: LERF
Test Well: 299-E26-77
Test Date: 11-18-2008

AQUIFER DATA

Saturated Thickness: 24.15 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (299-E26-77-2)

Initial Displacement: 3.347 ft
Total Well Penetration Depth: 24.15 ft
Casing Radius: 0.167 ft
Static Water Column Height: 24.15 ft
Screen Length: 24.15 ft
Well Radius: 0.833 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Springer-Gelhar
K = 0.1549 cm/sec
Le = 0.8248 ft

K = Hydraulic conductivity
Le = Effective water column length

Figure D-17. AQTESOLV Springer-Gelhar Critically Dampened Type-Curve Match to Well 299-E26-77 Second Slug Withdraw Test November 18, 2008

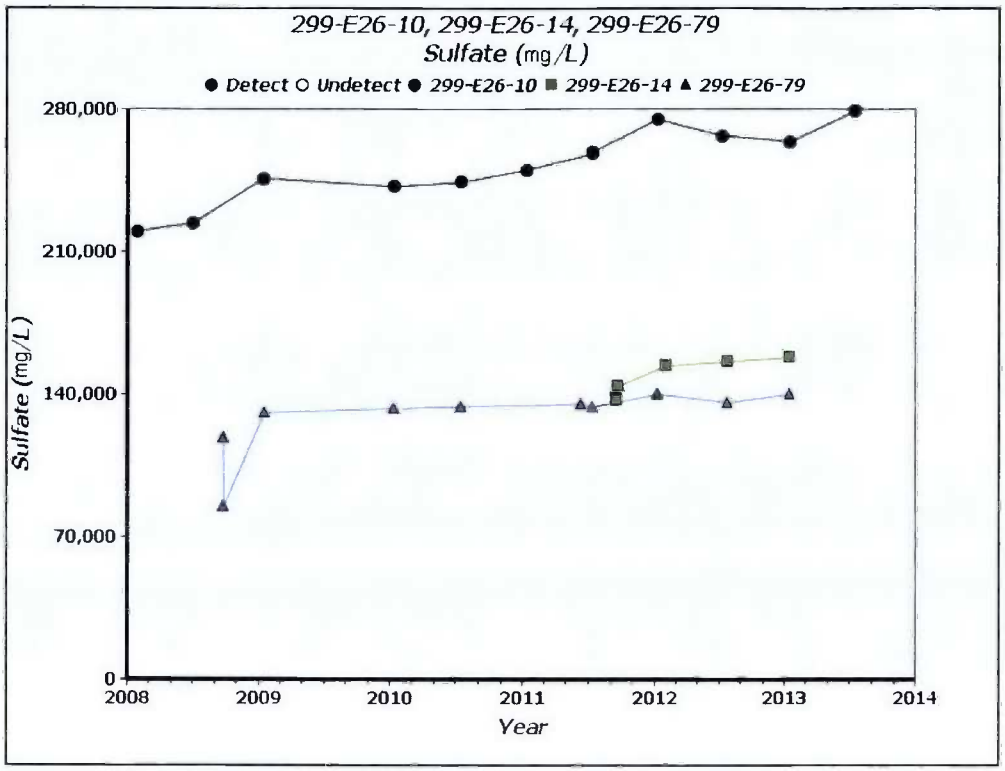


Figure D-18. Comparison of Sulfate Concentration Results in Wells 299-E26-10, 299-E26-14, and 299-E26-79

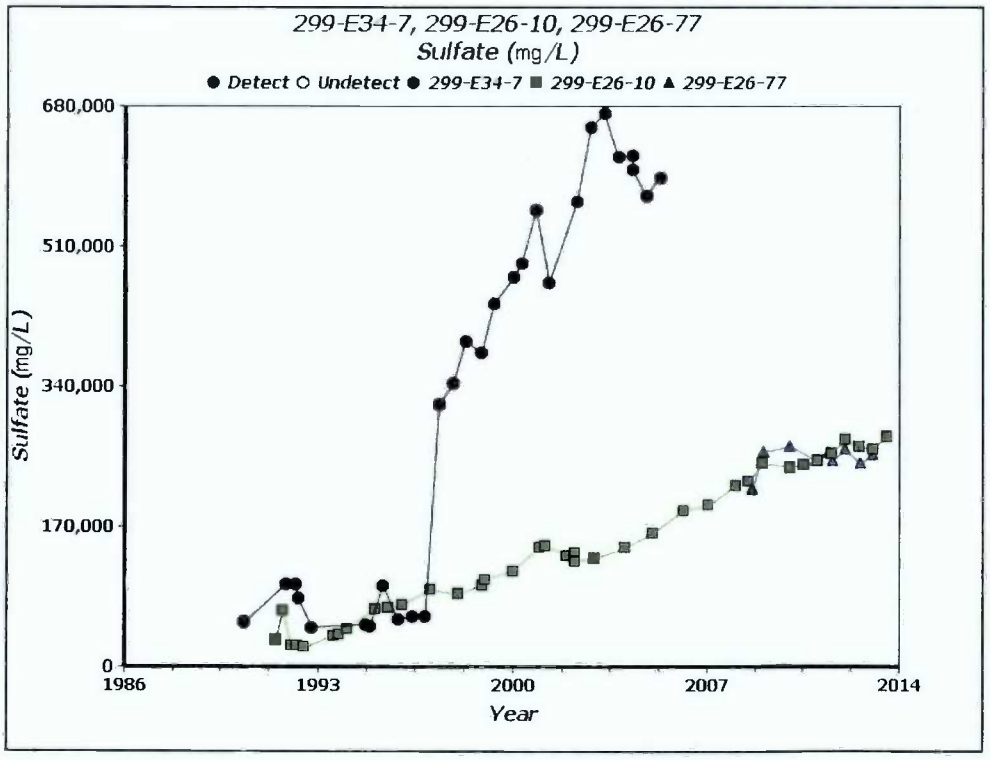


Figure D-19. History of Sulfate Increases in Wells 299-E26-10, 299-E26-77, and 299-E34-7

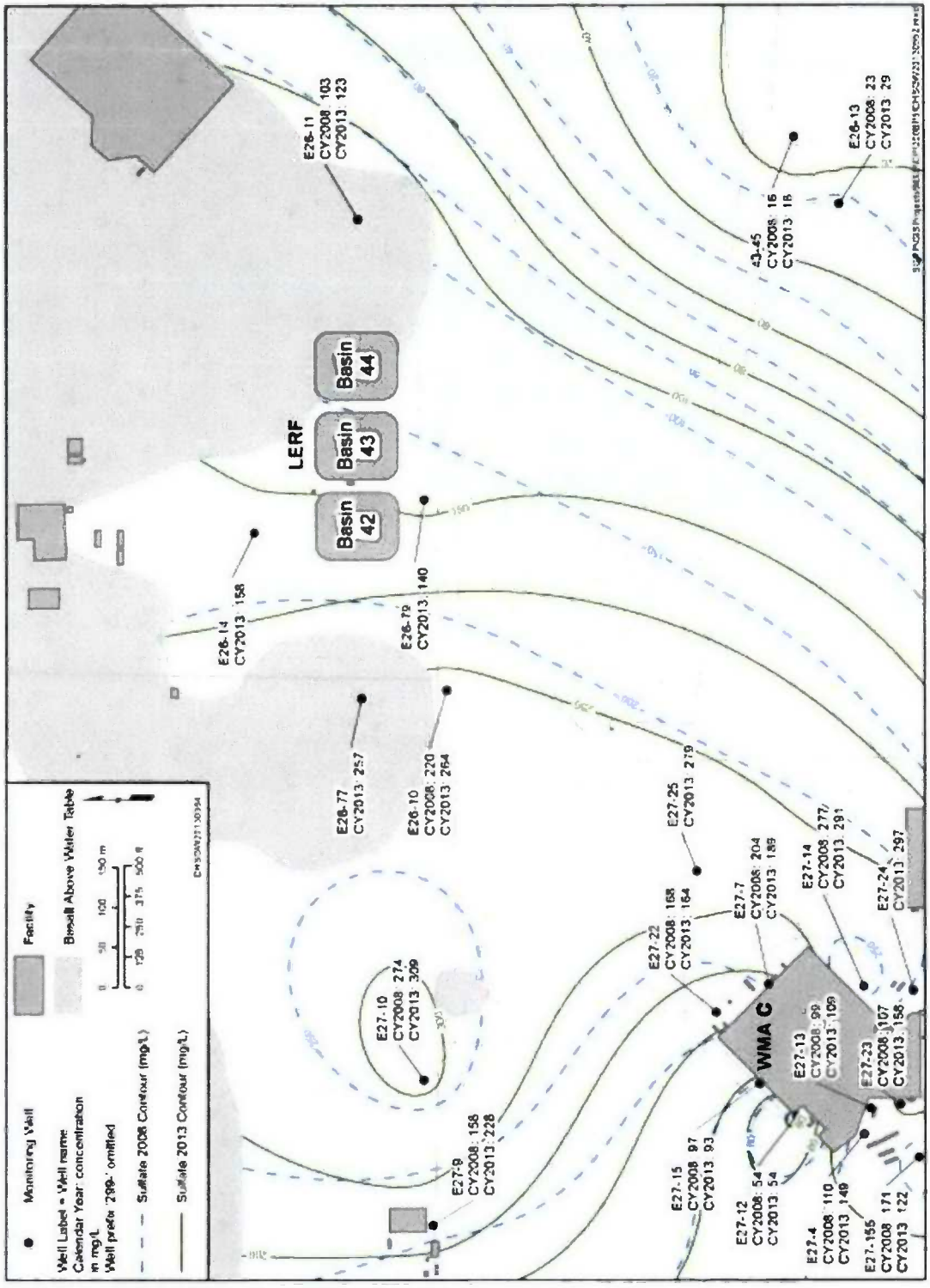


Figure D-20. 2008 and 2013 Regional Sulfate Plume

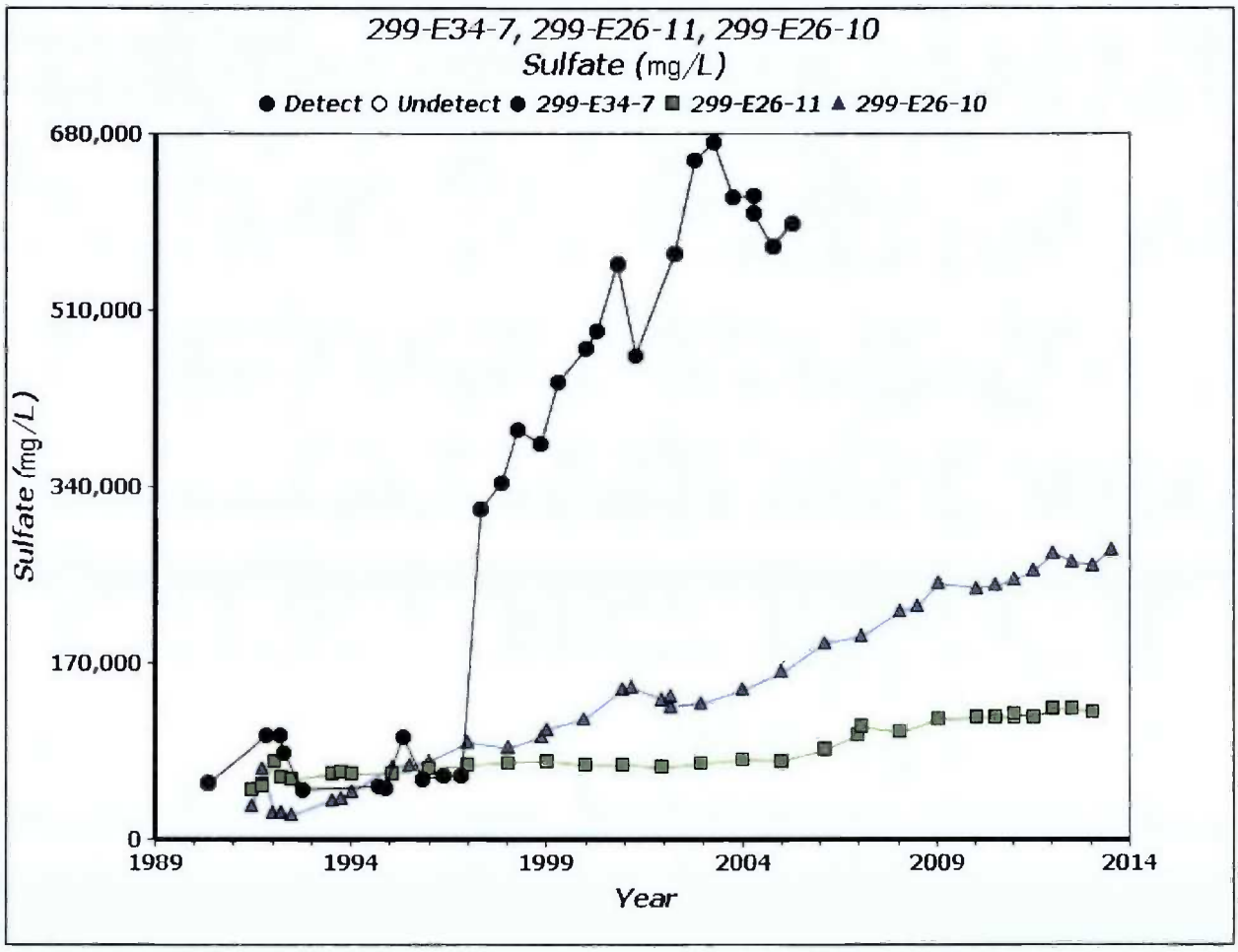


Figure D-21. Comparison of Sulfate Increases in Wells 299-E26-10, 299-E26-11, and 299-E34-7

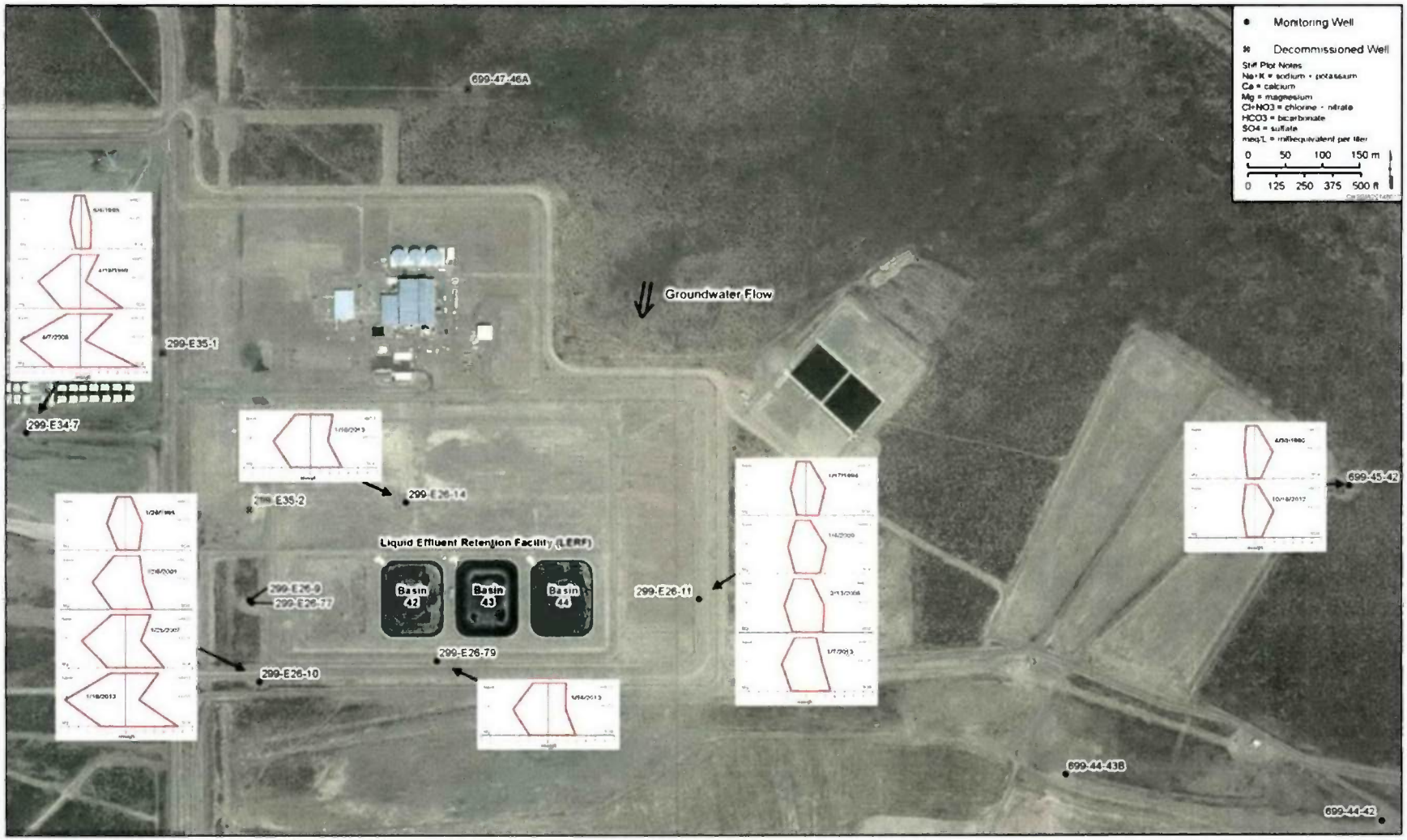


Figure D-22. Historical View of Changing Groundwater Conditions Beneath the Vicinity of LERF

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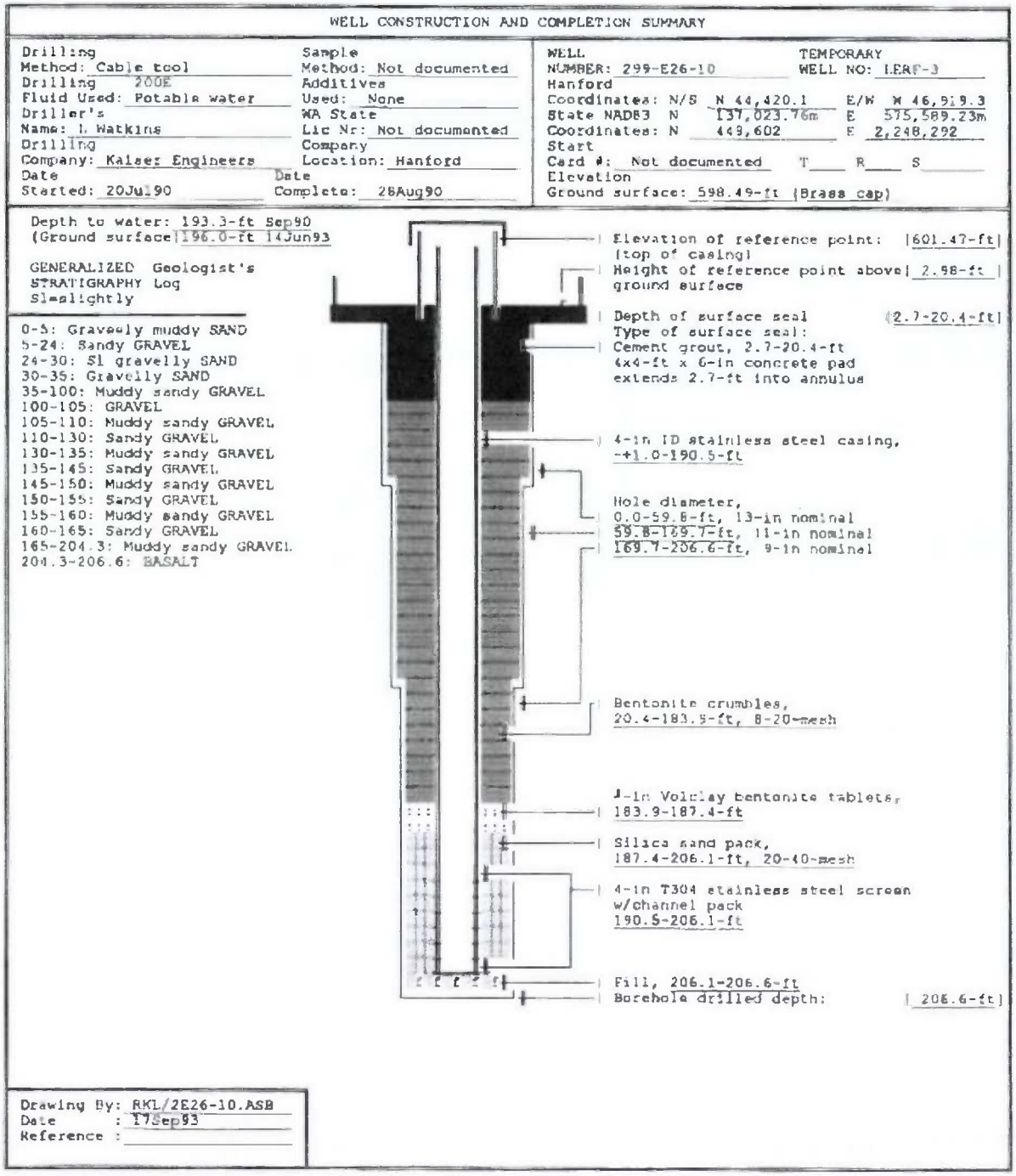


Figure D-23. Well Construction Diagram for Well 299-E26-10 in LERF Groundwater Monitoring Network

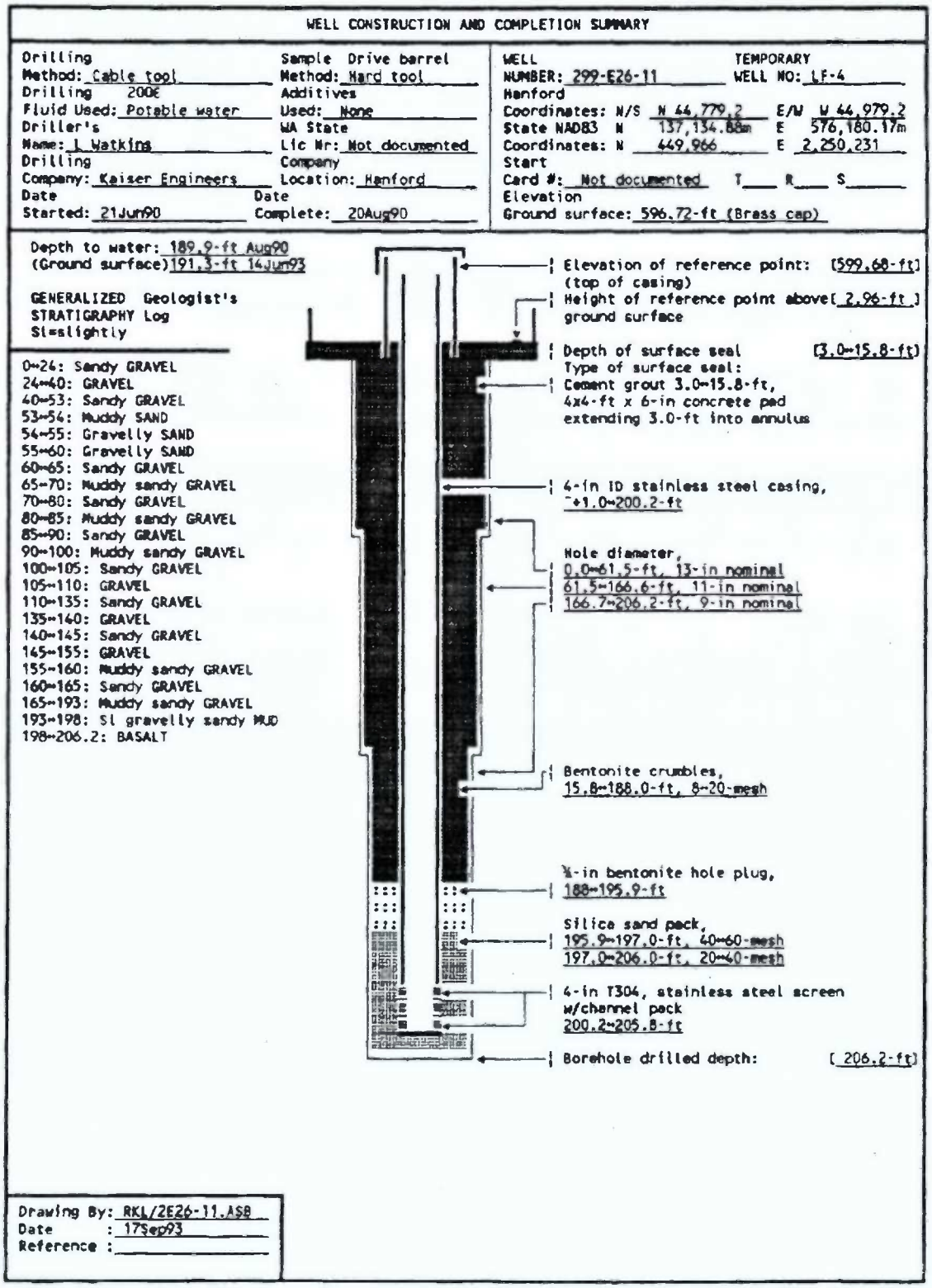


Figure D-24. Well Construction Diagram for Well 299-E26-11 in the Past LERF Groundwater Monitoring Network

WELL SUMMARY SHEET		Start Date: 9/8/11 Finish Date: 9/27/11	Page 1 of 2
Well ID: C8204		Well Name: 299-E26-14	
Location: 250 meters south of LERF Facility		Project: 2 M-24 RCRA Groundwater Wells	
Prepared By: Patrick Cabbage	Date: 10/20/11	Reviewed By: DC Weekes	Date: 10/24/11
Signature: Patrick Cabbage		Signature: DC Weekes	

CONSTRUCTION DATA

Description

Stainless Steel Protective Casing: 2.88 ft above ground surface

Type I/II Portland Cement Grout: 0 - 9.2 ft bgs

#8 Granular Bentonite Crumbles: 9.2 - 187.3 ft bgs

4-in I.D., Schedule 10, Type 304, Stainless Steel Permanent Casing: 1.79 ft ags - 195.90 ft bgs

All temporary drill casing was removed from the ground.

All depths are in feet below ground surface.

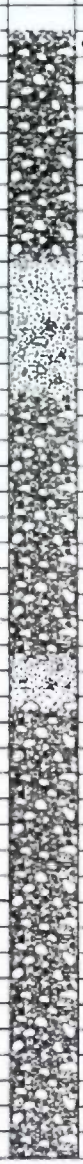
The borehole was drilled with 10 ¾-inch O.D. casing from 0.0 - 100.6 ft bgs, with 8 ¾-inch O.D. casing from 100.6 - 220.7 ft bgs, and with open hole from 220.7 to 240.6 ft bgs.

Diagram

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 20, 40, 60, 80, 100, 120, 140, 160

Graphic Log



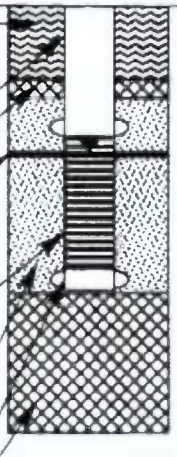
Lithologic Description/Groundwater Sample Depths (ft bgs)

0-1 Gravel Drill Pad (G)
1-34 Silty Sandy Gravel (msG)
34-36 Sandy Gravel (sG)
36-45 Sand (S)
45-57 Gravelly Sand (gS)
57-77 Sandy Gravel (sG)
77-83 Sandy Gravel (sG)
83-98 Sandy Gravel (sG)
98-103 Gravelly Sand (gS)
103-106 Gravelly Sand (gS)
106-122 Sandy Gravel (sG)
122-177 Sandy Gravel (sG)

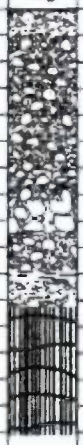
Figure D-25. Well Construction Diagram for Well 299-E26-14 in LERF Groundwater Monitoring Network

WELL SUMMARY SHEET		Start Date: 9/8/11 Finish Date: 9/27/11	Page 2 of 2
Well ID: C8204		Well Name: 299-E26-14	
Location: 250 meters south of LERF Facility		Project: 2 M-24 RCRA Groundwater Wells	
Prepared By: Patrick Cabbage	Date: 10/21/11	Reviewed By: DC Weekes	Date: 10/24/11
Signature: Patrick Cabbage		Signature: DC Weekes	

CONSTRUCTION DATA

Description	Diagram
#8 Granular Bentonite Crumbles: 9.2 - 187.3 ft bgs 4-in I.D., Schedule 10, Type 304, Stainless Steel Permanent Casing: 1.79 ft ags - 195.90 ft bgs 3/8-in Bentonite Pellets: 187.3 - 190.0 ft bgs Static Water Level: 198.4 ft bgs (9/27/11) 4-in I.D., Schedule 10, Type 304, Stainless Steel 20-slot Screen: 195.90 - 215.90 ft bgs Primary Filter Pack 10-20 Mesh Colorado Silica Sand: 190.0 - 219.6 ft bgs 4-in I.D., Schedule 10, Type 304, Stainless Steel Sump: 215.90 - 218.90 ft bgs 3/8-in Bentonite Pellets: 219.6 - 240.6 ft bgs	

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet	Graphic Log	Lithologic Description/Groundwater Sample Depths (ft bgs)
180		177-180 Silty Gravel (mG)
		180-200 Silty Sandy Gravel (msG)
200		200-202.5 Gravel (G)
		202.5-205 Silty Sandy Gravel (msG)
		205-210 Gravel (G)
		210-215.5 Sandy Gravel (sG)
		215.5-217 Silt (M)
220		217-220 Gravelly Silt (gM)
		220-221 Silty Gravel (mG)
		221-240.6 Basalt
240		TD = 240.6 ft bgs (09-21-2011)
260		

All temporary drill casing was removed from the ground.

All depths are in feet below ground surface.

The borehole was drilled with 10 ¾-inch O.D. casing from 0.0 - 100.6 ft bgs, with 8 ¾-inch O.D. casing from 100.6 - 220.7 ft bgs, and with open hole from 220.7 to 240.6 ft bgs.

Figure D-25. Well Summary Sheet for Well 299-E26-14 in the LERF Groundwater Monitoring Network (Cont.)

WELL SUMMARY SHEET

Start Date: 08/12/2008
Finish Date: 02/05/2008
Page 1 of 2

Well ID: C10455	Well Name: 299-E26-77
Location: Inside fence, LERF 200 E	Project: M-24 RCRA Wells (LERF)
Prepared By: S. Sexton — Date: 9/08/08	Reviewed By: L. D. Walker — Date: 10/13/08
Signature:	Signature:

CONSTRUCTION DATA

Description:

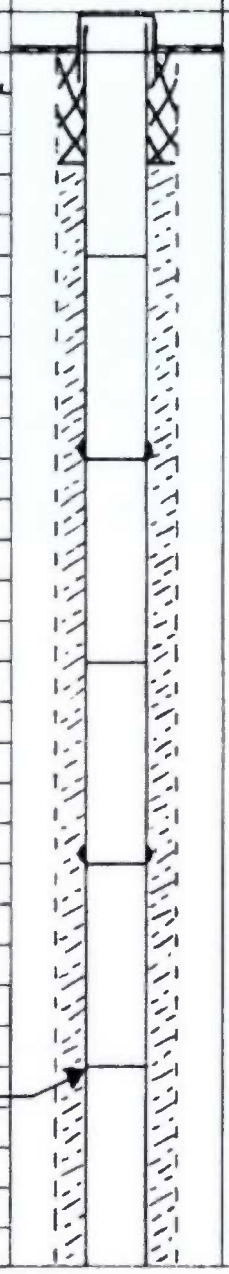
6" x 4' x 4' concrete pad
6" stainless steel protective monument:

4" ID Sch. 10 stainless steel casing: 1.96 ft ags to 200.85 ft bgs
4" stainless steel wire wrap screen, 0.020": 200.85 to 225.6 ft bgs
4" Sch. 10 stainless steel sump: 225.6 to 228.6 ft bgs

Portland cement grout: 0 to 11.05 ft bgs
Bentonite granules: 11.05 to 189.0 ft bgs
Bentonite pellets: 189.0 to 194.16 ft bgs
10-20 silica sand: 194.16 to 232.8 ft bgs

casing joint

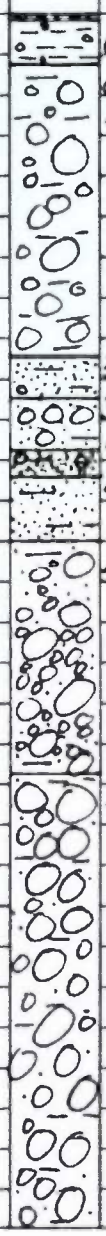
Diagram:



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 20, 40, 60, 80, 100

Graphic Log:



Lithologic Description:

0-0.5: gravel drill pad
0.5-5: gravelly Silt (gM)
5-34: silty Gravel (mG)
34-38: gravelly silty Sand (gmS)
38-43: silty sandy Gravel (msG)
43-45.5: gravelly Sand (gS)
45.5-52: silty Sand (mS)
52-75: silty sandy Gravel (msG)
75-123: sandy silty Gravel (smG)

A-6003-643 (03/03)

Figure D-26. Well Summary Sheet for Well 299-E26-77 in LERF Groundwater Monitoring Network

WELL SUMMARY SHEET

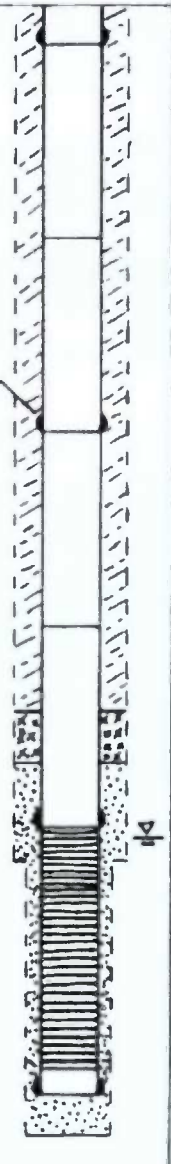
Start Date: 06/12/2008
Finish Date: 02/05/2008
Page 2 of 2

Well ID: C6455
Well Name: 299-E26-77
Location: Inside fence, LERF, 200E
Project: M-24 RCRA Wells (LERF)
Prepared By: S. Sexton
Date: 9/08/08
Reviewed By: L.J. Walker
Date: 10/13/08
Signature:
Signature:

CONSTRUCTION DATA

Description

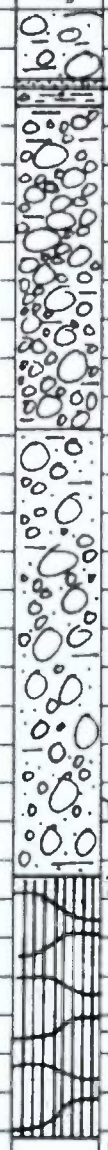
Diagram



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet

Graphic Log



Lithologic Description

123-124: Sand (s)
124-126: gravelly Silt (gM)
126-159: silty Gravel (mG)
159-205.5: silty sandy Gravel (msG)
DTW = 201.9 ft bgs on 08/27/2008
205.5-233: basalt
TD = 232.8' bgs on 08/26/2008
All depths recorded in feet "below ground surface" (bgs)

A-6003-643 (03/03)

Figure D-26. Well Summary Sheet for Well 299-E26-77 in LERF Groundwater Monitoring Network (Cont.)

WELL SUMMARY SHEET

Start Date: 09/09/2008
Finish Date: 10/02/2008
Page 1 of 2

Well ID: C6826	Well Name: 299-E26-79
Location: Inside fence, LERF, 200E	Project: M-24 RCRA Wells (LERF)
Prepared By: S. Sexton — Date: 10/4/08	Reviewed By: L.D. Walker — Date: 10/13/08
Signature:	Signature:

CONSTRUCTION DATA

Description:

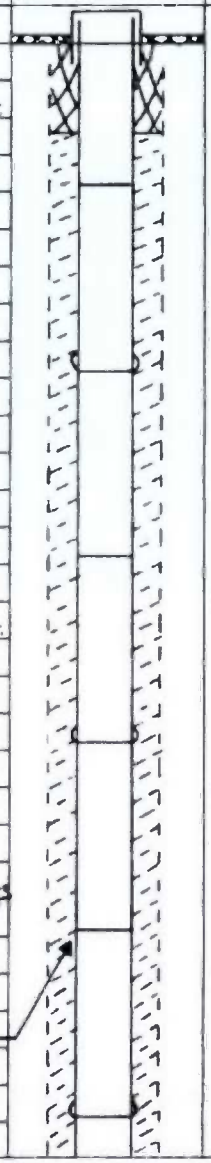
6" x 4' x 4' concrete pad
6" stainless steel protective monument: 3.0' bgs to 3.1' ags

4" stainless steel Sch. 10 casing: 2.3 ft ags to 195.2 ft bgs
4" stainless steel wire wrap screen, 0.020": 195.2 to 220.2' bgs
4" stainless steel Sch. 10 sump: 220.2 to 223.2 ft bgs

Portland cement grout: 0 to 10.3 ft bgs
Bentonite granules: 10.3 to 183.0 ft bgs
Bentonite pellets: 183.0 to 187.8 ft bgs
10-20 silica sand: 187.8 to 224.76 ft bgs

Casing Joint

Diagram:



GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 0, 20, 40, 60, 80, 100

Graphic Log:

Lithologic Description:

0-1: gravel drill pad
1-27: sandy silty Gravel (SM)
27-27.5: sandy Silt (SM)
27.5-29: silty Gravel (m G)
29-32: sandy Silt (SM)
32-54: silty Sand (m S)
54-79: silty sandy Gravel (m SG)
79-119: sandy silty Gravel (SM G)

A-6003-643 (03/03)

Figure D-27. Well Summary Sheet for Well 299-E26-79 in LERF Groundwater Monitoring Network

WELL SUMMARY SHEET

Start Date: 09/09/2008
Finish Date: 10/02/2008
Page 2 of 2

Well ID: C6826
Well Name: 299-E26-79
Location: Inside fence, LERF, 200E
Project: M-24 RCRA Wells (LERF)
Prepared By: S. Sexton
Date: 10/6/08
Reviewed By: L. D. Walker
Date: 10/13/08
Signature:
Signature:

CONSTRUCTION DATA

Description

Centralizer

All temporary casing removed from borehole

Diagram

GEOLOGIC/HYDROLOGIC DATA

Depth in Feet: 120, 140, 160, 180, 200, 220

Graphic Log

Lithologic Description

115-135: silty sandy Gravel(GW)

135-152: Gravel (G)

152-200: silty sandy Gravel

DTW = 201.7 ft bgs on 09/22/2008

200-203: sandy Gravel (GG)

203-206: gravelly Sand(GS)

206-207: mottled clay

207-224.76: basalt

TD = 224.76 ft bgs on 09/23/2008

All depths recorded in feet below ground surface (bgs)

A-6003-643 (03/03)

Figure D-27. Well Summary Sheet for Well 299-E26-79 in LERF Groundwater Monitoring Network (Cont.)

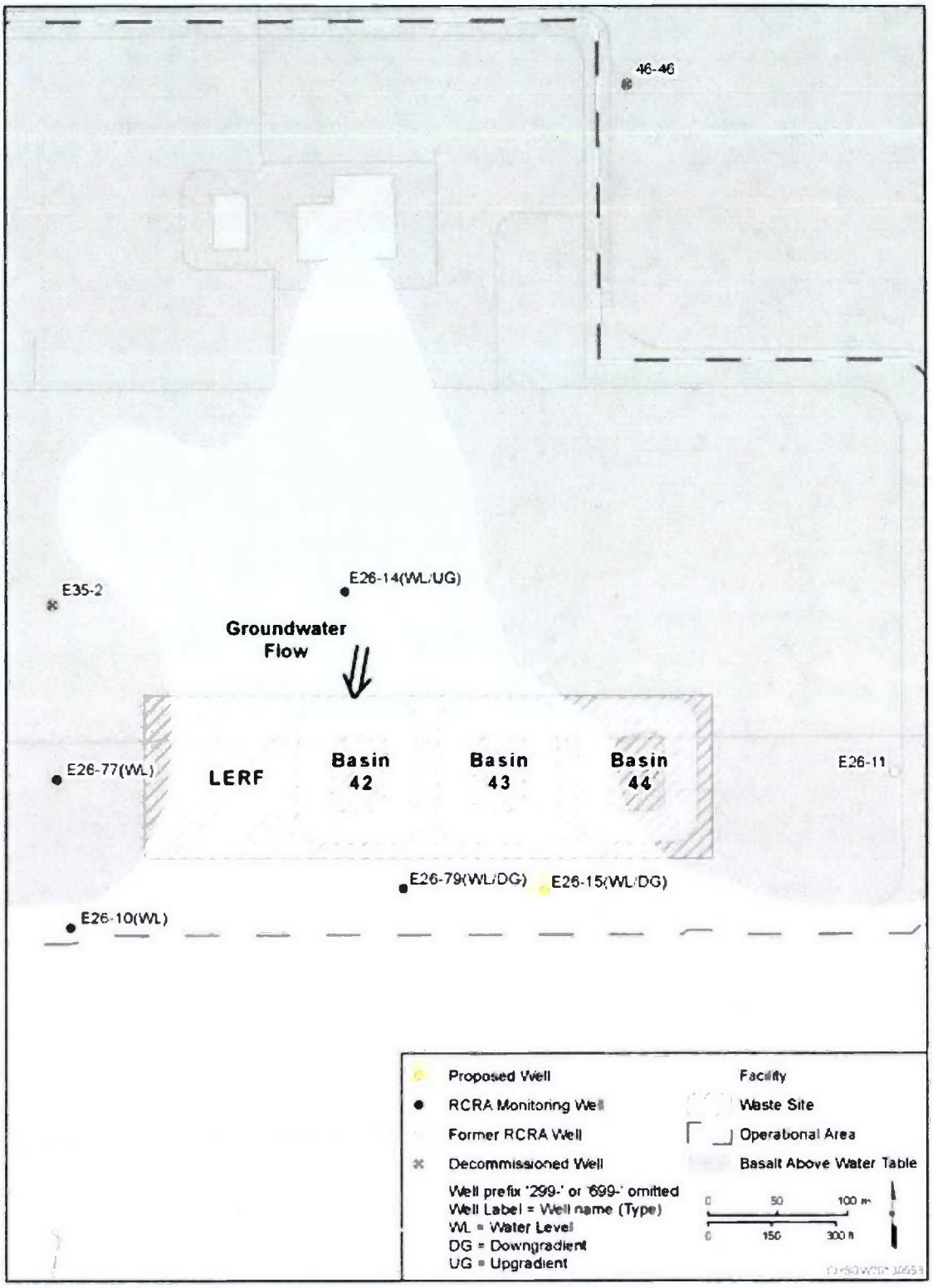


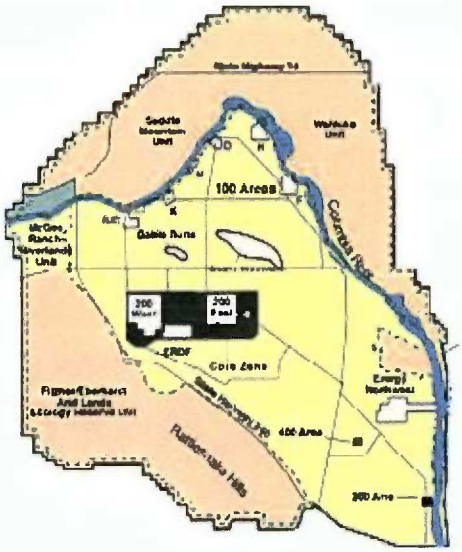
Figure D-28. Proposed LERF Well and Facility Description Map

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Hanford Facility
Resource Conservation and Recovery Act Permit, Dangerous Waste Portion

Revision 8C

For the Treatment, Storage, and Disposal of Dangerous Waste



Washington State Department of Ecology
Nuclear Waste Program

April 2014

For additional copies of this permit contact:

Washington State Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354-1670
509-372-7950

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For more information or if you have special accommodation needs, please contact the Nuclear Waste Program at (509) 372-7950.

Department of Ecology Headquarters telecommunications device for the deaf (TDD) number is: (360) 407-6006

DANGEROUS WASTE PORTION OF THE RESOURCE CONSERVATION AND RECOVERY ACT PERMIT FOR THE TREATMENT, STORAGE, AND DISPOSAL OF DANGEROUS WASTE

Washington State Department of Ecology
Nuclear Waste Program
3100 Port of Benton Boulevard
Richland, Washington 99354
Telephone: 509-372-7950

Issued in accordance with the applicable provisions of the Hazardous Waste Management Act, Chapter 70.105 Revised Code of Washington (RCW), and the regulations promulgated there under in Chapter 173-303 Washington Administrative Code (WAC).

ISSUED TO:

United States Department of Energy
Richland Operations Office
(Owner/Operator)
P.O. Box 550, MSIN A7-50
Richland, Washington 99352
Telephone: (509) 376-7395

United States Department of Energy
Office of River Protection
(Owner/Operator)
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Telephone: (509) 372-3062

Mission Support Alliance
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Richland, Washington 99354
Telephone: (509) 376-1310

Bechtel National, Inc.
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Richland, Washington 99354
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Washington Closure Hanford, LLC
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Richland, Washington 99354
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Washington River Protection Solutions, LLC
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Richland, Washington 99352
Telephone: (509) 372-9138

Pacific Northwest National Laboratory
(Co-operator)
P.O. Box 999, MSIN K1-46
Richland, Washington 99352
Telephone: (509) 375-5911

CH2MHILL Plateau Remediation Company
(Co-operator)
P.O. Box 1600, MSIN H7-30
Richland, Washington 99352
Telephone: (509) 376-0556

This Permit as modified on October 22, 2007, will remain in effect until reissuance of the September 27, 2004 Permit, unless revoked and reissued under WAC 173-303-830(3), terminated under WAC 173-303-830(5), or continued in accordance with WAC 173-303-806(7).

ISSUED BY:
WASHINGTON STATE DEPARTMENT OF ECOLOGY

[signature] for _____ Date: 10/17/07

Jane A. Hedges, Program Manager
Nuclear Waste Program, Department of Ecology

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List of Attachments

The following listed documents are attached in their entirety. However, only those portions of the attachments specified in Parts I through VI are enforceable conditions of this Permit and subject to the permit modification requirements of Permit Condition I.C.3. Changes to portions of the attachments, which are not subject to the permit modification process, will be addressed in accordance with Permit Conditions I.E.8, I.E.11, I.E.13, I.E.15, through I.E.20, and I.E.22. Ecology has, as deemed necessary, modified specific language in these attachments. These modifications are described in the conditions (Parts I through VI), and thereby supersede the language of the attachment.

Attachment 1	Hanford Federal Facility Agreement and Consent Order, (as amended) http://www.hanford.gov/tpa/coverpg.htm
Attachment 2	Hanford Facility Legal Description, from Class 1 modification, dated January 7, 1999
Attachment 3	Security, dated September 30, 2010
Attachment 4	*Hanford Emergency Management Plan*, DOE/RL-94-02 Revision 5, as amended and approved modifications
Attachment 5	Hanford Facility Personnel Training Program, dated September 30, 2010
Attachment 6	Reports and Records, dated September 30, 2010
Attachment 7	Policy on Remediation of Existing Wells and Acceptance Criteria for RCRA and CERCLA, June 1990
Attachment 8	Hanford Well Maintenance and Inspection Plan, HNF-56398, Revision 1, April 10, 2014
Attachment 9	Permit Applicability Matrix, dated September 30, 2010
Attachment 10	Purgewater Management Plan, July 1990

Introduction

Where information regarding treatment, management, and disposal of the radioactive source, byproduct material, special nuclear material (as defined by the Atomic Energy Act of 1954, as amended) and/or the radionuclide component of mixed waste has been incorporated into this permit, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit or Chapter 70.105 RCW.

Pursuant to Chapter 70.105 RCW, the Hazardous Waste Management Act (HWMA) of 1976, as amended, Chapter 70.105D RCW, the Model Toxics Control Act (MTCA), and regulations promulgated there under by the Washington State Department of Ecology (hereafter called Ecology), codified in Chapter 173-303 Washington Administrative Code (WAC), Dangerous Waste Regulations, a Dangerous Waste Permit is issued to the United States Department of Energy (USDOE) - Richland Operations Office (RL) and Office of River Protection (ORP) [owner/operator], and its contractors [co-operators], Bechtel National, Incorporated (BNI), CH2MHILL Plateau Remediation Company (CHPRC), Mission Support Alliance, LLC (MSA)], Pacific Northwest National Laboratory (PNNL), Washington Closure Hanford, LLC (WCH), and Washington River Protection Solutions, LLC (WRPS) and hereafter called the Permittees, for the treatment, storage, and disposal of dangerous waste at the Hanford Facility.

This Dangerous Waste Permit, issued in conjunction with the United States Environmental Protection Agency's (hereafter called EPA) Hazardous and Solid Waste Amendments Portion of the Resource Conservation and Recovery Act (RCRA) Permit for the Treatment, Storage, and Disposal (TSD) of Hazardous Waste (HSWA Permit), constitutes the RCRA Permit for the Hanford Facility. Use of the term "Permit" within the Dangerous Waste Permit will refer to the Dangerous Waste Permit, while use of the term "Permit" within the HSWA Permit, will refer to the HSWA Permit. Use of the same term in both the Dangerous Waste Permit and the HSWA Permit, will have the standard meaning associated with the activities addressed by the permit in which the term is used. Such meanings will prevail, except where specifically stated otherwise.

The Permittees will comply with all terms and conditions set forth in this Permit and those portions of the Attachments that have been specifically incorporated into this Permit. When the Permit and the Attachments (except Permit Attachment 1) conflict, the wording of the Permit will prevail. The Permit is intended to be consistent with the terms and conditions of the Hanford Federal Facility Agreement and Consent Order (HFFACO, Permit Attachment 1). The Permittees will also comply with all applicable state regulations, including Chapter 173-303 WAC.

Applicable state regulations are those which are in effect on the date of issuance, or as specified in subsequent modifications of this Permit. In addition, applicable state regulations include any self-implementing statutory provisions and related regulations which, according to the requirements of the HWMA, as amended, or other law(s), are automatically applicable to the Permittees' dangerous waste management activities, notwithstanding the conditions of this Permit.

This Permit is based upon the Administrative Record, as required by WAC 173-303-840. The Permittees' failure in the application, or during the Permit issuance process, to fully disclose all relevant facts, or the Permittees' misrepresentation of any relevant facts at any time, will be grounds for the termination or modification of this Permit and/or initiation of an enforcement action, including criminal proceedings. The Permittees will inform Ecology of any deviation from the Permit conditions, or changes in the information on which the application is based, which would affect either the Permittees' ability to comply, or actual compliance with the applicable regulations or the Permit conditions, or which alters any condition of this Permit in any way.

Ecology will enforce all conditions of this Permit for which the State of Washington is authorized, or which are "state-only" provisions (i.e., conditions broader in scope or more stringent than the federal RCRA program). Any challenges of any Permit condition may be appealed in accordance with WAC 173-303-845. In the event that any Permit condition is challenged by any Permittee under WAC 173-303-845, Ecology may stay any such Permit condition as it pertains to all Permittees, in accordance with the same terms of any stay it grants to the challenging Permittee. If such a stay is granted, it will constitute a "stay by the issuing agency" within the meaning of RCW 43.21B.320(1).

This Permit has been developed to allow a step-wise permitting process of the Hanford Facility to ensure the proper implementation of the HFFACO. In order to accomplish this, this Permit consists of six (6) parts.

Part I, Standard Conditions, contains conditions which are similar to those appearing in all dangerous waste permits.

Part II, General Facility Conditions, combines typical dangerous waste permit conditions with those conditions intended to address issues specific to the Hanford Facility. Where appropriate, the general facility conditions apply to all final status dangerous waste management activities at the Facility. Where appropriate, the general facility conditions also address dangerous waste management activities which may not be directly associated with distinct TSD units, or which may be associated with many TSD units (i.e., spill reporting, training, contingency planning, etc.). Part II also includes conditions that address corrective action at solid waste management units and areas of concern.

Part III, Unit-Specific Conditions for Operating Units, contains those Permit requirements that apply to each individual TSD unit operating under final status. Conditions for each TSD unit are found in a chapter dedicated to that TSD unit. These unit-specific chapters contain references to Standard Conditions (Part I) and General Conditions (Part II), as well as additional requirements which are intended to ensure that each TSD unit is operated in an efficient and environmentally protective manner. Additional requirements may also be added when an operating unit ceases operations and undergoes closure.

Part IV, Unit-Specific Conditions for Corrective Action, contains Permit conditions for releases from Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs). For past practice units identified in the HFFACO as either Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Past Practice units (CPP units) or combined Resource Conservation and Recovery Act-Comprehensive Environmental Response, Compensation and Liability Act Past Practice units (R-CPP units), the corrective action conditions are structured around reliance on, the investigation and cleanup requirements established under the HFFACO. ForTSD units identified in the HFFACO, the corrective action conditions contemplate use of closure and post-closure processes to satisfy corrective action.

Part V, Unit-Specific Conditions for Units Undergoing Closure, contains those requirements which apply to those specific TSD units, included in this part, that are undergoing closure. In accordance with Section 5.3 of the Action Plan of the HFFACO, all TSD units that undergo closure, irrespective of permit status, will be closed pursuant to the authorized State Dangerous Waste Program in accordance with WAC 173-303-610. Requirements for each TSD unit undergoing closure are found in a chapter dedicated to that TSD unit. These unit-specific chapters contain references to Standard Conditions (Part I) and General Conditions (Part II), as well as additional requirements which are intended to ensure that each TSD unit is closed in an efficient and environmentally protective manner.

Part VI, Unit-Specific Conditions for Units in Post-Closure, contains those requirements which apply to those specific units in this part that have completed modified or landfill closure requirements, and now only need to meet Post-Closure Standards. As set forth in Section 5.3 of the Action Plan of the HFFACO, certain TSD units will be permitted for post-closure care pursuant to the authorized State Dangerous Waste Program (173-303 WAC) and the Hazardous and Solid Waste Amendments. Requirements for each unit undergoing post-closure care are found in a chapter, within this part, dedicated to that unit. These unit specific chapters may contain references to Standard Conditions (Part I) and General Conditions (Part II), as well as the unit specific conditions, all of which are intended to ensure the unit is managed in an efficient, environmentally protective manner.

1 **Unit Status Table**

PERMIT REVISION	REVISION DATE	UNITS INCORPORATED
Permit Revision 0	8/29/94	616 NDWSF, 305-B Storage Facility, 183-H SEB, 300 ASE, 2727-S, NRDWSF
Permit Revision 1	4/28/95	Simulated High-Level Waste Slurry, 218-E-9 Borrow Pit Demo Site, 200 W Area Ash Pit Demo Site, 2101-M Pond, 216-B-3 Expansion Ponds
Permit Revision 2	8/29/95	Hanford Patrol Academy Demolition Site, 105-DR Large Sodium Fire Facility, 304 Concretion Facility
Permit Revision 3	11/25/96	PUREX Storage Tunnels, 4843 Alkali Metal Storage Facility, 3718-F Alkali Metal Treatment & Storage Facility, 303-K Storage Facility, 300 APT
Permit Revision 4	1/28/98	LERF & 200 Area ETF, 242-A Evaporator, 325 HWTUs
Permit Revision 5	5/18/99	100 D Ponds, 1301-N & 1325-Liquid Waste Disposal Facility, 1324-N Surface Impoundment, 1324-NA Percolation Pond
Permit Revision 6	3/28/00	Permit Condition II.Y, Corrective Action
Permit Revision 7	2/27/01	Waste Treatment & Immobilization Plant, 300 Area WATS
Permit Revision 8	9/23/04	No new units, modification updates
Permit Revision 8A	3/6/06	Integrated Disposal Facility
Permit Revision 8B	1/2007	331-C Storage Unit, PFP Treatment Unit, 241-Z Treatment & Storage Tanks, 303-M Oxide Facility
Permit Revision 8C	8/2007	400 Area Waste Management Unit, 224-T TRUSAF

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UNIT	Permit Revision		Comments/History
	Incorporated	Retired	
PART III, OPERATING UNITS			
616 Non-Radioactive Dangerous Waste Storage Facility	Rev. 6	Rev. 7	Closed, 9/5/01
242-A Evaporator	Rev. 4		
305-B Storage Facility	Rev. 0		Closed, 7/2/07
325 Hazardous Waste Treatment Units	Rev. 4		RLWT procedural closure, 9/04
LERF & 200 Area ETF	Rev. 4		
PUREX Storage Tunnels	Rev. 3		
Waste Treatment and Immobilization Plant	Rev. 7		Permitted unit under construction
Integrated Disposal Facility	Rev. 8A		
331-C Storage Unit	Rev. 8B		
400 Area Waste Management Unit	Rev. 8C		
PART IV, CORRECTIVE ACTION			
100-NR-1 Operable Unit	Rev. 6		
100-NR-2 Operable Unit	Rev. 6	Rev. 8C	Retired, 9/30/09
PART V, UNDERGOING CLOSURE UNITS			
100-D Ponds	Rev. 5	Rev. 6	Closed, 8/9/99
105 DR Large Sodium Fire Facility	Rev. 2	Rev. 6	Closed, 7/1/04
1301-N Liquid Waste Disposal Facility	Rev. 5		
1324-N Surface Impoundment	Rev. 5		
1324-NA Percolation Pond	Rev. 5		
1325-N Liquid Waste Disposal Facility	Rev. 5		
200 West Area Ash Pit Demo Site	Rev. 1	Rev. 6	Closed, 11/28/95
2101-M Pond	Rev. 1	Rev. 6	Closed, 11/28/95
216-B-3 Expansion Ponds	Rev. 1	Rev. 6	Closed, 7/31/95
218-E-8 Borrow Demolition Site	Rev. 1	Rev. 6	Closed, 11/28/95
2727-S Storage Facility	Rev. 0	Rev. 6	Closed, 7/31/95
300 Area Solvent Evaporator	Rev. 0	Rev. 6	Closed, 7/31/95
300 Area Waste Acid Treatment System	Rev. 6	Rev. 8B	Closed, 1/21/05
303-K Storage Facility	Rev. 4	Rev. 6	Closed, 7/22/02
304 Concretion Facility	Rev. 2	Rev. 6	Closed, 1/21/96
311 Tanks (includes 300 Area WATS)	Rev. 6	Rev. 7	Closed, 5/20/02
3718-F Alkali Metal Treatment /Storage	Rev. 3	Rev. 6	Closed, 8/4/98
4843 Alkali Metal Storage Facility	Rev. 3	Rev. 6	Closed, 4/14/97
Hanford Patrol Academy Demo Site	Rev. 2	Rev. 6	Closed, 11/28/95
Simulated High Level Waste Slurry	Rev. 1	Rev. 6	Closed, 9/6/95

UNIT	Permit Revision		Comments/History
	Incorporated	Retired	
PFP Treatment Unit (HA-20MB)	Rev. 8B	Rev. 8B	Closed 2/8/05
241-Z Treatment and Storage Tanks	Rev. 8B	Rev. 8B	Closed 2/22/07
303-M Oxide Facility	Rev. 8B	Rev. 8B	Closed 6/15/06
224-T Transuranic Waste Storage and Assay Facility	Rev. 8C	Rev. 8C	Closed 11/12/08
PART VI, POSTCLOSURE UNITS			
183-H Solar Evaporation Basin	Rev 4		
300 Area Process Trenches	Rev 3		
PROCEDURALLY CLOSED			
216-U-12 Crib	N/A	N/A	Closed 7/19/07
221-T Test Facility	N/A	N/A	Closed 2/22/99
2727-WA SRE Sodium Storage Bldg	N/A	N/A	Closed 2/22/99
324 Pilot Plant	N/A	N/A	Closed 6/9/97
332 Storage Facility	N/A	N/A	Closed 4/21/97
437 Maintenance and Storage Facility	N/A	N/A	Closed 9/11/03
Biological Treatment Test Facilities	N/A	N/A	Closed12/10/96
Physical/Chemical Treatment Test Facilities	N/A	N/A	Closed 5/13/96
Sodium Storage/Sodium Reaction	N/A	N/A	Closed 9/17/03
Thermal Treatment Test Facilities	N/A	N/A	Closed 5/13/96
TO BE INCORPORATED			
1706-KE Waste Treatment System			
207-A South Retention Basin			
216-A-10 Crib			
216-A-29 Ditch			
216-A-36B Crib			
216-A-37-1 Crib			
216-B-3 Main Pond			
216-B-63 Trench			
216-S-10 Pond & Ditch			
222-S Dangerous & Mixed Waste TSD Unit			
241-CX Tank System			
600 Area Purgewater Storage and Treatment Facility			
Central Waste Complex			
Contact Handled Transuranic Mixed Waste Packaging and Interim Storage Facility			
DST System/204-AR Waste Unloading Station			
Grout Treatment Facility			
Hexone Storage & Treatment Facility			
IHLW Interim Storage/Canister Storage Building			
Low-Level Burial Grounds			
Nonradioactive Dangerous Waste Landfill			
Single-Shell Tank System			
T Plant Complex			
Waste Encapsulation and Storage Facility			
Waste Receiving and Processing Facility			
TRANSITION UNDER HFFACO ACTION PLAN, SECTION 8 (Will not be incorporated into Permit)			
B Plant Complex			
PUREX Plant			

Definitions

Except with respect to those terms specifically defined below, all definitions contained in the HFFACO, May 1989, as amended, and in WAC 173-303-040 and other portions of Chapter 173-303 WAC are hereby incorporated, in their entirety, by reference into this Permit. For terms defined in both Chapter 173-303 WAC and the HFFACO, the definitions contained in Chapter 173-303 WAC will control within this Permit. Nonetheless, this Permit is intended to be consistent with the HFFACO.

Where terms are not defined in the regulations, the Permit, or the HFFACO, a standard dictionary reference, or the generally accepted scientific or industrial meaning of the terms will define the meaning associated with such terms.

As used in this Permit, words in the masculine gender also include the feminine and neuter genders, words in the singular include the plural, and words in the plural include the singular.

The following definitions apply throughout this Permit:

The term "**Area of Concern**" means any area of the Facility where a release of dangerous waste or dangerous constituents has occurred, is occurring, is suspected to have occurred, or threatens to occur.

The term "**Contractor(s)**" means, unless specifically identified otherwise in this Permit, or Attachments, Bechtel National, Inc. (BNI), CH2M HILL Plateau Remediation Company, Inc. (CHPRC), Mission Support Alliance, LLC (MSA), Pacific Northwest National Laboratory (PNNL), Washington Closure Hanford, LLC (WCH), and Washington River Protection Solutions, LLC (WRPS).

The term "**Critical Systems**" as applied to determining whether a Permit modification is required, means those specific portions of a TSD unit's structure, or equipment, whose failure could lead to the release of dangerous waste into the environment, and/or systems which include processes which treat, transfer, store, or dispose of regulated wastes. A list identifying the critical systems of a specific TSD unit may be developed and included in Part III, V, and/or VI of this Permit. In developing a critical system list, or in the absence of a critical system list, WAC 173-303-830 Modifications will be considered.

The term "**Dangerous Constituent**" means any constituent identified in WAC 173-303-9905 or 40 CFR Part 264 Appendix IX, any constituent which caused a waste to be listed or designated as dangerous under Chapter 173-303 WAC, and any constituents within the meaning of hazardous substance at RCW 70.105D.020(7).

The term "**Dangerous Waste**" means those solid wastes designated under Chapter 173-303 WAC as dangerous or extremely hazardous waste. As used in the Permit, the phrase "dangerous waste" will refer to the full universe of wastes regulated by Chapter 70.105 RCW and Chapter 173-303 WAC (including dangerous waste, hazardous waste, extremely hazardous waste, mixed waste, and acutely hazardous waste).

The term "**Days**" means calendar days, unless specifically identified otherwise. Any submittal, notification, or recordkeeping requirement that would be due, under the Conditions of this Permit, on a Saturday, Sunday, or federal, or state holiday, will be due on the following business day, unless specifically stated otherwise in the Permit.

The term "**Director**" means the Director of the Washington State Department of Ecology, or a designated representative. The Program Manager of the Nuclear Waste Program (with the address as specified on page one [1] of this Permit) is a duly authorized and designated representative of the Director for purposes of this Permit.

The term "**Ecology**" means the Washington State Department of Ecology (with the address as specified on page one [1] of this Permit).

The term "**Facility**" means all contiguous land, structures, other appurtenances, and improvements on the land used for recycling, reusing, reclaiming, transferring, storing, treating, or disposing of dangerous waste. The legal and physical description of the Facility is set forth in Permit Attachment 2.

The term "**Facility**" for the purposes of corrective action under Permit Condition II.Y, means all contiguous property under the control of the Permittees and all property within the meaning of "facility" at RCW 70.105D.020(3) as set forth in Permit Attachment 2.

The term "**HFFACO**" means the Hanford Federal Facility Agreement and Consent Order, as amended (Commonly referred to as Tri-Party Agreement [TPA]).

The term "**Permittees**" means the United States Department of Energy (owner/operator), Bechtel National, Inc. (Co-operator), CH2M HILL Plateau Remediation Company (Co-operator), Mission Support Alliance, LLC (MSA), Pacific Northwest National Laboratory (Co-operator), Washington Closure Hanford, LLC (Co-operator), Washington River Protection Solutions, LLC.

The term "**Permittees**" for purposes of corrective action under Permit Condition II.Y means only the United States Department of Energy (owner/operator).

The term "**Raw Data**" means the initial value of analog or digital instrument output, and/or manually recorded values obtained from measurement tools or personal observation. These values are converted into reportable data (e.g., concentration, percent moisture) via automated procedures and/or manual calculations.

The term "**RCRA Permit**" means the Dangerous Waste Portion of the RCRA Permit for the Treatment, Storage, and Disposal of Dangerous Waste (Dangerous Waste Permit) issued by the Washington State Department of Ecology, pursuant to Chapter 70.105 RCW and Chapter 173-303 WAC, coupled with the HSWA Portion of the RCRA Permit for the Treatment, Storage, and Disposal of Hazardous Waste (HSWA Permit) issued by EPA, Region 10, pursuant to 42 U.S.C. 6901 et seq. and 40 CFR Parts 124 and 270.

The term "**Reasonable Times**" means normal business hours; hours during which production, treatment, storage, construction, disposal, or discharge occurs, or times when Ecology suspects a violation requiring immediate inspection.

The term "**Release**" means any intentional or unintentional spilling, leaking, pouring, emitting, emptying, discharging, injecting, pumping, escaping, leaching, dumping, or disposing of dangerous constituents into the environment and includes the abandonment or discarding of barrels, containers, and other receptacles containing dangerous waste or dangerous constituents, and includes any releases within the meaning of release at RCW 70.105D.020(20).

The term "**Significant Discrepancy**" in regard to a manifest or shipping paper, means a discrepancy between the quantity or type of dangerous waste designated on the manifest, or shipping paper, and the quantity or type of dangerous waste a TSD unit actually receives. A significant discrepancy in quantity is a variation greater than ten (10) percent in weight for bulk quantities (e.g., tanker trucks, railroad tank cars, etc.), or any variation in piece count for nonbulk quantities (i.e., any missing container or package would be a significant discrepancy). A significant discrepancy in type is an obvious physical or chemical difference which can be discovered by inspection or waste analysis (e.g., waste solvent substituted for waste acid).

The term "**Solid Waste Management Unit (SWMU)**" means any discernible location at the Facility where solid wastes have been placed at any time, irrespective of whether the location was intended for the management of solid or dangerous waste, and includes any area at the Facility at which solid wastes have been routinely and systematically released (for example through spills), and includes dangerous waste treatment, storage, and disposal units.

The term **"Unit" or "TSD unit"**, as used in Parts I through VI of this Permit, means the contiguous area of land on or in which dangerous waste is placed, or the largest area in which there is a significant likelihood of mixing dangerous waste constituents in the same area. A TSD unit, for purposes of this Permit, is a subgroup of the Facility which has been identified in a Hanford Facility Dangerous Waste Part A Form.

Acronyms

ALARA	As Low As Reasonably Achievable
AMSF	Alkali Metal Storage Facility
APDS	Ash Pit Demolition Site
APP	Used to Denote Appendix Page Numbers
APT	Area Process Trenches
ARAR	Applicable, Relevant, and Appropriate Requirements
BNI	Bechtel National, Inc
BPDS	Borrow Pit Demolition Site
CD/RR	Chemical Disposal/Recycle Request
CERCLA	Comprehensive Environmental Response Compensation and Liability Act of 1980 (as Amended by the Superfund Reauthorization Act of 1986)
CFR	Code of Federal Regulations
CHPRC	CH2M HILL Plateau Remediation Company
CIP	Construction Inspection Plan
CLARC	Cleanup Levels and Risk Calculations
CLP	Contract Laboratory Program
COC	Chemical Contaminants of Concern
CPP	CERCLA Past Practice
USDOE-RL	U.S. Department of Energy, Richland Operations Office
USDOE-ORP	U.S. Department of Energy, Office of River Protection
DQO	Data Quality Objective
DSC	Differential Scanning Colorimetry
EC	Emergency Coordinator
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERA	Expedited Response Action
ETF	200 Area Effluent Treatment Facility
HFFACO	Hanford Federal Facility Agreement and Consent Order
GW	Ground Water
HPADS	Hanford Patrol Academy Demolition Site
HSWA	Hazardous and Solid Waste Amendments of 1984
HWMA	Hazardous Waste Management Act
ID	Identification
IRM	Interim Remedial Measure
LDR	Land Disposal Restrictions
LERF	Liquid Effluent Retention Facility
LSFF	105-DR Large Sodium Fire Facility
MSA	Mission Support Alliance, LLC
MTCA	Model Toxics Control Act

OSWER	Office of Solid Waste and Emergency Response
PNNL	Pacific Northwest National Laboratory
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act of 1976
RCW	Revised Code of Washington
ROD	Record of Decision
RPD	Relative Percent Difference
RPP	RCRA Past Practice
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act of 1986
SCD	Security Control Devices
SHLWS	Simulated High Level Waste Slurry
SOP	Standard Operating Procedure
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TSD	Treatment, Storage, and/or Disposal
USDOE	United States Department of Energy
U.S.C.	United States Code
WAC	Washington Administrative Code
WAP	Waste Analysis Plan
WCH	Washington Closure Hanford, LLC
WRPS	Washington River Protection Solutions, LLC
WTP	Waste Treatment and Immobilization Plant
183-H	183-H Solar Evaporation Basins
242-A	242-A Evaporator
300 APT	300 Area Process Trenches
300 ASE	300 Area Solar Evaporator
303-K	303-K Storage Facility
305-B	305-B Storage Facility
325 HWTUs	325 Hazardous Waste Treatment Units
616-NRDWSF	616 Nonradioactive Dangerous Waste Storage Facility

PART I STANDARD CONDITIONS

I.A EFFECT OF PERMIT

The Permittees are authorized to treat, store, and dispose of dangerous waste in accordance with the Conditions of this Permit and in accordance with the applicable provisions of Chapter 173-303 WAC (including provisions of the Chapter as they have been applied in the HFFACO). Any treatment, storage, or disposal of dangerous waste by the Permittees at the Facility that is not authorized by this Permit, or by WAC 173-303-400 (including provisions of this regulation as they have been applied in the HFFACO), for those TSD units not subject to this Permit, and for which a Permit is required by Chapter 173-303 WAC, is prohibited.

TSD units operating or closing under interim status will maintain interim status until that TSD unit is incorporated into Part III, V, and/or VI of this Permit, or until interim status is terminated under WAC 173-303-805(8). Interim status units will be incorporated into this Permit through the Permit modification process.

The Conditions of this Permit will be applied to the Facility as defined by the Permit Applicability Matrix (Permit Attachment 9).

I.A.1 USDOE is responsible for activities which include, but are not limited to, the overall management and operation of the Facility.

BNI is identified as a Permittee for activities subject to the Conditions of this Permit where its agents, employees, or subcontractors have operational and/or management responsibilities and control.

CHPRC is identified as a Permittee for activities subject to the Conditions of this Permit where its agents, employees, or subcontractors have operational and/or management responsibilities and control.

MSA is identified as a Permittee for activities subject to the Conditions of this Permit where its agents, employees, or subcontractors have operational and/or management responsibilities and control.

PNNL is identified as a Permittee for activities subject to the Conditions of this Permit where its agents, employees, or subcontractors have operational and/or management responsibilities and control.

WCH is identified as a Permittee for activities subject to the Conditions of this Permit where its agents, employees, or subcontractors have operational and/or management responsibilities and control.

WRPS is identified as a Permittee for activities subject to the Conditions of this Permit where its agents, employees, or subcontractors have operational and/or management responsibilities and control.

I.A.2 Coordination with the HFFACO

Each TSD unit will have an application for a final status Permit or closure/post-closure plan submitted to Ecology in accordance with the schedules identified in the HFFACO Milestone M-20-00 or in accordance with WAC 173-303-830. After completion of the Permit application or closure/post-closure plan review, a final Permit decision will be made pursuant to WAC 173-303-840. Specific Conditions for each TSD unit will be incorporated into this Permit in accordance with the Class 3 Permit modification procedure identified in Permit Condition I.C.3.

I.B PERSONAL AND PROPERTY RIGHTS

This Permit does not convey property rights of any sort, or any exclusive privilege; nor does it authorize any injury to persons or property, or any invasion of other private rights, or any violation of federal, state, or local laws or regulations.

I.C PERMIT ACTIONS

I.C.1 Modification, Revocation, Reissuance, or Termination

This Permit may be modified, revoked and reissued, or terminated by Ecology for cause per WAC 173-303-810(7) as specified in WAC 173-303-830(3), (4), and (5).

I.C.2 Filing of a Request

The filing of a request for a Permit modification, or revocation and reissuance, or termination, or a notification of planned changes, or anticipated noncompliance on the part of the Permittees, will not stay any Permit condition [WAC 173-303-810(7)]except as provided in WAC 173-303-810(2) under an emergency permit.

I.C.3 Modifications

I.C.3.a Except as provided otherwise by specific language in this Permit, the Permit modification procedures of WAC 173-303-830(2), (3), and (4) will apply to modifications or changes in design or operation of the Facility, or any modification or change in dangerous waste management practices covered by this Permit.

I.C.3.b As an exception, the Permittees will provide notifications to Ecology required by WAC 173-303-830(4)(a)(i)(A) on a quarterly basis. Each quarterly notification will be submitted within ten (10) days of the end of the quarter, and provide the required information for all such modification s put into effect during that reporting period.

I.C.3.c Quarterly reporting periods will be based upon the state Fiscal Year. For notifications required by the Permittees to persons on the facility mailing list described in WAC 173-303-830(4)(a)(i)(B), -830(4)(b)(ii), -830(4)(c)(ii), and -830(4)(e)(ii)(C), use of appropriate HFFACO Community Relations Plan publications and/or list servers for public involvement satisfy the notification requirements.

I.D SEVERABILITY

I.D.1 Effect of Invalidation

The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit to any circumstance is contested and/or held invalid, the application of such provision to other circumstances and the remainder of this Permit will not be affected thereby. Invalidation of any state statutory or regulatory provision which forms the basis for any Condition of this Permit does not affect the validity of any other state statutory or regulatory basis for said Condition.

I.D.2 Final Resolution

In the event that a Condition of this Permit is stayed for any reason, the Permittees will continue to comply with the related applicable and relevant interim status standards in WAC 173-303-400 until final resolution of the stayed Condition, unless Ecology determines compliance with the related applicable and relevant interim status standards would be technologically incompatible with compliance with other Conditions of this Permit, which have not been stayed, or unless the HFFACO authorizes an alternative action, in which case the Permittees will comply with the HFFACO.

I.E DUTIES AND REQUIREMENTS

I.E.1 Duty to Comply

The Permittees will comply with all Conditions of this Permit, except to the extent and for the duration such noncompliance is authorized by an emergency Permit issued under WAC 173-303-804. Any Permit noncompliance other than noncompliance authorized by an emergency Permit constitutes a violation of Chapter 70.105 RCW, as amended, and is grounds for enforcement action, Permit termination, modification or revocation and reissuance of the Permit, and/or denial of a Permit renewal application.

I.E.2 Compliance Not Constituting Defense

Compliance with the terms of this Permit does not constitute a defense to any order issued or any action brought under Section 3007, 3008, 3013, or 7003 of RCRA (42 U.S.C. Sections 6927, 6928, 6934, and 6973), Section 104, 106(a) or 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) [42 U.S.C. Sections 9604, 9606(a), and 9607], as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 U.S.C. 9601 et seq.), or any other federal, state, or local law governing protection of public health, or the environment; provided, however, that compliance with this Permit during its term constitutes compliance at those areas subject to this Permit for the purpose of enforcement with WAC 173-303-140, WAC 173-303-180, WAC 173-303-280 through -395, WAC 173-303-600 through -680, WAC 173-303-810, and WAC 173-303-830, except for Permit modification s and those requirements not included in the Permit that become effective by statute, or that are promulgated under 40 CFR Part 268 restricting the placement of dangerous waste in or on the land.

I.E.3 Duty to Reapply

If the Permittees wish to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittees must apply for, and obtain a new Permit, in accordance with WAC 173-303-806(6).

I.E.4 Permit Expiration and Continuation

This Permit, and all Conditions herein, will remain in effect beyond the Permit's expiration date until the effective date of the new Permit, if the Permittees have submitted a timely, complete application for renewal per WAC 173-303-806 and, through no fault of the Permittees, Ecology has not made a final Permit determination as set forth in WAC 173-303-840.

I.E.5 Need to Halt or Reduce Activity Not a Defense

It will not be a defense in the case of an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the Conditions of this Permit.

I.E.6 Duty to Mitigate

In the event of noncompliance with the Permit, the Permittees will take all reasonable steps to minimize releases to the environment, and will carry out such measures as are reasonable to minimize or correct adverse impacts on human health and the environment.

I.E.7 Proper Operation and Maintenance

The Permittees will at all times properly operate and maintain all facilities and systems of treatment and control, which are installed or used by the Permittees, to achieve compliance with the Conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of backup or auxiliary facilities, or similar systems only when necessary to achieve compliance with the Conditions of the Permit.

I.E.8 Duty to Provide Information

The Permittees will furnish to Ecology, within a reasonable time, any relevant information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittees will also furnish to Ecology, upon request, copies of records required to be kept by this Permit.

I.E.9 Inspection and Entry

The Permittees will allow Ecology, or authorized representatives, upon the presentation of Ecology credentials, to:

I.E.9.a During operating hours, and at all other reasonable times, enter and inspect the Facility or any unit or area within the Facility, where regulated activities are located or conducted, or where records must be kept under the Conditions of this Permit;

I.E.9.b Have access to, and copy, at reasonable times, any records that must be kept under the Conditions of this Permit;

I.E.9.c Inspect at reasonable times any portion of the Facility, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and,

I.E.9.d Sample or monitor, at reasonable times, for the purposes of assuring Permit compliance, or as otherwise authorized by state law, as amended, for substances or parameters at any location.

I.E.10 Monitoring and Records

I.E.10.a Samples and measurements taken by the Permittees for the purpose of monitoring required by this Permit will be representative of the monitored activity. Sampling methods will be in accordance with WAC 173-303-110 or 40 CFR 261, unless otherwise specified in this Permit, or agreed to in writing by Ecology. Analytical methods will be as specified in the most recently published test procedure of the documents cited in WAC 173-303-110(3)(a) through (h), unless otherwise specified in this Permit, or agreed to in writing by Ecology.

I.E.10.b The Permittees will retain at the TSD unit(s), or other locations approved by Ecology, as specified in Parts III, V, and/or VI of this Permit, records of monitoring information required for compliance with this Permit, including calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of reports and records required by this Permit, and records of data used to complete the application for this Permit for a period of at least ten (10) years from the date of the sample, measurement, report, or application, unless otherwise required for certain information by other Conditions of this Permit. This information may be retained on electronic media.

I.E.10.c The Permittees will retain at the Facility, or other approved location, records of all monitoring and maintenance records, copies of all reports and records required by this Permit, and records of all data used to complete the application for this Permit, which are not associated with a particular TSD unit, for a period of at least ten (10) years from the date of certification of completion of post-closure care, or corrective action for the Facility, whichever is later. This information may be retained on electronic media.

I.E.10.d The record retention period may be extended by request of Ecology at any time by notification, in writing, to the Permittees, and is automatically extended during the course of any unresolved enforcement action regarding this Facility to ten (10) years beyond the conclusion of the enforcement action.

I.E.10.e Records of monitoring information shall include:

I.E.10.e.i The date, exact place and time of sampling or measurements;

I.E.10.e.ii The individual who performed the sampling or measurements and their affiliation;

I.E.10.e.iii The dates the analyses were performed;

I.E.10.e.iv The individual(s) who performed the analyses and their affiliation;

I.E.10.e.v The analytical techniques or methods used; and,

I.E.10.e.vi The results of such analyses

I.E.11 Reporting Planned Changes

The Permittees will give notice to Ecology, as soon as possible, of any planned physical alterations, or additions to the Facility subject to this Permit. Such notice does not authorize any noncompliance with, or modification of, this Permit.

I.E.12 Certification of Construction or Modification

I.E.12.a The Permittees may not commence treatment, storage, or disposal of dangerous wastes in a new or modified portion of TSD units subject to this Permit until:

I.E.12.b The Permittees have submitted to Ecology, by certified mail, overnight express mail, or hand delivery, a letter signed by the Permittees, and a registered professional engineer, stating that the TSD unit has been constructed or modified in compliance with the Conditions of this Permit; and,

I.E.12.c Ecology has inspected the modified or newly constructed TSD unit, and finds that it is in compliance with the Conditions of this Permit; or

I.E.12.d Within fifteen (15) days **of the date of receipt of the Permittees' letter, the Permittees** have not received notice from Ecology of its intent to inspect, prior inspection is waived, and the Permittees may commence treatment, storage, and disposal of dangerous waste.

I.E.13 Anticipated Noncompliance

The Permittees will give at least thirty (30) days advance notice to Ecology of any planned changes in the Facility subject to this Permit, or planned activity which might result in noncompliance with Permit requirements.

If thirty (30) days advance notice is not possible, then the Permittees will give notice immediately after the Permittees become aware of the anticipated noncompliance. Such notice does not authorize any noncompliance with, or modification of, this Permit.

I.E.14 Transfer of Permits

I.E.14.a This Permit may be transferred to a new owner/operator only if it is modified, or revoked and reissued, pursuant to WAC 173-303-830(3)(b). Unit-specific portion may be transferred to a new Co-operator as a Class [1]1 modification with prior approval of the **Department's director.**

I.E.14.b Before transferring ownership or operation of the Facility during its operating life, the owner/operator will notify the new owner/operator in writing, of the requirements of WAC 173-303-290(2), -600 and -806, and this Permit.

I.E.15 Immediate Reporting

I.E.15.a The Permittees will verbally report to Ecology any release of dangerous waste or hazardous substances, or any noncompliance with the Permit which may endanger human health or the environment. Any such information will be reported immediately after the Permittees become aware of the circumstances.

I.E.15.b The immediate verbal report will contain all the information needed to determine the nature and extent of any threat to human health and the environment, including the following:

I.E.15.b.i Name, address, and telephone number of the Permittee responsible for the release or noncompliant activity;

I.E.15.b.ii Name, location, and telephone number of the unit at which the release occurred;

I.E.15.b.iii Date, time, and type of incident;

I.E.15.b.iv Name and quantity of material(s) involved;

I.E.15.b.v The extent of injuries, if any;

I.E.15.b.vi An assessment of actual or potential hazard to the environment and human health, where this is applicable;

I.E.15.b.vii Estimated quantity of released material that resulted from the incident; and,

I.E.15.b.viii Actions which have been undertaken to mitigate the occurrence.

I.E.15.c The Permittees will report, in accordance with Permit Conditions I.E.15.a and I.E.15.b, any information concerning the release, or unpermitted discharge, of any dangerous waste or hazardous substances that may cause an endangerment to drinking water supplies, or ground or surface waters, or of a release, or discharge of dangerous waste, or hazardous substances, or of a fire or explosion at the Facility, which may threaten human health or the environment. The description of the occurrence and its cause will include all information necessary to fully evaluate the situation and to develop an appropriate course of action.

I.E.15.d For any release or noncompliance not required to be reported to Ecology immediately, a brief account must be entered within two (2) working days, into the TSD Operating Record, for a TSD unit, or into the Facility Operating Record, inspection log, or separate spill log, for non-TSD units. This account must include: the time and date of the release, the location and cause of the release, the type and quantity of material released, and a brief description of any response actions taken or planned.

I.E.15.e All releases, regardless of location of release, or quantity of release, will be controlled and mitigated, if necessary, as required by WAC 173-303-145(3).

I.E.16 Written Reporting

Within fifteen (15) days after the time the Permittees become aware of the circumstances of any noncompliance with this Permit, which may endanger human health or the environment, the Permittees will provide to Ecology a written report. The written report will contain a description of the noncompliance and its cause (including the information provided in the verbal notification); the period of noncompliance including exact dates and times; the anticipated time noncompliance is expected to continue, if the noncompliance has not been corrected; corrective measures being undertaken to mitigate the situation, and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

I.E.17 Manifest Discrepancy Report

I.E.17.a For dangerous waste received from outside the Facility, whenever a significant discrepancy in a manifest is discovered, the Permittees will attempt to reconcile the discrepancy. If not reconciled within fifteen (15) days of discovery, the Permittees will submit a letter report in accordance with WAC 173-303-370(4), including a copy of the applicable manifest or shipping paper, to Ecology.

I.E.17.b For dangerous waste which is being transported within the Facility (i.e., shipment of on-site generated dangerous waste), whenever a significant discrepancy in the shipping papers (see Permit Condition II.Q.1) is discovered, the Permittees will attempt to reconcile the discrepancy. If not reconciled within fifteen (15) days of discovery, the Permittees will **note the discrepancy in the receiving unit's Operating Record.**

I.E.18 Unmanifested Waste Report

The Permittees will follow the provisions of WAC 173-303-370 for the receipt of any dangerous waste shipment from off-site. The Permittees will also submit a report in accordance with WAC 173-303-390(1) to Ecology within fifteen (15) days of receipt of any unmanifested dangerous waste shipment received from off-site sources.

I.E.19 Other Noncompliance

The Permittees will report to Ecology all instances of noncompliance, not otherwise required to be reported elsewhere in this Permit, at the time the Annual Dangerous Waste Report is submitted.

I.E.20 Other Information

Whenever the Permittees become aware that they have failed to submit any relevant facts in a Permit application, closure plan, or post-closure plan, or submitted incorrect information in a Permit application, closure plan, or post-closure plan, or in any report to Ecology, the Permittees will promptly submit such facts or corrected information.

I.E.21 Reports, Notifications, and Submissions

All written reports, notifications or other submissions, which are required by this Permit to be sent, or given to the Director or Ecology, should be sent certified mail, overnight express mail, or hand delivered, to the current address and telephone number shown below. This address and telephone number may be subject to change.

Washington State Department of Ecology
Nuclear Waste Program
3100 Port of Benton Blvd
Richland, Washington 99354
Telephone: (509) 372-7950

Telephonic and oral reports/notifications also need to be provided to Ecology's Richland Office.

Ecology will give the Permittees written notice of a change in address or telephone number. It is the responsibility of the Permittees to ensure any required reports, notifications, or other submissions are transmitted to the addressee listed in this Condition. However, the Permittees will not be responsible for ensuring verbal and written correspondence reaches a new address or telephone number until after their **receipt of Ecology's written notification.**

I.E.22 Annual Report

The Permittees will comply with the annual reporting requirements of WAC 173-303-390(2)(a) through (e), and (g).

I.F SIGNATORY REQUIREMENT

All applications, reports, or information submitted to Ecology, which require certification, will be signed and certified in accordance with WAC 173-303-810(12) and (13). All other reports required by this Permit and other information requested by Ecology will be signed in accordance with WAC 173-303-810(12).

I.G CONFIDENTIAL INFORMATION

The Permittees may declare as confidential any information required to be submitted by this Permit, at the time of submission, in accordance with WAC 173-303-810(15).

I.H DOCUMENTS TO BE MAINTAINED AT FACILITY SITE

The Permittees will maintain at the Facility, or some other location approved by Ecology, the following documents and amendments, revisions, and modifications to these documents: (1) This Permit and all Attachments; and (2) The Hanford Facility Operating Record.

All dangerous waste Part B permit applications, post closure permit applications, and closure plan applications are maintained in the Administrative Record located at 2440 Stevens, Room 1101, Richland, WA.

Other approved locations: (1) 700 Area, (2) Locations within the City of Richland under control of one or more of the Permittees, (3) Administrative Record locations within the Stevens Center complex, (4) Consolidated Information Center at Washington State University, Tri-Cities. (5) Archived records at the National Archives and Records Administration (NARA), Pacific Alaska Region, 6125 Sand Point Way NE, Seattle, Washington, 98115-7999.

These documents will be maintained for ten (10) years after post-closure care or corrective action for the Facility, whichever is later, has been completed and certified as complete.

PART II GENERAL FACILITY CONDITIONS

II.A FACILITY CONTINGENCY PLAN

II.A.1 The Permittees will immediately carry out applicable provisions of the *Hanford Emergency Management Plan* as provided in Permit Attachment 4, pursuant to WAC 173-303-360(2), whenever there is an incident meeting the criteria of Permit Attachment 4, Section 4.2. Enforceable portions of Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02) are identified in Permit Attachment 4, Appendix A.

II.A.2 The Permittees will comply with the requirements of WAC 173-303-350(4), as provided in the *Hanford Emergency Management Plan* (Permit Attachment 4). The *Hanford Emergency Management Plan* provides reference to the need for unit-specific contingency documentation. Unit-specific contingency documentation for Part III TSD units is included in Part III of this Permit. Unit-specific contingency documentation for Part V and VI TSD units required by this Permit condition is maintained in the Hanford Facility Operating Record, Unit-Specific files.

II.A.3 The *Permittees* will review and amend, if necessary, the applicable portions of the *Hanford Emergency Management Plan*, as provided in Permit Attachment 4, pursuant to WAC 173-303-350(5), and in accordance with the provisions of WAC 173-303-830(4). The Permittees will be able to demonstrate how Amendments to the applicable portions are controlled. The plan will be amended within a period of time agreed upon by Ecology.

II.A.4 The Permittees will comply with the requirements of WAC 173-303-350(3) and –360(1) concerning the emergency coordinator, except the names and home telephone numbers will be on file with the single point-of-contact, phone number (509) 373-3800 or 375-2400 (for PNNL units) as described in the *Hanford Emergency Management Plan*.

II.B PREPAREDNESS AND PREVENTION

II.B.1 The Permittees will equip the Facility with the equipment specified in WAC 173-303-340(1) as specified in the *Hanford Emergency Management Plan* (Permit Attachment 4). Unit-specific preparedness and prevention provisions are included in Parts III, V, and/or VI of this Permit.

II.B.2 The Permittees will test and maintain the equipment specified in Permit Condition II.B.1 as necessary to assure proper operation in the event of emergency.

II.B.3 The Permittees will maintain access to communications or alarms pursuant to WAC 173-303-340(2), as provided in the *Hanford Emergency Management Plan* (Permit Attachment 4) and unit-specific contingency plans.

II.B.4 The Permittees will comply with WAC 173-303-340(4) and WAC 173-303-355(1) pertaining to arrangements with local authorities.

II.B.5 Based on the arrangements with local authorities required by WAC 173-303-340(4) documented in Permit Attachment 4, Table 3-1, the Permittees will maintain the Memorandums of Understanding to comply with WAC 173-303-350(4)(b). The Hanford Facility Memorandums of Understanding with local authorities provides emergency planning and coordination equivalent to submittal of the contingency plan to local authorities

II.C PERSONNEL TRAINING

II.C.1 The Permittees will conduct personnel training as required by WAC 173-303-330. The Permittees will maintain documents in accordance with WAC 173-303-330(2) and (3). Training records may be maintained in the Hanford Facility Operating Record, or on electronic data storage.

II.C.2 All Hanford Facility personnel will receive general Facility training within six (6) months of hire. This training will provide personnel with orientation of dangerous waste management activities being conducted at the Hanford Facility. This training will include:

II.C.2.a Description of emergency signals and appropriate personnel response;

II.C.2.b Identification of contacts for information regarding dangerous waste management activities;

II.C.2.c Introduction to waste minimization concepts;

II.C.2.d Identification of contact(s) for emergencies involving dangerous waste; and

II.C.2.e Familiarization with the applicable portions of the *Hanford Emergency Management Plan*.

II.C.3 Description of training plans for personnel assigned to TSD units subject to this Permit are delineated in the unit-specific Chapters in Parts III, V, and/or VI of this Permit.

II.C.4 The Permittees will provide the necessary training to non-Facility personnel (i.e., visitors, sub-contractors), as appropriate, for the locations of such personnel, and the activities that will be undertaken. At a minimum, this training will describe dangerous waste management hazards at the Facility.

II.D WASTE ANALYSIS

II.D.1 All waste analyses required by this Permit will be conducted in accordance with a written waste analysis plan (WAP), or sampling and analysis plan (SAP). Operating TSD units will have a WAP, which will be approved through incorporation of the TSD unit into Part III of this Permit. Closing TSD units, and units in post-closure, should have a SAP and, if necessary, a WAP, which will be approved through incorporation of the TSD unit into Part V and/or VI of this Permit.

II.D.2 Until a WAP is implemented in accordance with Permit Condition II.D.1., any unit(s) identified in Parts III, V, and/or VI of this Permit, without a unit-specific WAP approved by Ecology, will not treat, store, or dispose of dangerous waste, unless specified otherwise by Ecology in writing.

II.D.3 Each TSD unit WAP will include:

II.D.3.a The parameters for which each dangerous waste will be analyzed, and the rationale for selecting these parameters; (i.e., how analysis for these parameters will provide sufficient information on the waste properties to comply with WAC 173-303-300(1), (2), (3), and (4);

II.D.3.b The methods of obtaining or testing for these parameters;

II.D.3.c The methods for obtaining representative samples of wastes for analysis (representative sampling methods are discussed in WAC 173-303-110(2);

II.D.3.d The frequency with which analysis of a waste will be reviewed, or repeated, to ensure that the analysis is accurate and current;

II.D.3.e The waste analyses which generators have agreed to supply;

II.D.3.f Where applicable, the methods for meeting the additional waste analysis requirements for specific waste management methods, as specified in WAC 173-303-140(4)(b), 173-303-395(1), 173-303-630 through 173-303-670, and 40 CFR 264.1034, 264.1063, 284(a), and 268.7, for final status facilities;

II.D.3.f.i For off-site facilities, the procedures for confirming that each dangerous waste received matches the identity of the waste specified on the accompanying manifest, or shipping paper. This includes at least:

II.D.3.f.i.a The procedure for identifying each waste movement at the Facility; and,

II.D.3.f.i.b The method for obtaining a representative sample of the waste to be identified, if the identification method includes sampling.

II.D.3.f.ii For surface impoundments exempted from Land Disposal Restrictions (LDR) under 40 CFR 268.4(a), incorporated by reference in WAC 173-303-140(2), the procedures and schedules for:

II.D.3.f.iii The sampling of impoundment contents;

II.D.3.f.iv The analysis of test data; and

II.D.3.f.v The annual removal of residues that are not delisted under 40 CFR 260.22, or which exhibit a characteristic of hazardous waste and either;

II.D.3.f.v.a Do not meet applicable treatment standards of 40 CFR Part 268, Subpart D; or

II.D.3.f.v.b Where no treatment standards have been established:

II.D.3.f.v.b.1 Such residues are prohibited from land disposal under 40 CFR 268.32, or RCRA Section 3004(d); or

II.D.3.f.v.b.2 Such residues are prohibited from land disposal under 40 CFR 268.33(f); and

II.D.4 Should waste analysis be required by this Permit at a location on the Facility, other than at a TSD unit, a SAP will be maintained by the Permittees, and made available upon request from Ecology. Any SAP required by this Permit, not associated with a particular TSD unit, will include the elements of Permit Conditions II.D.3.a.

II.E QUALITY ASSURANCE/QUALITY CONTROL

II.E.1 All WAPs and SAPs required by this Permit will include a quality assurance/quality control (QA/QC) plan, or equivalent, to document all monitoring procedures to ensure that all information, data, and resulting decisions are technically sound, statistically valid, and properly documented in accordance with HFFACO Action Plan §6.5, Quality Assurance, and reported/made available in accordance with HFFACO Action Plan §9.6, Data Access and Delivery Requirements.

II.E.2 The level of QA/QC for the collection, preservation, transportation, and analysis of each sample required for implementation of this Permit may be based upon an Ecology-approved DQO for the sample. These DQOs will be approved by Ecology in writing or through incorporation of unit plans and Permits into Parts III, V, and/or VI of this Permit.

II.F GROUND WATER AND VADOSE ZONE MONITORING

The Permittees will comply with the ground water monitoring requirements of WAC 173-303-645. This Condition will apply only to those wells the Permittees use for the ground water monitoring programs applicable to the TSD units incorporated into Parts III, V, and/or VI of this Permit. Where releases from TSD units subject to this Permit have been documented or confirmed by investigation, or where vadose zone monitoring is proposed for integration with ground water monitoring, the Permittees will evaluate the applicability of vadose zone monitoring. The Permittees will consult with Ecology regarding the implementation of these requirements. If agreed to by Ecology, integration of ground water and vadose zone monitoring, for reasons other than this Permit, may be accommodated by this Permit. Results from other investigation activities will be used whenever possible to supplement and/or replace sampling required by this Permit.

II.F.1 Purgewater Management

Purgewater will be handled in accordance with the requirements set forth in permit Attachment 10, *Purgewater Management Plan.*

II.F.2 Well Inspection and Maintenance

II.F.2.a The Permittees will inspect the integrity of active resource protection wells as defined by WAC 173-160-030, subject to this Permit, at least once every five (5) years as specified in the *Hanford Well Maintenance Inspection Plan* (Permit Attachment 8). These inspections will be recorded in the Operating Record.

II.F.2.b The Permittees will evaluate resource protection wells subject to this Permit according to the *Hanford Well Maintenance Inspection Plan* (Permit Attachment 8) and the *Policy on Remediation of Existing Wells and Acceptance Criteria for RCRA and CERCLA*, June 1990 (Permit Attachment 7). The Permittees will submit a permit modification request to Ecology to decommission or maintain wells as necessary to ensure compliance with WAC 173-303-645(8)(c). This permit modification request will include a schedule of compliance, which may incorporate by reference applicable schedule(s) in HFFACO Milestone M-24. For Wells to be decommissioned, this permit modification must also include a request for installation of replacement wells, if necessary, to ensure compliance with WAC 173-303-645 requirements.

II.F.2.c Ecology will receive a notice of intent (NOI) in writing at least seventy-two (72) hours before the Permittees decommission (excluding maintenance activities) any well subject to this Permit.

II.F.2.d For wells subject to this Permit, the Permittees will achieve full compliance with Chapter 173-160 WAC and Chapter 18.104 RCW by replacing non-compliant wells subject to the permit with new wells under the schedule in HFFACO Milestone M-24, as amended, incorporated by reference into this Permit.

II.F.3 Well Construction

All wells constructed pursuant to this Permit will be constructed in compliance with Chapter 173-160 WAC.

II.G SITING CRITERIA

The Permittees will comply with the applicable notice of intent and siting criteria of WAC 173-303-281 and WAC 173-303-282, respectively.

II.H RECORDKEEPING AND REPORTING

The provisions of WAC 173-303-620 are not applicable to the Hanford Facility because the USDOE is both owner and operator of the Hanford Facility. WAC 173-303-620(1)(c).

II.I FACILITY OPERATING RECORD

II.I.1 The Permittees will maintain a written Facility Operating Record until ten (10) years after post-closure, or corrective action is complete and certified for the Facility, whichever is later. Except as specifically provided otherwise in this Permit, the Permittees will also record all information referenced in this Permit in the Facility Operating Record within seven (7) working days after the information becomes available. A TSD unit-specific Operating Record will be maintained for each TSD unit at a location identified in Parts III, V, and VI of this Permit. This information may be maintained on electronic media. Each TSD unit-specific Operating Record will be included by reference in the Facility Operating Record. Information required in each TSD unit-specific Operating Record is identified on a unit-by-unit basis in Part III, V, or VI of this Permit. The Facility Operating Record will include, but not be limited to, the following information.

II.I.1.a A description of the system(s) currently utilized to identify and map solid waste management units and their locations. The description of the system(s) is required to include an identification of on-site access to the system's data, and an on-site contact name and telephone number. In addition to, or as part of, this system(s), the Permittees will also maintain a list identifying active ninety (90)-day waste storage areas, and dangerous waste satellite accumulation areas and their locations. The list will identify the location, the predominant waste types managed at the area, and a date identifying when the list was compiled. Maps will be provided by the Permittees upon request by Ecology;

II.I.1.b Records and results of waste analyses required by WAC 173-303-300;

II.I.1.c An identification of the system(s) currently utilized to generate Occurrence Reports. The identification of the system(s) is required to include a description, an identification of an on-site location of hard-copy Occurrence Reports, an identification of on-site access to the system's data, and an on-site contact name and telephone number;

II.I.1.d Copies of all unmanifested waste reports;

II.I.1.e The *Hanford Emergency Management Plan*, as well as summary reports, and details of all incidents that require implementing the contingency plan, as specified in WAC 173-303-360(2)(k);

II.I.1.f An identification of the system(s) currently utilized and being developed to record personnel training records and to develop training plans. The identification of the system(s) is required to include a description, an identification of on-site access to the system's data, and an on-site contact name and telephone number;

II.I.1.g Preparedness and prevention arrangements made pursuant to WAC 173-303-340(4) and documentation of refusal by state or local authorities that have declined to enter into agreements in accordance with WAC 173-303-340(5);

II.I.1.h Reserved Condition;

II.I.1.i Reserved Condition;

II.I.1.j Documentation (e.g., waste profile sheets) of all dangerous waste transported to or from any TSD unit subject to this Permit. This documentation will be maintained in the receiving unit's Operating Record from the time the waste is received;

II.I.1.k An identification of the system(s) currently utilized to cross-reference waste locations to specific manifest document numbers. The identification of the system(s) is required to include a thorough description, an identification of an on-site location of a hard-copy data report, an identification of on-site access to the system's data, and an on-site contact name and telephone number;

II.I.1.l Reserved Condition;

II.I.1.m Annual Reports required by this Permit;

II.I.1.n An identification of all systems currently utilized to record monitoring information, including all calibration and maintenance records, and all original strip chart recordings for continuous monitoring instrumentation. The identification of systems will include a description of the systems. The descriptions will include a confirmation that the criteria of Permit Condition I.E.10 is provided by the utilization of the system. The identification of the systems will also include an identification of on-site access to the system's data, an on-site contact name and telephone number;

II.I.1.o Reserved Condition;

II.I.1.p Summaries of all records of ground water corrective action required by WAC 173-303-645;

II.I.1.q An identification of the system(s) currently being utilized and being developed to evaluate compliance with the Conditions of this Permit and with Chapter 173-303 WAC. The identification of the system(s) will include a description of the system(s), an identification of on-site access to the system's data, and an on-site contact name and telephone number. The description of the system(s) will also include a definition of which portion(s) of the system(s) is accessible to Ecology;

II.I.1.r All deed notifications required by this Permit (to be included by reference);

II.I.1.s All inspection reports required by this Permit; and

II.I.1.t All other reports as required by this Permit, including design change documentation and nonconformance documentation.

II.J FACILITY CLOSURE

II.J.1 Final closure of the Hanford Facility will be achieved when closure activities for all TSD units have been completed, as specified in Parts III, IV, V, or VI of this Permit. Completion of these activities will be documented using either certifications of closure, in accordance with WAC 173-303-610(6), or certifications of completion of post-closure care, in accordance with WAC 173-303-610(11).

II.J.2 The Permittees will close all TSD units as specified in Parts III, V, and/or VI of this Permit.

II.J.3 The Permittees will submit a written notification of, or request for, a Permit modification in accordance with the provisions of WAC 173-303-610(3)(b), whenever there is a change in operating plans, facility design, or the approved closure plan. The written notification or request must include a copy of the amended closure plan for review, or approval, by Ecology.

II.J.4 The Permittees will close the Facility in a manner that:

II.J.4.a Minimizes the need for further maintenance;

II.J.4.b Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated run-off, or dangerous waste decomposition products, to the ground, surface water, ground water, or the atmosphere; and

II.J.4.c Returns the land to the appearance and use of surrounding land areas to the degree possible, given the nature of the previous dangerous waste activity.

II.J.4.d Meets the requirements of WAC 173-303-610(2)(b).

II.K SOIL/GROUND WATER CLOSURE PERFORMANCE STANDARDS

II.K.1 For purposes of Permit Condition II.K, the term "clean closure" shall mean the status of a TSD unit at the Facility which has been closed to the cleanup levels prescribed by WAC 173-303-610(2)(b), provided certification of such closure has been accepted by Ecology.

II.K.2 The Permittees may close a TSD unit to background levels as defined in Ecology approved Hanford Site Background Documents, if background concentrations exceed the levels prescribed by Permit Condition II.K.1. Closure to these levels, provided the Permittees comply with all other closure requirements for a TSD unit as identified in Parts III, V, and/or VI of this Permit, shall be deemed as "clean closure".

II.K.3 Except for those TSD units identified in Permit Conditions II.K.1, II.K.2, or II.K.4, the Permittees may close a TSD unit to a cleanup level specified under Method C of Chapter 173-340 WAC. Closure of a TSD unit to these levels, provided the Permittees comply with all other closure requirements for the TSD unit as specified in Parts III, V, and/or VI of the Permit, and provided the Permittees comply with Permit Conditions II.K.3.a through II.K.3.c, shall be deemed as a "modified closure".

II.K.3.a For "modified closures", the Permittees shall provide institutional controls in accordance with WAC 173-340-440 which restricts access to the TSD unit for a minimum of five (5) years following completion of closure. The specific details and duration of institutional controls shall be specified in Parts III, V, and/or VI of this Permit for a particular TSD unit.

II.K.3.b For "modified closures", the Permittees shall provide periodic assessments of the TSD unit to determine the effectiveness of the closure. The specific details of the periodic assessments shall be specified in Parts III, V, and/or VI of this Permit. The periodic assessments shall include, as a minimum, a compliance monitoring plan in accordance with WAC 173-340-410 that will address the assessment requirements on a unit-by-unit basis. At least one (1) assessment activity shall take place after a period of five (5) years from the completion of closure, which will demonstrate whether the soils and ground water have been maintained at or below the allowed concentrations as specified in Parts III, V, or VI of this Permit. Should the required assessment activities identify contamination above the allowable limits as specified in Parts III, V, and/or VI, the TSD unit must be further remediated, or the requirements of II.K.4 must be followed. Should the required assessment activities demonstrate that contamination has diminished, or remained the same, the Permittees may request that Ecology reduce, or eliminate the assessment activities and/or institutional controls.

II.K.3.c For "modified closures", the Permittees shall specify the particular activities required by this Condition in a Post-Closure Permit application.

II.K.4 Any TSD unit for which Permit Conditions II.K.1, II.K.2, or II.K.3, are not chosen as the closure option, closing the TSD unit as a landfill may be selected. Closure and post-closure of the TSD unit as a landfill, must follow the procedures and requirements specified in WAC 173-303-610.

II.K.5 The cleanup option selected shall be specified in Parts III, V, and/or VI of this Permit, and shall be chosen with consideration of the potential future site use for that TSD unit/area. Definitions contained within Chapter 173-340 WAC shall apply to Permit Condition II.K. Where definitions are not otherwise provided by this Permit, the HFFACO, or Chapter 173-303 WAC.

II.K.6 Deviations from a TSD unit closure plan required by unforeseen circumstances encountered during closure activities, which do not impact the overall closure strategy, but provide equivalent results, shall be documented in the TSD unit-specific Operating Record and made available to Ecology upon request, or during the course of an inspection.

II.K.7 Where agreed to by Ecology, integration of other statutorily or regulatory mandated cleanups may be accommodated by this Permit. Results from other cleanup investigation activities shall be used whenever possible to supplement and/or replace TSD unit closure investigation activities. All, or appropriate parts of, multipurpose cleanup and closure documents can be incorporated into this Permit through the Permit modification process. Cleanup and closures conducted under any statutory authority, with oversight by either Ecology or the EPA, which meet the equivalent of the technical requirements of Permit Conditions II.K.1 through II.K.4, may be considered as satisfying the requirements of this Permit.

II.L DESIGN AND OPERATION OF THE FACILITY

II.L.1 Proper Design and Construction

The Permittees will design, construct, maintain, and operate the Facility to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous substances to air, soil, ground water, or surface water, which could threaten human health, or the environment.

II.L.2 Design Changes, Nonconformance, and As-Built Drawings

II.L.2.a After completing the Permit modification process in Permit Condition I.C.3, the Permittees will conduct all construction subject to this Permit in accordance with the approved designs, plans and specifications that are required by this Permit, unless authorized otherwise in Permit Conditions II.L.2.b or II.L.2.c. For purposes of Permit Conditions II.L.2.b and II.L.2.c, an Ecology construction inspector, or TSD unit manager, are designated representatives of Ecology.

II.L.2.b During construction of a project subject to this Permit, changes to the approved designs, plans and specifications will be formally documented. All design change documentation will be maintained in the TSD unit-specific Operating Record and will be made available to Ecology upon request or during the course of an inspection. The Permittees will provide copies of design change documentation affecting any critical system to Ecology within five (5) working days of initiating the design change documentation. Identification of critical systems will be included by the Permittees in each TSD unit-specific dangerous waste Permit application, closure plan or Permit modification, as appropriate. Ecology will review a design change documentation modifying a critical system, and inform the Permittees in writing within two (2) working days, whether the proposed design change documentation, when issued, will require a Class 1, 2, or 3

Permit modification. If after two (2) working days Ecology has not responded, it will be deemed as acceptance of the design change documentation by Ecology.

II.L.2.c During construction of a project subject to this Permit, any work completed which does not meet or exceed the standards of the approved design, plans and specifications will be formally documented with nonconformance documentation. All nonconformance documentation will be maintained in the TSD unit-specific Operating Record and will be made available to Ecology upon request, or during the course of an inspection. The Permittees will provide copies of nonconformance documentation affecting any critical system to Ecology within five (5) working days after identification of the nonconformance. Ecology will review nonconformance documentation affecting a critical system and inform the Permittees in writing, within two (2) working days, whether a Permit modification is required for any nonconformance, and whether prior approval is required from Ecology before work proceeds, which affects the nonconforming item. If Ecology does not respond within two (2) working days, it will be deemed as acceptance and no Permit modification will be required.

II.L.2.d Upon completion of a construction project subject to this Permit, the Permittees will produce as-built drawings of the project which incorporate the design and construction modifications resulting from all project design change documentation and nonconformance documentation, as well as modifications made pursuant to WAC 173-303-830. The Permittees will place the drawings into the Operating Record within twelve (12) months of completing construction, or within an alternate period of time specified in a unit-specific Permit Condition in Part III or V of this Permit.

II.L.2.e Facility Compliance

The Permittees in receiving, storing, transferring, handling, treating, processing, and disposing of dangerous waste, will design, operate, and/or maintain the Facility in compliance with all applicable federal, state, and local laws and regulations.

II.M SECURITY

The Permittees will comply with the security provisions of WAC 173-303-310. The Permittees may comply with the requirements of WAC 173-303-310(2) on a unit-by-unit basis.

II.N RECEIPT OF DANGEROUS WASTES GENERATED OFF-SITE

II.N.1 Receipt of Off-Site Waste

The Permittees will comply with Permit Conditions II.N.2 and II.N.3 for any dangerous wastes which are received from sources outside the United States, or from off-site generators.

II.N.2 Waste from Sources Outside the United States

The Permittees will meet the requirements of WAC 173-303-290(1) for waste received from outside the United States.

II.N.3 Notice to Generator

For waste received from off-site sources (except where the owner/operator is also the generator), the Permittees will inform the generator in writing that they have the appropriate Permits for, and will accept, the waste the generator is shipping, as required by WAC 173-303-290(3). The Permittees will keep a copy of this written notice as part of the TSD unit-specific Operating Record.

II.O GENERAL INSPECTION REQUIREMENTS

II.O.1 The Permittees will inspect the Facility to prevent malfunctions and deterioration, operator errors, and discharges, which may cause or lead to the release of dangerous waste constituents to the environment, or threaten human health. Inspections must be conducted in accordance with the provisions of WAC 173-303-320(2). In addition to the TSD unit inspections specified in Parts III, V, and/or VI, the following inspections will also be conducted:

II.O.1.a The 100, 200 East, 200 West, 300, and 400 areas will be inspected annually.

II.O.1.b The Permittees will inspect the banks of the Columbia River, contained within the Facility boundary, once a year. The inspection will be performed from the river, by boat, and the inspectors will follow the criteria in Permit Condition II.O.1.c.

II.O.1.c The Permittees will visually inspect the areas identified in Permit Conditions II.O.1.a and II.O.1.b for malfunctions, deterioration, operator errors, and discharges which may cause or lead to the release of dangerous waste constituents to the environment, or that threaten human health. Specific items to be noted are as follows:

II.O.1.c.i Remains of waste containers, labels, or other waste management equipment;

II.O.1.c.ii Solid waste disposal sites not previously identified for remedial action;

II.O.1.c.iii Uncontrolled waste containers (e.g., orphan drums);

II.O.1.c.iv Temporary or permanent activities that could generate an uncontrolled waste form; and

II.O.1.c.v Unpermitted waste discharges.

II.O.1.d The Permittees will notify Ecology at least seven (7) days prior to conducting these inspections in order to allow representatives of Ecology to be present during the inspections.

II.O.2 If the inspection by the Permittees, conducted pursuant to Permit Condition II.O.1, reveals any problems, the Permittees will take remedial action on a schedule agreed to by Ecology.

II.O.3 The inspection of high radiation areas will be addressed on a case-by-case basis in either Part III of this Permit, or prior to the inspections required in Permit Condition II.O.1.

II.P MANIFEST SYSTEM

II.P.1 The Permittees will comply with the manifest requirements of WAC 173-303-370 for waste received from off-site and WAC 173-303-180 for waste shipped off-site.

II.P.2 Transportation of dangerous wastes along roadways, if such routes are not closed to general public access at the time of transport, can be manifested pursuant to an alternate tracking system as allowed by WAC 173-303-180(5). The alternate tracking system can be a paper system or an electronic system. The roadways addressed by this condition are a public or private right-of-way within or along the border of contiguous property where the movement is under control of the USDOE. The alternate tracking system will consist of documentation between the offering Hanford Facility location and the receiving Hanford Facility location containing the following information:

II.P.2.a Hanford Facility offeror name, location, and telephone number;

II.P.2.b Hanford Facility receiver name, location, and telephone number;

II.P.2.c Description of waste;

II.P.2.d Number and type of containers;

II.P.2.e Total quantity of waste;

II.P.2.f Unit volume/weight;

II.P.2.g Dangerous waste number(s) or U.S. Department of Transportation hazard class; and

II.P.2.h Special handling instructions including emergency contacts.

II.P.3 The Hanford Facility offeror and receiver will resolve any discrepancies of information found related to Permit Conditions II.P.2.a through II.P.2.h.

II.P.4 If the discrepancies cannot be resolved at the Hanford Facility receiving location, a new Hanford Facility receiver location will be agreed upon, or the dangerous waste will be returned to the offeror location. The documentation accompanying the movement of dangerous waste will be updated to reflect the new receiving location.

II.Q ON-SITE TRANSPORTATION

II.Q.1 Documentation must accompany any on-site dangerous waste which is transported to or from any TSD unit subject to this Permit, through or within the 600 Area, unless the roadway is closed to general public access at the time of shipment. Waste transported by rail or by pipeline is exempt from this Condition. This documentation will include the following information, unless other unit-specified provisions are designated in Part III or V of this Permit:

II.Q.1.a Generator's name, location, and telephone number;

II.Q.1.b Receiving TSD unit's name, location, and telephone number;

II.Q.1.c Description of waste;

II.Q.1.d Number and type of containers;

II.Q.1.e Total quantity of waste;

II.Q.1.f Unit volume/weight;

II.Q.1.g Dangerous waste number(s); and

II.Q.1.h Any special handling instructions.

II.Q.2 All non-containerized solid, dangerous waste transported to or from TSD units, subject to this Permit, will be covered to minimize the potential for material to escape during transport.

II.R EQUIVALENT MATERIALS

II.R.1 The Permittees may substitute an equivalent or superior product for any equipment or materials specified in this Permit. Use of equivalent or superior products will not be considered a modification of this Permit. A substitution will not be considered equivalent unless it is at least as effective as the original equipment or materials in protecting human health and the environment.

II.R.2 The Permittees will place in the Operating Record (within seven [7] days after the change is put into effect) the substitution documentation, accompanied by a narrative explanation, and the date the substitution became effective. Ecology may judge the soundness of the substitution.

II.R.3 If Ecology determines that a substitution was not equivalent to the original, it will notify the Permittees that the Permittees' claim of equivalency has been denied, of the reasons for the denial, and that the original material or equipment must be used. If the product substitution is denied, the Permittees will comply with the original approved product specification, or find an acceptable substitution.

II.S LAND DISPOSAL RESTRICTIONS (LDR)

Unless specifically identified otherwise in the HFFACO, the Permittees will comply with all LDR requirements as set forth in WAC 173-303-140.

II.T ACCESS AND INFORMATION

To the extent that work required by this Permit must be done on property not owned or controlled by the Permittees, the Permittees must utilize their best efforts to obtain access and information at these locations.

II.U MAPPING OF UNDERGROUND PIPING

II.U.1 Reserved.

II.U.2 Reserved.

II.U.3 The Permittees will maintain piping maps for existing, newly identified, and/or new dangerous waste underground pipelines (including active, inactive, and abandoned pipelines, which contain or contained dangerous waste subject to the provisions of Chapter 173-303 WAC) at the Hanford Facility. The maps will identify the origin, destination, direction of flow, size, depth and type (i.e., reinforced concrete, stainless steel, cast iron, etc.), of each pipe, and the location of their diversion boxes, valve pits, seal pots, catch tanks, receiver tanks, and pumps, and utilize Washington State Plane Coordinates, NAD 83(91), meters. If the type of pipe material is not documented on existing drawings, the most probable material type will be provided. The maps will also identify whether the pipe is active, inactive, or abandoned. The age of all pipes requiring identification pursuant to this Condition will be documented in an Attachment to the submittal. If the age cannot be documented, an estimate of the age of the pipe will be provided based upon best engineering judgment. These maps need not include the pipes within a fenced tank farm or within a building/structure. These maps will be compiled using documented QA/QC control methods and procedures outlined in DOE/RL-96-50, *Hanford Facility RCRA Permit Mapping and Marking of Dangerous Waste Underground Pipelines Report*, September 1996. These maps and any Attachments will be maintained in the Facility Operating Record and be updated annually as required by Permit Condition II.U.4.

II.U.4 Permittees will maintain current all maps required by Permit Condition II.U.3. These maps will be updated to incorporate new or revised information available by March 30th of each year. By September 30th of each year, the Permittees will submit to Ecology a list of maps that have been updated. The updated maps (including any Attachments) and the annual list submitted to Ecology will be maintained in the Facility Operating Record.

II.V MARKING OF UNDERGROUND PIPING

The Permittees will maintain marking of underground pipelines located outside the 200 East, 200 West, 300, 400, 100N, and 100K Areas. These pipelines will be marked at the point they pass beneath an area fence, at their origin and destination, at any point they cross an improved road, and every 100 meters along the pipeline corridor where practicable. The markers will be labeled with a sign that reads "Buried Dangerous Waste Pipe" and will be visible from a distance of fifteen (15) meters.

II.W OTHER PERMITS AND/OR APPROVALS

II.W.1 The Permittees will be responsible for obtaining all other applicable federal, state, and local permits authorizing the development and operation of the Facility. To the extent that work required by this Permit must be done under a permit and/or approval pursuant to other regulatory authority, the Permittees will use their best efforts to obtain such permits.

II.W.2 All other permits related to dangerous waste management activities are severable and enforceable through the permitting authority under which they are issued.

II.W.3 All air emissions from units subject to this Permit will comply with all applicable state and federal regulations pertaining to air emission controls, including but not limited to, Chapter 173-400 WAC, General Regulations for Air Pollution Sources; Chapter 173-460 WAC, Controls for New Sources of Toxic Air Pollutants; and Chapter 173-480 WAC, Ambient Air Quality Standards and Emission Limits for Radionuclides.

II.X SCHEDULE EXTENSIONS

II.X.1 The Permittees will notify Ecology in writing, as soon as possible, of any deviations or expected deviations, from the schedules of this Permit. The Permittees will include with the notification all information supporting their claim that they have used best efforts to meet the required schedules. If Ecology determines that the Permittees have made best efforts to meet the schedules of this Permit, Ecology will notify the Permittees in writing by certified mail, that the Permittees have been granted an extension. Such an extension will not require a Permit modification under Permit Condition I.C.3. Should Ecology determine that the Permittees have not made best efforts to meet the schedules of this Permit, Ecology may take such action as deemed necessary.

Copies of all correspondence regarding schedule extensions will be kept in the Operating Record.

II.X.2 Any schedule extension granted through the approved change control process identified in the HFFACO will be incorporated into this Permit. Such a revision will not require a Permit modification under Permit Condition I.C.3.

II.Y CORRECTIVE ACTION

In accordance with WAC 173-303-646 and WAC 173-303-815(2)(b)(ii), the Permittees must conduct corrective action, as necessary to protect human health and the environment, for releases of dangerous waste and dangerous constituents from solid waste management units and areas of concern at the Facility, including releases that have migrated beyond the Facility boundary. The Permittees may be required to implement measures within the Facility to address releases, which have migrated beyond the Facility's boundary. As specified in permit conditions II.Y.1.g, II.Y.2.a.iii, and II.Y.2.a.ii, the Permittee's right to challenge Ecology's authority to impose corrective action with respect to radionuclides, CERCLA Past Practice (CPP) Units (as identified under Permit Condition II.Y.2.a) and selected solid waste management units not covered by the HFFACO at property currently subleased to US Ecology, Inc. (as identified under Permit Condition II.Y.3.a.i), is reserved until such time as Ecology chooses to impose corrective action in accordance with the permit modification procedures of WAC 173-303-830.

II.Y.1 Compliance with chapter 173-340 WAC

In accordance with WAC 173-303-646, the Permittee must conduct corrective action "as necessary to protect human health and the environment". To ensure that corrective action will be conducted as necessary to protect human health and the environment, except as provided in Permit Condition II.Y.2, the Permittee must conduct corrective action in a manner consistent with the following provisions of chapter 173-340 WAC:

II.Y.1.a As necessary to select a cleanup action in accordance with WAC 173-340-360 and WAC 173-340-350 State Remedial Investigation and Feasibility Study.

II.Y.1.b WAC 173-340-360 Selection of Cleanup Actions.

II.Y.1.c WAC 173-340-400 Cleanup Actions.

II.Y.1.d WAC 173-340-410 Compliance Monitoring Requirements.

II.Y.1.e WAC 173-340-420 Periodic Site Reviews.

II.Y.1.f WAC 173-340-440 Institutional Controls.; and

II.Y.1.g WAC 173-340-700 through -760 Cleanup Standards, except that to the extent that Ecology seeks to impose corrective action with respect to radionuclides regulated under the provisions of the Atomic Energy Act, as amended, 42 U.S.C. § 2011 et.seq. (AEA), the Permittees may challenge Ecology's authority to impose such corrective action through a timely appeal of the Permit modification issued by Ecology without argument from Ecology that such right has been waived by a failure to fully litigate that issue through an appeal taken within thirty (30) days of the issuance of this Permit, and without argument from the Permittees that such requirement fails to satisfy a cause for Permit modification under WAC 173-303-830(3)(a).

II.Y.2 Acceptance of Work Under Other Authorities or Programs and Integration with the HFFACO.

Corrective action is necessary to protect human health and the environment for all units identified in Appendix B and Appendix C of the HFFACO. Notwithstanding Permit Condition II.Y.1, work under other cleanup authorities or programs, including work under the HFFACO, may be used to satisfy corrective action requirements, provided it protects human health and the environment.

II.Y.2.a For past practice units identified in Appendix C of the HFFACO, as amended, as CERCLA Past Practice (CPP) Units, Ecology accepts work under the HFFACO, as amended, and under the CERCLA program, as satisfying corrective action requirements to the extent provided for in, and subject to the reservations and requirements of, Permit Conditions II.Y.2.a.i through II.Y.2.a.iv.

II.Y.2.a.i For any past practice unit identified in Appendix C of the HFFACO as a CPP unit, the Permittee must comply with the requirements and schedules related to investigation and cleanup of the CPP unit(s) developed and approved under the HFFACO, as amended. The requirements and schedules related to investigation and cleanup of CPP units currently in place under the HFFACO, as amended, and in the future developed and approved under the FFAOC, as amended, are incorporated into this Permit by this reference and apply under this Permit as if they were fully set forth herein. If the Permittee is not in compliance with requirements of the HFFACO, as amended, that relate to investigation or cleanup of CPP unit(s), Ecology may take action to independently enforce the requirements as corrective action requirements under this Permit.

II.Y.2.a.ii For any past practice unit identified in Appendix C of the HFFACO as a CPP unit, in the case of an interim Record of Decision (ROD), a final decision about satisfaction of corrective action requirements will be made in the context of issuance of a final ROD.

II.Y.2.a.iii If EPA and Ecology, after exhausting the dispute resolution process under Section XXVI of the HFFACO, cannot agree on requirements related to investigation or cleanup of CPP unit(s), Ecology will notify the Permittees, in writing, of the disagreement and impose, in accordance with the permit modification procedures of WAC 173-303-830, a requirement for the Permittees to conduct corrective action for the subject units(s) in accordance with Permit Condition II.Y.1. The Permittees may challenge Ecology's authority to impose such corrective action requirements through a timely appeal of such Permit modification, without argument from Ecology that the Permittee's right to raise such challenge has been waived by a failure to fully litigate that issue through an appeal taken within thirty (30) days of the issuance of this Permit, and without argument from the Permittee that such requirement fails to satisfy a cause for Permit modification under WAC 173-303-830(3)(a). Within 60 days of receipt of the above Permit modification, or within some other reasonable period of time agreed to by Ecology and the Permittees, the Permittees must submit for Ecology review and approval, a plan to conduct corrective action in accordance with Permit Condition II.Y.1 for the subject unit(s). The Permittee's plan may include a request that Ecology evaluate work under another authority or program. Approved corrective action plans under this Permit Condition will be incorporated into this Permit in accordance with the Permit Modification Procedures of WAC 173-303-830.

II.Y.2.a.iv The Permittees must maintain information on corrective action for CPP units covered by the HFFACO in accordance with Sections 9.0 and 10.0 of the HFFACO Action Plan. In addition, the Permittees must maintain all reports and other information developed in whole, or in part, to implement the requirements of Permit Condition II.Y.2.a, including reports of investigations and all raw data, in the Hanford Facility Operating Record in accordance with Permit Condition II.I. Information that is maintained in the Hanford Site Administrative Record may be incorporated by reference into the Hanford Facility Operating Record.

II.Y.2.b For past practice units identified in Appendix C of the HFFACO, as amended, as RCRA-CERCLA Past Practice (R-CPP) units, Ecology accepts work under the HFFACO, as amended, as satisfying corrective action requirements to the extent provided for, and subject to the reservations and requirements of, Permit Conditions II.Y.2.b.i through II.Y.2.b.ii.

II.Y.2.b.i For any past practice unit identified in Appendix C of the HFFACO, as amended, as an R-CPP unit, the Permittees must comply with the requirements and schedules related to investigation and cleanup of R-CPP units developed and approved under the HFFACO, as amended. The requirements and schedules related to investigation and cleanup of R-CPP units currently in place under the HFFACO, as amended, and in the future developed and approved under the HFFACO, as amended, are incorporated into this Permit by this reference and apply under this Permit as if they were fully set forth herein. If the Permittee is not in compliance with requirements and schedules related to investigation and cleanup of R-CPP units developed and approved under the HFFACO, as amended, Ecology may take action to independently enforce the requirements as corrective action requirements under this Permit.

II.Y.2.b.ii The Permittees must maintain information on corrective action for R-CPP units covered by the HFFACO, as amended, in accordance with Sections 9.0 and 10.0 of the HFFACO Action Plan. In addition, the Permittees must maintain all reports and other information developed in whole, or in part, to implement the requirements of Permit Condition

II.Y.2.b, including reports of investigations and all raw data, in the Hanford Facility Operating Record in accordance with Permit Condition II.I. Information that is maintained in the Hanford Site Administrative Record may be incorporated into the Hanford Facility Operating Record by reference.

II.Y.2.c For each TSD unit, when the Permittees submit a certification of closure or a certification of completion of post-closure care, or at an earlier time agreed to by Ecology and the Permittees, the Permittees must, at the same time, either:

II.Y.2.c.i Document that the activities completed under closure and/or post-closure satisfy the requirements for corrective action; or

II.Y.2.c.ii If the activities completed under closure and/or post-closure care do not satisfy corrective action requirements, identify the remaining corrective action requirements and the schedule under which they will be satisfied, if remaining corrective action requirements will be satisfied by work developed and carried out under the HFFACO provisions for R-CPP units or CPP units, a reference to the appropriate R-CPP or CPP process and schedule will suffice.

II.Y.2.c.iii Ecology will make final decisions as to whether the work completed under closure or post-closure care satisfies corrective action, specify any unit-specific corrective action requirements, and incorporate the decision into this Permit in accordance with the permit modification procedures of WAC 173-303-830.

II.Y.2.d Notwithstanding any other condition in this Permit, Ecology may directly exercise any administrative or judicial remedy under the following circumstances:

II.Y.2.d.i Any discharge or release of dangerous waste, or dangerous constituents, which are not addressed by the HFFACO, as amended.

II.Y.2.d.ii Discovery of new information regarding dangerous constituents or dangerous waste management, including but not limited to, information about releases of dangerous waste or dangerous constituents which are not addressed under the HFFACO, as amended.

II.Y.2.d.iii A determination that action beyond the terms of the HFFACO, as amended, is necessary to abate an imminent and substantial endangerment to the public health, or welfare, or to the environment.

II.Y.3 Releases of Dangerous Waste or Dangerous Constituents Not Covered By the HFFACO:

II.Y.3.a US Ecology

II.Y.3.a.i The following solid waste management units are not covered by the HFFACO:

II.Y.3.a.i.a US Ecology, Inc., SWMU 1: Chemical Trench.

II.Y.3.a.i.b US Ecology, Inc., SWMU 2-13: Low-Level Radioactive Waste Trenches 1 through 11A.

II.Y.3.a.i.c US Ecology, Inc., SWMU 17: Underground Resin Tank.

II.Y.3.a.ii Selected solid waste management units identified in Permit Condition II.Y.3.a.i are currently being investigated by US Ecology in accordance with the Comprehensive Investigation US Ecology – Hanford Operations Workplan. Following completion of this investigation and any closure required of such solid waste management unit under the authority of the Washington State Department of Health, or within one year of the effective date of this Permit Condition, whichever is earlier, Ecology will make a tentative decision as to whether additional investigation or cleanup is necessary to protect human health or the environment for the solid waste management units identified in Permit Condition II.Y.3.a.i, and publish that decision as a draft permit in accordance with WAC 173-303-840(10). Following the associated public comment period, and

consideration of any public comments received during the public comment period, Ecology will publish as final Permit conditions under WAC 173-303-840(8) either:

II.Y.3.a.ii.a A decision that corrective action is not necessary to protect human health or the environment;

II.Y.3.a.ii.b An extension to the schedule established under Permit Condition II.Y.3.a.ii, or

II.Y.3.a.ii.c A decision, that corrective action, in accordance with Permit Condition II.Y.1, is necessary to protect human health or the environment.

II.Y.3.a.iii If Ecology decides under Permit Condition II.Y.3.a.ii that corrective action is necessary to protect human health or the environment, the Permittees **may challenge Ecology's** authority to impose such corrective action requirements through a timely appeal of such permit modification, without argument from Ecology that the right to raise such challenge has been waived by a failure to fully litigate that issue through an appeal taken within 30 days of the issuance of this Permit, and with argument from the Permittees that such requirement fails to satisfy a cause for permit modification under WAC 173-303-830(3)(a). Within 180 days of receipt of the above Permit modification, the Permittees must submit, for Ecology review and approval, a plan to conduct corrective action in accordance with Permit Condition II.Y.1. Approved corrective action plans under this condition will be incorporated into this Permit in accordance with the Permit Modification Procedures of WAC 173-303-830.

II.Y.3.b Newly Identified Solid Waste Management Units and Newly Identified Releases of Dangerous Waste or Dangerous Constituents.

The Permittees must notify Ecology of all newly-identified solid waste management units and all newly-identified areas of concern at the Facility. For purposes of this condition, a **'newly-identified' solid waste management unit or a 'newly-identified' area of concern** is a unit or area not identified in the HFFACO, as amended, on the effective date of this condition and not identified by Permit Condition II.Y.3.a. Notification to Ecology must be in writing and must include, for each newly-identified unit or area, the information required by WAC 173-303-806(4)(a)(xxiii) and WAC 173-303-806(4)(a)(xxiv). Notification to Ecology must occur at least once every calendar year, in January, and must include all units and areas newly identified since the last notification, except that if a newly identified unit or area may present an imminent and substantial endangerment to human health or the environment, notification must occur within five days of identification of the unit or area. If information required by WAC 173-303-806(4)(a)(xxiii) or WAC 173-303-806(4)(a)(xxiv) is already included in the Waste Information Data System, it may be incorporated by reference into the required notification.

II.Z WASTE MINIMIZATION

In accordance with WAC 173-303-380(1)(q), and Section 3005(h) of RCRA, 42 U.S.C. 6925(h), the Permittee must place a certification in the Hanford Facility Operating Record, Unit-Specific Files on an annual basis that:

II.Z.1.a A program is in place to reduce the volume and toxicity of hazardous waste generated to the degree determined by the Permittee to be economically practicable; and,

II.Z.1.b The proposed method of treatment, storage or disposal is that practicable method currently available to the Permittee, which minimizes the present and future threat to human health and the environment.

II.Z.2 The Permittee will maintain each such certification of waste minimization in the operating record as required by Permit Condition II.I.1.

II.AA AIR EMISSION STANDARDS FOR PROCESS VENTS

The Permittees will comply with applicable requirements of WAC 173-303-690 for process vents associated with Part III units performing specific separations processes unless exempted by WAC 173-303-690(1)(d). Threshold limits applied to process vents potentially requiring emission controls subject to WAC 173-303-690 are evaluated based on the summation of applicable emission sources for the entire Hanford Facility. When the summed emissions fall below threshold limits in 40 CFR 264.1032(a)(1), no emission control devices are required. If threshold limits in 40 CFR 264.1032(a)(1) are predicted to be exceeded, the Permittees will notify Ecology to determine the appropriate course of action. Unit-specific information is contained in Part III of the Permit for applicable units.

II.BB AIR EMISSION STANDARDS FOR EQUIPMENT LEAKS

The Permittees will comply with applicable requirements of WAC 173-303-691 for certain equipment leaks associated with Part III units unless exempted by WAC 173-303-691(1)(e) or (f). Air emission standards apply to equipment that contacts or contains hazardous wastes with organic concentrations of at least 10 percent by weight. Unit-specific information is contained in Part III of the Permit for applicable units.

II.CC AIR EMISSION STANDARDS FOR TANKS, SURFACE IMPOUNDMENTS, AND CONTAINERS

The Permittees shall comply with applicable requirements of WAC 173-303-692 for containers, tanks, and surface impoundment areas associated with Part III units unless exempted by WAC 173-303-692(1)(b). Unit-specific information is contained in Part III of the Permit for applicable units.

PART III UNIT-SPECIFIC CONDITIONS FOR FINAL STATUS OPERATIONS

Operating Unit 2, PUREX Storage Tunnels
Operating Unit 3, Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility
Operating Unit 4, 242-A Evaporator
Operating Unit 5, 325 Hazardous Waste Treatment Units
Operating Unit 10, Waste Treatment and Immobilization Plant
Operating Unit 11, Integrated Disposal Facility
Operating Unit 15, 331-C Storage Unit
Operating Unit 16, 400 Area Waste Management Unit

PART IV UNIT SPECIFIC CONDITIONS FOR CORRECTIVE ACTION

Corrective Action Unit 1, 100-NR-1

PART V UNIT-SPECIFIC CONDITIONS FOR UNITS UNDERGOING CLOSURE

Closure Unit 1, 1325-N Liquid Waste Disposal Facility
Closure Unit 2, 1301-N Liquid Waste Disposal Facility
Closure Unit 3, 1324-N Surface Impoundment and 1324-NA Percolation Pond

PART VI UNIT-SPECIFIC CONDITIONS FOR UNITS IN POST-CLOSURE

Post Closure Unit 1, 300 Area Process Trenches
Post Closure Unit 2, 183-H Solar Evaporation Basins

UNITS RETIRED FROM THE PERMIT

100 D Ponds (Closed 8/9/99)
105-DR Large Sodium Fire Facility (Closed 7/1/04)
100-NR-2 Operable Unit (9/30/09)
200 West Area Ash Pit Demolition Site (Closed 11/28/95)
2101-M Pond (Closed 11/28/95)
216-B-3 Expansion Ponds (Closed 7/31/95)
218-E-8 Borrow Pit Demolition Site (Closed 11/28/95)
224-T Transuranic Waste Storage and Assay Facility (Closed 11/12/08)
241-Z Treatment and Storage Tanks (Closed 2/22/07)
2727-S Nonradioactive Dangerous Waste Storage Facility (Closed 7/31/95)
300 Area Solvent Evaporator (Closed 7/31/95)
300 Area Waste Acid Treatment System (Closed 10/30/2005)
303-K Storage Facility (Closed 7/22/02)
303-M Oxide Facility (Closed 6/15/06)
304 Concretion Facility (Closed 1/21/96)
305-B Storage Facility (Closed 7/2/07)
3718-F Alkali Metal Treatment and Storage Facility Closure Plan (Closed 8/4/98)
4843 Alkali Metal Storage Facility Closure Plan (Closed 4/14/97)
Hanford Patrol Academy Demolition Site (Closed 11/28/95)
Plutonium Finishing Plant Treatment Unit (Closed 2/8/05)
Simulated High Level Waste Slurry Treatment and Storage Unit (Closed 10/23/95)

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PART III, OPERATING UNIT GROUP 3 PERMIT CONDITIONS

Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility

Unit Description:

The Liquid Effluent Retention Facility (LERF) and 200 Area Effluent Treatment Facility(200 Area ETF) consists of an aqueous waste treatment system that provides treatment, storage integral to the treatment process, and storage of secondary wastes from the treatment process for a variety of aqueous mixed waste. The 200 Area ETF is located in the 200 East Area. Aqueous wastes managed by the 200 Area ETF include process condensate from the LERF and 200 Area ETF and other aqueous waste generated from onsite remediation and waste management activities.

The LERF consists of three lined surface impoundments, or basins. Aqueous waste from LERF is pumped to the 200 Area ETF for treatment in a series of process units, or systems, that remove or destroy essentially all of the dangerous waste constituents. The treated effluent is discharged to a State-Approved Land Disposal Site (SALDS) north of the 200 West Area, under the authority of a Washington State Waste Discharge Permit (Ecology 2000) and 200 Area ETF Delisting (40 CFR 261, Appendix IX, Table 2). Construction of the LERF began in 1990. Waste management operations began at LERF in April 1994. Construction of the 200 Area ETF began in 1992. Waste management operations began at 200 Area ETF in November of 1995.

This Chapter provides unit-specific Permit conditions applicable to the dangerous waste management units for LERF and 200 Area ETF.

List of Addenda Specific to Operating Unit Group 3

Addendum A	Part A Form, dated March 31, 2014
Addendum B	Waste Analysis Plan, dated March 31, 2013
Addendum C	Process Information, dated April 8, 2014
Chapter 5.0	Groundwater Monitoring (DOE/RL-2013-46, Rev. 0), dated April 29, 2014
Addendum E	Security Requirements, dated, June 30, 2011
Addendum F	Preparedness and Prevention, dated April 8, 2014
Addendum G	Personnel Training, dated June 30, 2012
Addendum H	Closure Plan, dated June 30, 2011
Addendum I	Inspection Requirements, dated April 8, 2014
Addendum J	Contingency Plan, dated March 31, 2012

Definitions

State and federal delisting actions: The state delisting action pursuant to WAC 173-303-910(3), August 8, 2005, and the federal delisting action appearing in 40 CFR 261, Appendix IX, Table 2 applicable to the United States, Department of Energy, Richland, Washington.

Acronyms

LERF and 200 Area ETF	200-Area Liquids Processing Facility

III.3.A COMPLIANCE WITH UNIT-SPECIFIC PERMIT CONDITIONS

III.3.A.1 The Permittees will comply with all Permit Conditions in this Chapter and its Addendums and Chapters with respect to dangerous waste management and dangerous waste management units in LERF and 200 Area ETF, in addition to requirements in Permit Part I and Part II.

III.3.B GENERAL WASTE MANAGEMENT

III.3.B.1 The Permittees are authorized to accept dangerous and/or mixed waste for treatment in dangerous waste management units that satisfies the waste acceptance criteria in Permit Addendum B according to the waste acceptance procedures in Permit Addendum B. [WAC 173-303-300]

III.3.B.2 The Permittees are authorized to manage dangerous and/or mixed wastes physically present in the dangerous waste management units in LERF and 200 Area ETF as of the effective date of this Permit according to the requirements of Permit Condition III.15.B.1.

III.3.B.3 The Permittees are authorized to treat and/or store dangerous/mixed waste in the dangerous waste management units in LERF and 200 Area ETF according to the following requirements:

III.3.B.3.a The Permittees are authorized to treat, and store as necessary in support of treatment, dangerous waste in the 200 Area ETF tank systems identified in Permit Addendum C, Section C.2, and Section C.4 according to the Permit Conditions of this Chapter.

III.3.B.3.b The Permittees are authorized to store and treat those dangerous and/or mixed waste identified in Permit Addendum C, Section C.3, in containers according to the requirements of this Chapter. All container management activities pursuant to this Permit Condition will take place within the container storage area or within the 200 Area ETF process area identified in Permit Addendum C, Figure C.3.

III.3.B.3.c Treatment in containers authorized by Permit Condition III.3.B.3.b is limited to decanting of free liquids, and addition of sorbents to free liquids. The Permittees will ensure that sorbents are compatible with wastes and the containers. Sorbents will be compliant with the requirements of WAC 173-303-140(4)(b)(iv), incorporated by reference.

III.3.B.3.d The Permittees are authorized to treat aqueous waste in LERF Basins (Basins 42, 43 and 44) subject to the following requirements:

III.3.B.3.d.1 Following treatment in a LERF basin, aqueous wastes must be treated in 200 Area ETF according to Permit Conditions III.3.B.3.a through c.; [40 CFR 268.4(2)(iii), incorporated by reference by WAC 173-303-140]

III.3.B.3.d.2 The Permittees must ensure that for each basin, either supernatant is removed on a flow-through basis, to meet the requirement of 40 CFR 268.4(a)(2)(ii) incorporated by reference by WAC 173-303-140, or incoming waste is shown to not contain solids by either: (1) sampling results showing the waste does not contain detectable solids, or (2) filtering through a 10 micron filter;[WAC 173-303-815(2)(b)(ii)]

III.3.B.4 The Permittees will maintain the physical structure of the LERF and 200 Area ETF as documented in the applicable sections of Permit Addendum C, Section C.2. [WAC 173-303-630(7), WAC 173-303-640(3), WAC 173-303-640(4)]

III.3.B.5 The Permittees are authorized to use treated effluent for recycle/makeup water purposes at the 200 Area ETF as outlined in Permit Addendum C, Section C.2.5.5, and the letters dated August 19, 2005, EPA Region 10 to Keith A. Klein; and August 8, 2005, Department of Ecology to Keith A. Klein. [WAC 173-303-815 (2)(b)(ii)]

III.3.B.6 The Permittees will maintain and operate systems for the 200 Area ETF documented in Permit Addendum C, Section C.2.5 as necessary for proper operation of the 200 Area ETF, compliance with the conditions of this Permit, and protection of human health and the environment. For purposes of this Permit Condition, the Monitor and Control System documented in Permit Addendum C, Section C.2.5.1, is considered to include all indicators, sensors, transducers, actuators and other control devices connected to but remote from the centralized monitor and control system (MCS) computer.

III.3.B.7 The Permittees must complete the following requirements prior to acceptance for treatment in 200 Area ETF aqueous waste streams with listed waste numbers subject to the requirements of the State and Federal delisting: [WAC 173-303-815(2)(b)(ii)]

III.3.B.7.a The Permittees will prepare a written waste processing strategy according to the requirements of the State and Federal Delisting Actions Conditions (1)(a)(ii) and (1)(b), incorporated by reference, and Permit Addendum B, Section B.2.2.2.

III.3.B.7.b The waste processing strategy required by Permit Condition III.3.B.7.a, must document the proposed processing configuration for the 200 Area ETF, operating conditions for each processing unit, and the expected treated effluent characteristics based on the process model and treatability envelope data required by State and Federal Delisting Conditions (1)(a)(ii) and (1)(b).

III.3.B.7.c The written waste processing strategy required by Permit Condition III.3.B.7.a must demonstrate that the projected treated effluent characteristics satisfy the delisting exclusion limits in State and Federal Delisting Condition (5) of the state and federal delisting actions, and the discharge limits of the State Discharge Permit ST-4500.

III.3.B.7.d The Permittees will place a copy of the written waste processing strategy required by Permit Condition III.3.B.7.a in the Hanford Facility Operating Record, LERF and 200 Area ETF file as part of the documentation of waste streams accepted for management at the 200 Area ETF.

III.3.B.8 Treatment of aqueous waste streams in the 200 Area ETF with listed waste numbers that are subject to the requirements of the state and federal delisting actions must comply with the requirements of State and Federal Delisting Condition (1)(c), incorporated by reference. [WAC 173-303-815 (2)(b)(ii)]

III.3.B.9 The Permittees will manage treated effluent in the final verification tanks according to the requirements of the State and Federal Delisting Conditions (3) and (5), incorporated by reference. [WAC 173-303-815 (2)(b)(ii)]

III.3.B.10 The Permittees will manage treated effluent from the 200 Area ETF according to the requirements of the State Waste Discharge Permit ST 4500 and State and Federal Delisting Condition (7). [WAC 173-303-815(2)(b)(ii)]

III.3.B.11 The Permittees will ensure compliance with treatment standards (40 CFR 268, incorporated by reference by WAC 173-303-140) applicable to treated effluent prior to discharge to the State Authorized Land Disposal Site (SALDS), the delisting criteria at 40 CFR 261, Appendix IX, Table 2, and the corresponding state-approved delisting (dated August 8, 2005, all incorporated by reference). Sampling and analysis necessary for these demonstrations must meet the corresponding requirements in Permit Addendum B. [WAC 173-303-140, WAC 173-303-815 (2)(b)(ii)]

III.3.C WASTE ANALYSIS

III.3.C.1 The Permittees will comply with requirements in Permit Addendum B for sampling and analysis of all dangerous and/or mixed waste required by conditions in this Chapter. [WAC 173-303-300]

III.3.C.2 The Permittees will have an accurate and complete waste profile as described in Permit Addendum B, Section B.2.1.2, for every waste stream accepted for management in LERF and 200 Area ETF dangerous waste management units. [WAC 173-303-380 (1)(a), (b)]

III.3.C.3 The Permittees will place a copy of each waste profile required by Permit Condition III.15.C.2 in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2. [WAC 173-303-380 (1)(a), (b)]

III.3.C.4 The Permittees will make a copy of the waste profile required by Permit Condition III.15.C.2 available upon request. [WAC 173-303-380 (1)(a), (b)]

III.3.C.5 Records and results of waste analysis described in this Permit will be maintained in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2. [WAC 173-303-380 (1)(a), (b)]

III.3.D RECORDKEEPING AND REPORTING

III.3.D.1 The Permittees will place the following into the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2:

III.3.D.1.a Records required by WAC 173-303-380 (1)(k), and -(o) incorporated by reference.

III.3.D.1.b Records and results of waste analysis, waste determinations (as required by Subpart CC) and trial tests required by WAC 173-303-300, General waste analysis, and by 40 CFR §264.1034,§264.1063, §264.1083, §265.1034, §265.1063, §265.1084, §268.4(a), and §268.7; [WAC 173-303-310(2)]

III.3.D.1.c An inspection log, summarizing inspections conducted pursuant to Permit Condition III.3.H.1; [WAC 173-303-380(1)(e)]

III.3.D.1.d Records required by the State and Federal Delisting Condition (6), incorporated by reference; [WAC 173-303-815 (2)(b)(ii)]

III.3.E SECURITY

III.3.E.1 The Permittees comply with the Security requirements specific to the LERF and 200 Area ETF in Addendum E and Permit Attachment 3 as required by Permit Condition II.L. [WAC 173-303-310(2)]

III.3.F PREPAREDNESS AND PREVENTION

III.3.F.1 The Permittees will comply with the Preparedness and Prevention requirements specific to LERF and 200 Area ETF in Addendum F. [WAC 173-303-340]

III.3.G CONTINGENCY PLAN

III.3.G.1 The Permittees will comply with Addendum J, Contingency Plan, in addition to the requirements of Permit Condition II.A when applicable. [WAC 173-303-350]

III.3.H INSPECTIONS

III.3.H.1 The Permittees will comply with Addendum I in addition to the requirements of Permit Condition II.X. [WAC 173-303-320]

III.3.I TRAINING PLAN

III.3.I.1 The Permittees will include the training requirements described in Addendum G of this Chapter specific to the dangerous waste management units and waste management activities at LERF and 200 Area ETF into the written training plan required by Permit Condition II.C.

III.3.J GENERAL REQUIREMENTS

III.3.J.1 The Permittees will comply with the requirements of WAC 173-303-395(1), incorporated by reference, for prevention of reaction of ignitable, reactive, or incompatible wastes.

III.3.K CLOSURE

III.3.K.1 The Permittees will close dangerous waste management units in the LERF and 200 Area ETF in accordance with Addendum H, Closure Plan, and Permit Condition II.J. [WAC 173-303-610(3)(a)]

III.3.L POST CLOSURE – RESERVED

III.3.M CRITICAL SYSTEMS – RESERVED

III.3.N RESERVED

III.3.O CONTAINERS

III.3.O.1 Container Storage and Treatment Unit Standards

III.3.O.1.a As part of or in addition to the requirements of Permit Condition III.3.B.2, the Permittees will ensure the integrity of container storage secondary containment and the chemically resistant coating described in Addendum C, Section C.3.4.1 as necessary to ensure any spills or releases to secondary containment do not migrate to the underlying concrete or soils.

III.3.O.1.a.1 Include documentation of any damage and subsequent repairs in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2.

III.3.O.2 Container Management Standards

III.3.O.2.a The Permittees will maintain and manage wastes in accordance with the requirements of Addendum C, Section 4.3.2, and Section 4.3.2. [WAC 173-303-630(2)]

III.3.O.2.b The Permittees will label containers in accordance with the requirements of Addendum C, Section C.3.2, and Section C.3.3. [WAC 173-303-630(3)]

III.3.O.2.c The Permittees will comply with the requirements for managing wastes in containers in WAC 173-303-630(5), incorporated by reference.

III.3.O.2.d The Permittees will ensure wastes are compatible with containers and with other wastes stored or treated in containers within the 200 Area ETF according to the requirements of Addendum C, Section C.3.4.3. [WAC 173-303-630(4), WAC 173-303-630(9)]

III.3.O.2.e The Permittees may treat wastes in containers via decanting of free liquids and addition of sorbents. The Permittees may not use addition of sorbents for purposes of changing the treatability group of a waste with respect to the land disposal restriction standards of 40 CFR 268, incorporated by reference by WAC 173-303-140.

III.3.O.2.f The Permittees will remove any accumulated liquids from container storage areas in 200 Area ETF according to the requirements of Addendum C, Section C.3.4.2, to ensure containers are not in contact with free liquids and to prevent overflow of the container storage area secondary containment.

III.3.O.2.g The Permittees will comply with the requirements for air emissions from containers in Addendum C, Section C.6.3.2. [WAC 173-303-692]

III.3.P TANK SYSTEMS

III.3.P.1 Tank System Requirements

III.3.P.1.a The Permittees will develop a schedule for conducting integrity assessments (IA). The schedule will meet the requirements of Addendum C, Section C.4.2, and consideration of the factors in WAC 173-303-640(2)(e) or WAC 173-303-640(3)(b) as applicable:

III.3.P.1.b The Permittees will maintain a copy of the schedule required by Permit Condition III.3.P.1.a, in the Hanford Facility Operating Record, LERF and 200 Area ETF file, and conduct periodic integrity assessments according to the schedule. The Permittees will document results of integrity assessments conducted according to the IA in the Hanford Facility Operating Record, LERF and 200 Area ETF file.

III.3.P.1.c For existing tank systems, if a tank system is found to be leaking, or is unfit for use, the Permittees must follow the requirements of WAC 173-303-640(7), incorporated by reference. [WAC 173-303-640(3)(b)]

III.3.P.2 Tank System Operating Requirements

III.3.P.2.a The Permittees will comply with the requirements of WAC 173-303-640(5)(a), incorporated by reference.

III.3.P.2.b The Permittees will comply with the requirements of Addendum C, Section C.4.5.2. [WAC 173-303-640(5)(b)]

III.3.P.2.c The Permittees will comply with the requirements of Addendum C, Section C.4.6. [WAC 173-303-640(5)(d)]

III.3.P.2.d The Permittees will comply with the requirements of WAC 173-303-640(7), incorporated by reference, in response to spills or leaks from tanks systems at 200 Area ETF. [WAC 173-303-640(5)(c)]

III.3.P.2.e The Permittees will ensure that the Waste Processing Strategy required by Permit Condition III.3.B.7.a, provides for the immediate treatment or blending of waste accepted for management at the 200 Area ETF such that the resulting waste or mixture is no longer reactive or ignitable when further managed in 200 Area ETF tank systems. [WAC 173-303-640(9)]

III.3.P.2.f The Permittees will comply with the requirements of WAC 173-303-640(10), incorporated by reference.

III.3.Q SURFACE IMPOUNDMENTS

III.3.Q.1 The Permittees will maintain the three LERF basins according to the requirements of WAC 173-303-650 (2)(f), incorporated by reference.

III.3.Q.2 The Permittees will operate the LERF basins according to the requirements of Addendum C, Section C.5.3, and Addendum I, Section I.2.2.3.1 to prevent over-topping. [WAC 173-303-650 (2)(c)]

III.3.Q.3 The Permittees will develop and maintain, and operate the LERF basins to ensure that any flow of waste into the impoundment can be immediately shut off in the event of overtopping or liner failure. [WAC 173-303-650 (2)(d)]

III.3.Q.4 The Permittees will comply with the requirements of WAC 173-303-650 (2)(g), incorporated by reference.

III.3.Q.5 The Permittees will comply with the requirements of WAC 173-303-650 (4)(b), incorporated by reference.

III.3.Q.6 The Permittees will comply with the requirements of WAC 173-303-650 (4)(c), incorporated by reference. The certification required by this Permit Condition must be provided to Ecology no later than seven calendar days after the date of the certification. A copy of the certification will be placed in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2. [WAC 173-303-650 (4)(c)]

III.3.Q.7 The Permittees will comply with the requirements of WAC 173-303-650(5)(b), incorporated by reference, in response to events in WAC 173-303-650(5)(a), incorporated by reference.

III.3.Q.8 The Permittees will comply with the requirements of WAC 173-303-650(5)(d) for any LERF basin that has been removed from service in accordance with Permit Condition III.3.Q.7 that the Permittees will restore to service. [WAC 173-303-650(5)(d)]

III.3.Q.9 The Permittees will close any LERF basin removed from service in accordance with the requirements of Permit Condition III.3.Q.7 or a basin that cannot be repaired or that the Permittees will not to return to service. [WAC 173-303-650(5)(e)]

III.3.Q.10 The Permittees will comply with the requirements of Addendum C, Section C.5.10 with respect to management of ignitable or reactive wastes in the LERF basins. [WAC 173-303-650(7)]

III.3.Q.11 The Permittees can place incompatible wastes and materials in the same LERF basin only if in compliance with the requirements of WAC 173-303-395(1)(b), (c). [WAC 173-303-650(8)]

III.3.Q.12 The Permittees will use the action leakage rate in Addendum C, Section C.5.8, for operation of LERF basins, and comply with the requirements of WAC 173-303-650(10)(b). [WAC 173-303-650(10)]

III.3.Q.13 The Permittees will comply with the requirements of WAC 173-303-650(11), incorporated by reference.

III.3.Q.14 The Permittees will comply with the requirements of 40 CFR 264, Subpart CC, incorporated by reference by WAC 173-303-692.

III.3.R GROUNDWATER

III.3.R.1 The Permittees will comply with the requirements of Addendum D, Groundwater Monitoring Plan. [WAC 173-303-645]

III.3.R.2 All wells constructed pursuant to this Permit will be constructed in compliance with Chapter 173-160 WAC incorporated by reference through WAC 173-303-645 (8)(c).

III.3.R.3 Update the Groundwater Monitoring Network

III.3.R.3.a The Permittees will install an additional downgradient monitoring well E-26-15 as identified in Addendum D, Groundwater Monitoring Plan by December, 2016.

III.3.R.3.b Within 60-days of the well installation, the Permittees will submit a Class 2 Permit modification [WAC 173-303-830 Appendix I, C.1.a] to update Addendum D and include the additional monitoring well into the groundwater monitoring network.

III.3.R.3.c Concurrently with the permit modification request, the Permittees will submit a revised **"Liquid Effluent Retention Facility Characterization Report" for the additional** monitoring well that includes:

1) Well construction in accordance with WAC 173-303-645(8)(c)
2) Well screen placement in the upper aquifer in accordance with WAC 173-303-645(8)(a)
3) Hydrogeologic conditions, stratigraphy and hydraulic conductivity, derived from geologist observations of borehole archive samples, down hole gamma logging, and aquifer slug tests in accordance with WAC 173-303-645(8)(a)(i)(A)
4) Drilling and sampling details in accordance with WAC 173-303-645(8)(d)
5) Borehole corrections (e.g., precision surveys, gyroscopic corrections, and barometric response corrections) to ensure adequate hydraulic understanding considering the very small gradient in accordance with WAC 173-303-645(8)(f)
6) Geochemical comparison of the water quality with other existing wells to ensure anticipated representative conditions in accordance with WAC 173-303-645(8)(a)(ii)
7) Document surface location as required by WAC 173-303-645(6)

III.3.R.3.c.1 Groundwater sample results from the new well (E-26-15) and the existing wells for all constituents in the Addendum D, Groundwater Monitoring Plan for the Liquid Effluent Retention Facility,

III.3.R.3.c.2 Results of evaluating final well development data and drilling logs,

III.3.R.3.c.2.a A well use designation (e.g., upgradient or downgradient).

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Hanford Well Maintenance and Inspection Plan
HNF-56398, Revision 1
Previously BHI- 01265, Revision 0

1.0 INTROUCTION

This document presents the well maintenance and inspection plan for use in supporting groundwater activities at the Hanford Site. Wells located across the Hanford Site are used by Site contractors for a variety of groundwater programs. As such, these wells require various types of inspections and/or maintenance during their lifecycles. The wells that must be maintained are defined in Section 2.0, "Requirements."

2.0 REQUIREMENTS

Washington Administrative Code (WAC) 173-160, "Minimum Standards for Construction and Maintenance of Wells," states "It is the responsibility of the resource protection well operator, resource protection well contractor and the property owner to take whatever measures are necessary to guard against waste and contamination of the groundwater resource."

The provisions of the dangerous waste section of the *Resource Conservation and Recovery Act of 1976 Permit for the Treatment, Storage, and Disposal of Dangerous Waste at the Hanford Site* Permit are controlled by the "State of Washington Hazardous Waste Management Act of 1976" (RCW 70.105). Part II.F.2.a of (WA7890008967) states that "...the Permittees shall inspect the integrity of active resource protection wells as defined by WAC 173-160-030 subject to this Permit at least once every five (5) years." Wells subject to the RCRA Permit requirements are defined as wells actively monitoring treatment, storage, and disposal (TSD) unit closures (in Part V of the Permit); TSD operating units (in Part III of the Permit); and TSD units undergoing post-closure/modified closure (Part VI of the Permit).

3.0 SCHEDULE

The list of RCRA wells to be considered for maintenance or inspection will be based on a review of information on the current wells. This review may include field sampling notations, previous inspection results, or other data collected during sampling of the wells. In addition, the installation date and/or location of a well will also be considered.

Well inspections, consistent with the requirements in permit condition II.F.2.a, will occur in 2015, and continue every 5 years after that. The schedule will accommodate changes that will occur with the addition of new wells, adjustments in the TSD unit closures, and wells that are no longer needed for monitoring.

4.0 WELL INSPECTIONS

Well inspections are conducted as an integral part of field maintenance activities. Inspections include visual examination of the well site, surface components of the well structure (e.g., barrier posts, concrete surface pad and seal, protective well casing, well cap), identification of equipment installed in the well, and where possible measurements of the depths to water and/or bottom of the well. Inspections are documented on field reports.

5.0 WELL MAINTENANCE

Based on review of the 5 year inspection results, or other evaluations such as field sampling notations, well sampling issues, etc., well maintenance for groundwater monitoring wells will be performed as needed. Well maintenance will include the following tasks, as necessary, to restore the well to its intended use:

1. Removing groundwater sampling pump system and/or aquifer testing instrumentation/equipment
2. Inspecting and repairing (or replacing, as necessary) the sampling pump system and/or aquifer testing instrumentation/equipment
3. Cleaning the well casing perforations
4. Inspecting and cleaning well screen or repair of well screen (if possible)
5. Removing debris and fill material
6. Performing borehole video camera surveillance
7. Re-installing sampling and/or aquifer testing instrumentation/equipment
8. Redeveloping the well after performing maintenance
9. Inspecting final conditions after well maintenance (e.g. cap is replaced, concrete surface pad integrity, lock is secure, etc.)
10. Documenting well conditions and maintenance activities

6.0 REFERENCES

WA7890008967, 2007, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8C, for the Treatment, Storage, and Disposal of Dangerous Waste*, as amended, Washington State Department of Ecology, Richland, Washington *Resource Conservation and Recovery Act of 1976*, 42 U.S.C. 6901, et seq.

RCW 70.105, "State of Washington Hazardous Waste Management Act of 1976, "*Revised Code of Washington*, as amended.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

7.0 BIBLIOGRAPHY

DOE-RL, 1994, *Hanford Site Groundwater Management Program*, DOE/RL-89-12, as amended, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2013-46
Revision 0

Groundwater Monitoring Plan for the Liquid Effluent Retention Facility

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

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

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Release Approval _____ Date _____

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Addendum D

Groundwater Monitoring Plan

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Terms

bgs	below ground surface
Cr(VI)	hexavalent chromium
CRDL	contract-required detection limit
DQO	data quality objective
EB	equipment blank
Ecology	Washington State Department of Ecology
EMB	Elephant Mountain Member of the Saddle Mountains Basalt
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
FTB	full trip blank
FXR	field transfer blank
GC	gas chromatography
HDPE	high-density polyethylene
ICP	inductively coupled plasma
HEIS	Hanford Environmental Information System
KGS	Kansas Geological Survey
LCS	laboratory control sample
LERF	Liquid Effluent Retention Facility
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
OU	operable unit
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RPD	relative percent difference
TBD	to be determined
TOC	total organic carbon
TOX	total organic halides
UPR	unplanned release
XRF	X-ray fluorescence

D Groundwater Monitoring Plan, Liquid Effluent Retention Facility

This document describes a groundwater monitoring program for the Liquid Effluent Retention Facility (LERF) (Figure D-1). LERF is a regulated unit under RCW 70.105, "Hazardous Waste Management," and is subject to groundwater monitoring requirements pursuant to WAC 173-303-645, "Dangerous Waste Regulations," "Releases from Regulated Units."

D1 Introduction

This plan describes the LERF groundwater monitoring program, including the monitoring network, constituent list, sampling schedule, sampling and analysis protocols, and data evaluation and reporting methods for LERF groundwater monitoring. Four monitoring wells at LERF (299-E26-10, 299-E26-14, 299-E26-77, and 299-E26-79) provide a monitoring network for establishing the groundwater gradient, and two monitoring wells (299-E26-14 and 299-E26-79) provide upgradient-downgradient comparisons for detection monitoring, respectively (Figure D-2).

D1.1 History of Groundwater Monitoring at the Liquid Effluent Retention Facility

A four-well groundwater monitoring program was established at LERF in 1990 before final construction of the regulated unit. One well (299-E26-11) was completed to the east of LERF as an upgradient monitoring well, and three wells (299-E26-9, 299-E26-10, and 299-E35-2) were completed west of LERF as downgradient monitoring wells. Well 299-E26-77, a replacement well for well 299-E26-9, was located approximately 5 m (15 ft) to the southeast of well 299-E26-9 and because of the scale for Figure D-2, only well 299-E26-77 is identified. Samples were collected quarterly from the four monitoring wells, and evaluation of indicator parameters began before waste was transferred to the basins. Analytes listed in Appendix III, "EPA Interim Primary Drinking Water Standards," of 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring," were sampled to establish the suitability of the groundwater as a drinking water supply, as well as several other site-specific constituents the first year of sample collection. Total organic carbon (TOC), total organic halides (TOX), pH, and specific conductivity (indicator parameters) also were analyzed during the first year to derive upgradient/downgradient comparison values for these parameters based on requirements of 40 CFR 265, Subpart F. Detection monitoring continued on a semiannual schedule. Two wells, 299-E26-9 and 299-E35-2, could no longer yield representative samples of groundwater in 1999 and 2001, respectively, due to declining water levels. As a result, inter-well statistical evaluation of LERF groundwater monitoring data has not been performed since 2001. Sampling continued at former downgradient well 299-E26-10 and former upgradient well 299-E26-11. Wells 299-E26-77 and 299-E26-79 were drilled and completed in 2008 to define the aquifer flow rate, flow direction, and hydrogeologic conditions (SGW-41072, *Liquid Effluent Retention Facility Characterization Report*) (Figure D-2). These wells are located west and south of LERF, respectively, and were sampled concurrently with existing wells beginning in January 2009. Water level measurements, after incorporation of the two new wells, demonstrated two different flow conditions, westerly when incorporating well 299-E26-11 and more southerly when data for well 299-E26-11 are not incorporated (SGW-41072). Because of the uncertainty in flow direction, another well, 299-E26-14, was installed north of LERF to clarify current groundwater flow direction. A geophysical investigation was employed to target the best hydraulic location for well 299-E26-14 as discussed further in Section D2.1.1 (Figure D-3). In September 2011, well 299-E26-14 was installed. After two years of water level measurements using well 299-E26-14 and the three other wells (299-E26-10, 299-E26-77, and 299-E26-79), the flow direction was considered southward (discussed further in Section 2.2.2). Various chemical analyses were completed over the past two years to provide an upgradient baseline for dangerous waste constituents specified in this permit.

D1.2 Facility Description

The following subsections provide an overview of the physical structures, operational history, and waste characteristics of LERF. Additional details are provided in Addendum B (Waste Analysis Plan) and Addendum C (Process Information).

D1.3 Physical Structure

LERF is located in the central portion of the Hanford Site on the eastern boundary of the 200 East Area (Figure D-1). Construction of LERF was completed in 1991. The LERF basins consist of three dangerous waste management units classified as surface impoundments: Basins 42, 43, and 44 (Figure D-2). The LERF design uses a dual confinement barrier concept (i.e., dual basin liners and pipe-in-a-pipe transfer piping system) to minimize human exposure and potential for accidental releases to the environment. A leachate detection, collection, and removal system and basin covers are designed to reduce possible environmental or personnel exposures. The leachate detection system is monitored, as required, by the LERF-Effluent Treatment Facility (ETF) permit conditions and Addendum I.

LERF is a 15.8 ha (39 ac) site with three 2.9×10^7 L (7.8 million gal) capacity basins (Figure D-2). The basins are arranged side by side with 18.2 m (60 ft) separations between each basin. The dimensions of each basin (cell) are 100.5 by 82.2 m (330 by 270 ft), with a maximum fluid depth of 6.7 m (22 ft). The side slopes of the basin have a slope ratio of 3:1.

The primary liner for each basin is a 60 mil, high-density polyethylene (HDPE) geomembrane laid directly over a manufactured geotextile/bentonite carpet layer. The secondary liner is also a 60 mil HDPE geomembrane laid directly on 0.9 m (36 in.) of a soil/bentonite mixture. The liners are separated by a synthetic drainage geonet laid on the sides of the basins, with 0.3 m (12 in.) of drainage gravel at the bottom. The sides slope to a sump, which is pumped when the liquid level reaches approximately 28 cm (11 in.) and shuts off when it drops to 18 cm (7 in.). Each basin has a mechanically tensioned cover of very low density polyethylene construction, which is anchored to the perimeter concrete ring wall of the basins with batten plates.

D1.4 Operational History

LERF was constructed for interim storage and treatment for aqueous waste streams prior to final treatment in the 200 Area ETF. Treatment at LERF consists of flow and pH equalization. The flow equalization allows for several smaller waste streams that are intermittently received at the LERF basins to accumulate for continuous higher volume campaign processing at ETF. The pH equalization allows for a uniform wastewater to optimize ETF process campaigns.

LERF began receiving process condensate from the 242-A Evaporator in 1994. In 1995, several new liquid waste feeds were identified for treatment at LERF. These waste streams included Environmental Restoration Disposal Facility (ERDF) leachate, purge water from groundwater monitoring, B Plant waste, and 200-UP-1 groundwater remediation. Between 2000 and 2013, the majority of the liquid waste received at LERF was associated with the following in descending order: 200-UP-1/200-ZP-1 groundwater (181.4 million gal), ERDF leachate (16 million gal), process condensate from the 242-A Evaporator (7.3 million gal), Mixed Waste Burial Trenches leachate (2.9 million gal), K Basins (1.9 million gal), and purge water (1.8 million gal).

Projected ETF influent waste streams for 2010 through 2028 are presented in HNF-23142, *Engineering Study for the 200 Area Effluent Treatment Facility Secondary Waste Treatment of Projected Future Waste Feeds*.

D1.5 Waste Characteristics

As a unit of LERF, the 200 Area ETF was designed to treat a variety of aqueous wastes containing both chemical and radiological contaminants. This aqueous waste is collected in the three LERF basins before transfer to ETF for efficient operations. Before a liquid waste can be transferred to ETF or LERF by a waste generator, a waste profile of the subject waste must be developed. This waste profile is compared against the ETF/LERF acceptance criteria, as explained in Addendum B, "Waste Analysis Plan." Waste streams that have been approved are also periodically re-evaluated for waste characteristics. The results of these periodic re-evaluations (provided in this subsection) help identify reliable chemical contaminants that can be used as or for additional indicator parameters for detection monitoring (as described in WAC 173-303-645(9)(a)). Waste characteristics for liquid effluents that have been historically stored in the three LERF basins (Basins 42, 43, and 44) are provided in the following subsections.

D1.6 Basin 42

Various aqueous waste streams feed Basin 42; however, the 242-A Evaporator waste stream has been the largest volume waste stream associated with Basin 42. Over the past 13 years (1999 through 2012), the liquid volume associated with the 242-A Evaporator waste was 10 times that of any other waste streams sent to Basin 42. Maximum concentration limits for the 242-A Evaporator waste stream during initial startup were provided in WHC-SD-W105-SAR-001, *Final Safety Analysis Report 242-A Evaporator Liquid Effluent Retention Facility*. When the maximum concentrations for the 242-A Evaporator waste stream (Table 9.6 of WHC-SD-W105-SAR-001) were compared with the average contaminant concentration levels (2009 through 2010 weighted average liquid concentrations) in Basin 42 (Table D-1), nearly all of the average Basin 42 concentrations were lower. Constituents with greater concentrations were limited to two anions (chloride and sulfate), one cation (calcium), and four trace metals (barium, manganese, uranium, and zinc). These constituents appear to be associated with other waste streams such as the Mixed Waste Trenches 31 and 34 leachate and Hanford Site purge water which had the second and third largest waste streams by volume. The other 17 waste streams associated with Basin 42 make up approximately 2 percent of the volume.

The makeup of Basin 42 is similar to the groundwater wells upgradient of the Hanford Site or regional background groundwater concentrations, except for alkalinity, nitrogen, and sulfate. A comparison between Basin 42 wastewater and upgradient Hanford Site wells can be seen in the appropriate Table D-1 columns (e.g., 2009 Basin 42 Characterization Results and Basin 42 Average versus Regional Background Concentration of Table D-1). In general, regional groundwater background concentrations are similar to groundwater concentrations beneath LERF, except for anions. Although Basin 42 and groundwater beneath Basin 42 share a common suite of elevated constituents (anions), the source of the elevated anions in the groundwater is from a crossgradient/upgradient groundwater location. The crossgradient/upgradient groundwater location is shown by historical groundwater results at well 299-E34-7 prior to the start of LERF and more recently at the LERF upgradient well 299-E27-14 (Figure D-4). By comparison, the average concentration[1] of sulfate in Basin 42 (55.6 mg/L) is much less than the historical sulfate concentration at well 299-E34-7 of 671 mg/L (sample date 4/3/2003). Even characterization results from Basins 42, 43, and 44 (Tables D-1, D-2, and D-3) do not compare with the maximum groundwater results at well 299-E34-7. The same is true for nitrate in Basin 42 as compared with nitrate at the crossgradient/upgradient well 299-E34-7. Only the contributions of the 200-BP-5 perched water waste streams from Basin 43 and ERDF leachate exceed the groundwater results at well 299-E34-7. However, because of the nature of the elevated groundwater results at well 299-E34-7, including elevated TOC, and the relationship to past unplanned releases (UPRs) near well 299-E34-7

[1] All concentrations are reported as a weighted average.

(e.g., UPR-200-E-32 associated with the 216-B-2-1 Ditch and UPR-200-E-138 associated with the 216-B-2-2 Ditch [Figure D-1]), the elevated groundwater results at well 299-E34-7 appear to be from a source other than LERF (Figure D-5). The UPRs (e.g., UPR-200-E-32 and UPR-200-E-138) were associated with B Plant fractionation waste that had significant levels of nitrate, sulfate, and organic carbon. The nature of these UPRs appears more characteristic of the levels reported at well 299-E34-7. Well 299-E26-10, located to the west of LERF, appears to mimic the historical results at well 299-E34-7 (Figure D-4). As the nitrate and sulfate concentrations decrease over time, if concentrations follow the earlier trends at well 299-E34-7, these constituents may become more appropriate as indicator parameters at LERF. However, the concentration of these constituents in LERF Basins would not be distinguishable from current groundwater conditions beneath LERF. Because nitrate and sulfate may become more appropriate indicator parameters in the future, they will serve currently as groundwater quality parameters at the LERF monitoring wells. Because specific conductance is an indicator of nitrate and sulfate changes, specific conductance will be added as an indicator parameter for documentation of local changes and comparison between the upgradient and downgradient monitoring wells.

None of the toxicity characteristic of dangerous waste constituents received by Basin 42 exceed toxicity characteristics list threshold values (WAC 173-303-090(8)(c), "Dangerous Waste Regulations," "Dangerous Waste Characteristics"). Six of the potentially dangerous waste metal constituent results in the basin were above groundwater background levels (Table D-1): chromium, copper, lead, mercury, nickel, and thallium. Although the results are above the groundwater background levels, the results would not be detectable at groundwater compliance points should there be a potential release into the upper aquifer because of the low waste stream concentrations and dispersive effect associated with infiltrating waste into the groundwater.

There were low levels of organics found in Basin 42 with 1-butanol (288 μg/L) having the highest weighted average. The chemical nature of 1-butanol (e.g., rapidly degrades in water and has a relatively high detection level 100 μg/L) makes this constituent an unlikely indicator parameter.

In conclusion, no reliable waste constituent indicator parameters are presently available for Basin 42 groundwater detection.

D1.7 Basin 43

The largest volume of waste waters received by Basin 43 was the contaminated groundwater from the 200-UP-1/200-ZP-1 operable units (OUs) groundwater pumping systems (Table D-2). The 200-UP-1/200-ZP-1 OUs waste stream had 20 times more volume sent to LERF than the next closest waste stream (ERDF leachate) over the past decade and a half. The 200-UP-1/200-ZP-1 OUs groundwater effluent waste characteristics are contained in Table D-2. Tables D-2 and D-3 provides characteristics of the ERDF leachate. Table D-2 provides characteristics of ERDF leachate in Basin 43 in 2012 after receipt of the 200-UP-1/200-ZP-1 OUs groundwater effluent waste was terminated, and Table D-3 provides the average ERDF leachate characterization results for Basin 44 from 2000 through September 2011. Overall, the waste characteristics in Basin 43 are most comparable to the waste streams from 200-UP-1/200-ZP-1 OUs groundwater pumping systems because of its significant volume compared with the other waste streams.

The 200-UP-1/200-ZP-1 OUs waste streams have a makeup similar to the groundwater well results near sources of B Plant liquid effluent disposal sites. These sites received and disposed of metal waste, uranium recovery waste, and cesium and strontium scavenging waste which have infiltrated into the aquifer. The highest ionic results are associated with nitrogen. The Basin 43 weighted average concentration was 101 mg/L (nitrogen in nitrate) compared to 10 mg/L in the groundwater beneath LERF. Some of the other waste streams (e.g., ERDF leachate and 200-BP-5 perched water) received at Basin 43

also exceeded regional background groundwater results for chloride, nitrogen, and sulfate, with concentrations as great as 224 mg/L, 220 mg/L, and 597 mg/L, respectively (Table D-2). However, these constituents are not likely to be distinguishable from current groundwater conditions beneath LERF, mainly because of the concentration of these constituents in the groundwater at crossgradient/upgradient locations to LERF, as discussed in Section D1.5.1. As also discussed in Section D1.5.1, as the groundwater concentrations from the crossgradient/upgradient direction decrease, these constituents may become more appropriate as indicator parameters at LERF. Because nitrate and sulfate may become more appropriate indicator parameters in time, they will serve currently as groundwater quality parameters at LERF monitoring wells. Because specific conductance is an indicator of nitrate and sulfate changes, specific conductance will be added as an indicator parameter for documentation of the expected local changes and comparison between the upgradient and downgradient monitoring wells.

None of the toxicity characteristic dangerous waste constituents received by Basin 43 exceed the toxicity characteristics list threshold values (WAC 173-303-090(8)(c)). However, several of the potentially dangerous waste metal constituent results for the basin were above groundwater background levels. Even so, the results appear too low to determine should a potential release reach the aquifer because of the scattering effect associated with infiltrating liquid waste effluents through the vadose zone into the groundwater. However, it may be possible to differentiate hexavalent chromium (Cr(VI)). This constituent will need to be monitored semiannually for two years to develop a local background basis before potentially adding it as an indicator parameter. Total chromium is not a reliable indicator parameter because of the potential concentrations associated with casing corrosion.

Of the 49 volatile and semivolatile constituents, analyzed at various frequencies from 2008 to 2011 for liquid wastes sent to Basin 43, only 3 (carbon tetrachloride, chloroform, and trichloroethene) were detectable. The most significant constituent was carbon tetrachloride, with concentrations ranging between 190 and 800 μg/L. The other two constituents had concentrations less than 10 μg/L. Since carbon tetrachloride is not normally occurring in the groundwater, it should be an excellent indicator parameter. TOC ranged between 0.3 and 2.45 mg/L for liquid waste in Basin 43. The concentrations do not appear to be significant enough to differentiate a groundwater quality impact should a release occur. TOC analyses are subject to a wide range of variability and can lead to a false positive error. A more valid indicator of carbon tetrachloride is TOX (Figures D-6 and D-7). Although not analyzed for in Table D-2, this indicator parameter has a lower level of detection than TOC, and, as shown in Figures D-6 and D-7, mimics the carbon tetrachloride level better than TOC. Thus, detection of both indicators (carbon tetrachloride and TOX) would be conclusive of a dangerous waste constituent impact. As a result, TOX and carbon tetrachloride will be added as indicator parameters for the LERF monitoring network.

D1.8 Basin 44

Basin 44 has received liquid waste dominated by ERDF leachate (7 million gal or 60 percent by volume). Other liquid waste streams include K Basin waste (1.9 million gal or 16 percent by volume), leachate from double-lined burial trenches, Mixed Waste Trenches 31 and 34 located in the 218-W-5 Burial Ground (1.2 million gal or 10 percent by volume), and purge water from well development (1.1 million gal or 10 percent by volume). The purge water and Mixed Waste Trenches 31 and 34 waste streams are lower in all constituents as compared with ERDF leachate. Therefore, waste in Basin 44 is most similar to the ERDF leachate because of volume and concentration.

ERDF waste streams are similar to groundwater well results downgradient from B Plant liquid effluent disposal sites. The most comparable results are associated with chloride, nitrate, and sulfate. The average concentrations were 250 mg/L, 327 mg/L, and 474 mg/L, respectively (Table D-3). However, these constituents are not likely to be distinguishable from current groundwater conditions beneath LERF, mainly because the concentration of these constituents are already present in the groundwater at similar

concentrations both crossgradient and upgradient of LERF, as discussed in Section D1.5.1. As also discussed in Section D1.5.1, as the groundwater concentrations from the crossgradient/upgradient direction decrease, these constituents may become more appropriate as indicator parameters at LERF. Because nitrate and sulfate may become more appropriate indicator parameters in time they will serve currently as groundwater quality parameters at the LERF monitoring wells. Because specific conductance is an indicator of nitrate and sulfate changes, specific conductance will be added as an indicator parameter for documentation of the expected local changes and comparison between the upgradient and downgradient monitoring wells.

None of the toxicity characteristic dangerous waste constituents received by LERF exceed the toxicity characteristics list threshold values (WAC 173-303-090(8)(c)). Several of the potentially dangerous waste metal constituents received at LERF were above groundwater background levels (Table D-3). Nevertheless, the results would not show a measurable difference should a potential release to the aquifer occur because of the low waste stream concentrations and the scattering effect associated with infiltrating of liquid waste effluents through the vadose zone into the groundwater.

The organic chemical analytical results associated with Basin 44 were at very low levels (<5 μg/L) and were only periodically detected. Therefore, the ability to detect a potential release in the aquifer for organic chemicals is not practicable for the same reason as discussed for the metals and anions. TOC averaged 13.2 mg/L in Basin 44. TOC concentrations seem to be correlated with the elevated oil and grease results. Because oil and grease are viscous, TOC does not appear to be a good indicator parameter. The concentrations do not appear significant enough to be detectable in groundwater should a release occur. As noted previously, TOC analyses are subject to a wide range of variability and can potentially lead to a false positive error.

In conclusion, no reliable waste constituent indicator parameters are presently available for Basin 44 groundwater detection.

D1.9 Potential Contaminate Indicator Parameters in Groundwater

Based on the projected LERF influent waste streams and concentration levels from 2010 through 2028 as presented in HNF-23142, there does not appear a significant change in waste streams expected. Thus, the indicator parameters identified above appear to be sufficient for future detection monitoring at LERF. From review of the waste stream characterization data for Basins 42, 43, and 44, one additional indicator parameter (carbon tetrachloride) has been identified as a reliable indication of the presence of a potential dangerous waste constituent release into the groundwater. Another potential indicator parameter may be Cr(VI), based on local background results collected during 2014 through 2016.

D2 Hydrogeology and Groundwater-Chemistry

This section describes the geology, hydrogeology, and groundwater chemistry beneath the LERF area. To date, seven wells have been installed for monitoring the groundwater quality beneath the LERF basins. Table D-4 provides the well attributes for reference when reviewing this section.

D2.1 Geology

The geology near LERF consists of Columbia River Basalt overlain by a series of sedimentary units of the Ringold Formation and Hanford formation. The interpretations are based on information from the following sources:

- *Miocene- to Pliocene-Aged Suprabasalt Sediments of the Hanford Site, South-Central Washington* (BHI-00184)

- *Revised Hydrogeology for the Suprabasalt Aquifer System, 200-East Area and Vicinity, Hanford Site, Washington* (PNNL-12261)
- *Hydrogeologic Model for the Gable Gap Area, Hanford Site* (PNNL-19702)
- *Borehole Summary Report for the Installation of RCRA Wells 299-E26-77 (C6455), 299-E26-79 (C6826), 299-E25-236 (C6542) and 199-N-165 (C6693), FY 2008* (SGW-39344)
- *Liquid Effluent Retention Facility Characterization Report* (SGW-41072)
- *Landstreamer/Gimbaled GeoPhone Acquisition of High Resolution Seismic Reflection Data North of the 200 Area – Hanford Site* (SGW-43746)
- *Borehole Summary Report for the Installation of Two RCRA Groundwater Monitoring Wells in the 200 Areas, FY2011* (SGW-51467)
- *Seismic Reflection Investigation at the Liquid Effluent Retention Facility, 200 East Area, Hanford Site Richland, Washington* (SGW-52162)
- *Integrated Surface Geophysical Investigation Results at Liquid Effluent Retention Facility, 200 East Area, Hanford, Washington* (SGW-52467)
- *Site Characterization Report for the Liquid Effluent Retention Facility* (WHC-SD-EN-EV-024)
- *Borehole Completion Data Package for the Liquid Effluent Retention Facility* (WHC-MR-0235)

LERF lies in the Pasco Basin, between the axis of the Umtanum-Gable Mountain anticlinal ridge and the axis of the Cold Creek syncline. The terrain surrounding the LERF basins is flat to slightly undulating, and the average elevation is approximately 182 to 184 m (597 to 604 ft) above mean sea level.

The stratigraphy beneath LERF was interpreted from geologic observations during the drilling of seven boreholes, select analyses of sediment samples, aquifer tests, and geophysical investigations over the past two decades. The three principal stratigraphic units present near LERF, in ascending order, are the Elephant Mountain Member of the Saddle Mountains Basalt (EMB), the Ringold Formation, and the Hanford formation. The thickness of the suprabasalt sediments near the LERF basins ranges from 60 to 69 m (198 to 225 ft).

D2.1.1 Elephant Mountain Member

The nature and extent of the EMB, one of the youngest members of the Saddle Mountains Basalt and the uppermost basalt in this area, is based on result of observations and documentation of archive samples collected during drilling, X-ray fluorescence (XRF) analysis, seismic analyses, and hydraulic tests performed within the upper basalt flow top. The EMB in this area was characterized in WHC-SD-EN-EV-024 as consisting of only the oldest EMB flow (Elephant Mountain I). This flow is generally continuous throughout the area, with a thickness ranging from approximately 12 m (39 ft) where partially eroded, to greater than 35.1 m (115 ft) north of the 200 East Area. The EMB I flow contains three intraflow structures: colonnade, entablature, and flow top. The colonnade makes up the bottom third of the flow. The upper part of the colonnade grades from moderate- to well-developed columns into a platy cross-fractured colonnade and then into a hackly entablature. The entablature has numerous, irregular cross-fractures, vertical fractures, and small scattered vesicles near its top. The flow top is characterized by abundant vesicles and is brecciated and/or palagonitic (WHC-SD-EN-EV-024).

Observations during drilling near the LERF basins, when initially encountering the EMB surface, were described in WHC-MR-0235 as reddish weathered basalt with vesicles partially filled, except in

wells 299-E26-9 and 299-E26-10, located to the west. However, well 299-E26-77, located next to well 299-E26-9, was reported with heavy weathering and the presences of vesicles (SGW-41072). The drilling rate was moderate through the upper EMB to a depth of 2 to 3 m (6.5 to 9.8 ft) when drilling wells 299-E26-77 and 299-E26-79, respectively (SGW-39344). It was concluded in SGW-41072 that hydraulic communication of the uppermost aquifer (e.g., unconfined) extends from the suprabasalt sediments into the basalt, at least in the western half of LERF, because there was no impediment associated with the overlying Hanford formation sediments. The thickness of the flow top was interpreted to range from 2 m (6.5 ft) at well 299-E26-77 (west of LERF) to 3.2 m (10.5 ft) at well 299-E26-79 (south of LERF), and 1.5 m (5 ft) at well 299-E26-11 (east of LERF).

The EMB surface expression in the immediate vicinity of the LERF basins forms a depression centered at the newest well 299-E26-14 (Figure D-3). The contours presented in Figure D-3 are based on a combination of basalt contact during drilling and various geophysical investigations (e.g., seismic reflection and refraction, electrical resistivity, and time-domain electromagnetic sounding). Seismic results to the east and west of well 299-E26-14 portray limited aquifer conditions above the basalt (Figure D-8). Paleochannels are interpreted to the north and northwest of well 299-E26-14 and continued to the south-southeast, as displayed in Figures D-3 and D-9. Seismic reflection results suggest an even deeper depression to the east of well 299-E26-79, centered almost directly south of Basin 43, with as much as 8 m (26 ft) of aquifer thickness (Figure D-10, black line in figure provides the interpreted top of basalt). Continuing east of this depression to the south of LERF, the basalt surface is interpreted to rise to the current water table level. The apparent contact with the water table is estimated to be just south of the west boundary of Basin 44. Further east, the basalt is interpreted to plateau beyond well 299-E26-11. West of well 299-E26-79, the basalt surface is interpreted to increase in elevation linearly to the elevation of 121.3 m (398 ft) at well 299-E26-10. Finally, Figure D-11 provides an angle view of the well casing extensions from ground surface to basalt in the LERF area and to the west/northwest, including remnant Ringold Unit A sediments and groundwater extent above basalt. The depiction of the groundwater implies flow through the basalt flow top as discussed further in Section D2.2. Figure D-12 provides an interpretation of the basalt surface and Ringold sediments without the groundwater overlay.

D2.1.2 Ringold Formation

The Ringold Formation represents ancient fluvial and lacustrine deposits associated with the ancestral Columbia River, and the formation exhibits consolidation and weathering. Where present, this Formation overlies the EMB (Figure D-12). According to WHC-SD-EN-EV-024, remnant muds associated with the Ringold period exist to the east and northwest of the LERF site at wells 299-E26-11 and 299-E35-2, respectively. *200 East Groundwater Aggregate Area Management Study Report* (DOE/RL-92-19) reported approximately 2.74 m (9 ft) of the Ringold Lower Mud Unit in well 299-E26-11 and mapped the Lower Mud Unit extending to this location from the east. BHI-00184 identified the Ringold muds east of the 200 East Area as paleosol-overbank deposits. WHC-SD-EN-EV-024 concluded that the sediment layer was a paleosol based on XRF analysis. BHI-00184 states that pedogenically altered silt- and clay-rich overbank-paleosol (facies association III) deposits of the Ringold Formation are easily distinguished from the basalt-rich sand and gravel of the Hanford formation. In 2000, PNNL-12261 defined the sediments near well 299-E26-11 hydraulically as the Ringold Formation Unit A and, more specifically, the hydrogeologic unit 9C (Figure D-12).

The Ringold sediment at well 299-E26-11, as described in WHC-MR-0235, consists of a slightly gravelly sandy mud (5 percent gravel, 30 percent sand, and 65 percent mud). The color was reported as very dark grayish brown (10YR3/2). The gravel content was described as 90 percent mafic, and the sand content was 50 percent mafic. The sediments had no reaction to hydrochloric acid.

During drilling of the new well 299-E26-14, low permeability sediments were encountered at 65.5 to 66.1 m (215.5 to 217 ft) below ground surface (bgs). The sediments were described as 95 percent silt and 5 percent gravel. Photographic review of this sediment layer, presented in SGW-51467, showed a distinct texture and color change from the overlying Hanford sandy gravels. The reddish brown hue and yellow tints associated with this layer correlate well with the distal overbank description provided in BHI-00184. Other characteristics associated with this layer included no reaction to hydrochloric, similar to Ringold sediments described at well 299-E26-11. An alternative explanation may be that the apparent Ringold sediments are rework, removed from one location and deposited at this location, possibly associated with cataclysmic glacial fluvial floods.

Most of the area beneath LERF is considered devoid of Ringold sediments because of the high energy scouring associated glacial fluvial flooding in the Pleistocene and the lack of reflectors in the suprabasalt section during 2011 seismic data reviews. PNNL-19702 presents a conceptual model of various paleochannels originating to the northwest (Figure D-9). Some of these paleochannels may have been formed during Ringold times, and isolated remnants of Ringold sediments are sometimes found within these older paleochannels.

D2.1.3 Hanford Formation

The Hanford formation near LERF ranges in thickness from approximately 59 to 66 m (193 to 215 ft) or more (Figures D-13 and D-14). The texture of the Hanford formation is loose to weakly cemented, sandy, pebble-cobble gravels to gravelly sand, with occasional layers of sand and/or muddy sand. Regionally, the Hanford formation is subdivided into an upper gravel sequence (H1), a sandy sequence (H2), and a lower gravel sequence (H3). The sandy sequence is present locally and, where it is missing, a single sequence of gravel-dominated facies exists, which is undifferentiated in cross-sections.

LERF is located along the southern flank of a major west-northwest/east-southeast trending cataclysmic flood channel. Because of multiple flood events and the turbulence and extremely high energy associated with these floods, it is difficult to correlate individual strata within flood sequences. In outcrops of the Hanford formation elsewhere in the Pasco Basin, for example, it is common to see changes from gravel-dominated sediments to sand and silt-dominated sediments over a distance of a few tens of meters.

In general, more silt or mud was present to the west and east than north or south of the LERF basins based on geologic logs for the seven wells drilled within the LERF vicinity. However, high silt and clay content to the north and south of LERF is present near the contact with the EMB within the aquifer. These silt and clay layers ranged in thickness between 0.3 to 1.5 m (1 to 5 ft) and appear to be of Ringold age as discussed in D.2.1.2. The basalt content in layers above the silt and clay indicates Hanford origin. Above these initial layers, the gravel content was generally about 60 percent, consisting of 40 to 70 percent mafics. Significantly more cobbles were described in the north and south boreholes than to the east and west throughout the borehole log descriptions. The grayish brown to very dark grayish brown color description of the sediments was consistent throughout the area. Calcium carbonate levels are low to within 21 m (70 ft) of ground surface, based on little to no reaction to hydrochloric acid. The upper zone with increased calcium carbonate levels correlates with low modeled velocities during refraction and resistivity modeling, as stated in SGW-52467, and may be a distinctive feature to differentiate the H1 and H3 in this area. Moisture observations ranged from dry to wet; however, the damp and wet descriptions in the vadose zone pertained to zones where water was added during drilling. In conclusion, based on the larger gravel content and size to the north and south of the LERF basins, the dominant flow during deposition appears to be from the northwest, aligning with the conceptual model in PNNL-19702 (Figure D-9). In addition, there were no significant zones of silt or clay above the aquifer indicating no perching horizons in the suprabasalt sediments beneath the LERF vicinity.

D2.2 Groundwater Hydrology

The vadose zone beneath LERF consists of the Hanford formation and portions of the EMB above the water table, as well as potentially some of the Ringold Formation near well 299-E26-11. There have been no observations indicating perched water table conditions near the LERF basins; however, perched conditions could be present west and northwest of the westernmost LERF monitoring wells.

The uppermost aquifer directly beneath LERF is thin to moderate in thickness (e.g., ranging from possibly not present to greater than 8 m (26.25 ft) and exists in the Hanford and EMB flow top (Figures D-13 and D-14). This aquifer is unconfined, except to the east where barometric analyses within well 299-E26-11 indicate semiconfined conditions. This is consistent with the rise in groundwater elevation when drilling advanced through the lower Ringold sediments, present at this well, causing the groundwater elevation to rise nearly 3.1 m (10 ft) in the temporary casing (WHC-MR-0235). The westward extent of the Ringold sediments is uncertain; however, it has been portrayed to pinch out west of well 299-E26-11 (Figure D-12). Although well 299-E26-11 is still capable of yielding representative samples from the same hydrostratigraphic unit as the other LERF wells, the chemical nature of the samples is different and has been more characteristic of groundwater to the east of LERF.

Well construction details are discussed in Section D2.4 and presented in Table D-4. To date, seven wells have been installed for detection monitoring since 1990. Three of the wells (299-E26-11, 299-E26-77, and 299-E26-79) were screened either entirely or primarily within the EMB flow top. The wells produce at a minimum 22.7 L/min (6 gal/min), which is sufficient for groundwater sampling, and the flow top is sufficiently permeable for adequate hydraulic connection with the overlying sediments.

Basalt flow top fracturing, brecciation, and/or weathering provide localized zones of higher permeability. Where these conditions exist and are in hydraulic communication with overlying saturated sediments, the basalt flow top is part of the overlying unconfined aquifer system. Based on evaluations of drill cuttings, drilling rates, and water production noted during drilling wells 299-E26-77 and 299-E26-79, the EMB flow top functions as a component of the unconfined aquifer and forms a laterally continuous aquifer beneath LERF.

The uppermost aquifer is thickest north of Basin 42 and appears to thicken south of Basin 43 (Figures D-8, D-10, D-13, and D-14) due to paleochannel development. The flow interior of the EMB represents the lower boundary of the uppermost aquifer. This was verified by observations during drilling at wells 299-E26-77 and 299-E26-79, as discussed in Section D2.1.1.

D2.2.1 Aquifer Properties

Hydraulic tests were conducted in 1990, 2003, 2008, and 2011 to derive representative hydraulic parameters for the various saturated formations beneath the LERF general vicinity. Slug tests were completed for each of the seven wells with a derived hydraulic conductivity value. The 1990 slug tests were completed in wells 299-E26-9, 299-E26-10, 299-E26-11, and 299-E35-2, which were constructed with a 10.2 cm (4 in.) diameter wire wrapped screen and 0.25 mm (0.010 in.) slot width. A 20-40 silica sand filter pack encases the screen interval. The following paragraphs summarize the results for each well, and WHC-SD-EN-EV-024 provides further detailed discussion. The 2003 hydraulic tests were completed at wells 299-E26-10 and 299-E26-11 and consisted of slug tests at each well and the following additional tests at well 299-E26-10: tracer test, tracer-pumpback test, and constant-rate pumping test. This subsection summarizes the results for each well, and PNNL-14804, *Results of Detailed Hydrologic Characterization Tests Fiscal Year 2003*, provides further discussion. The 2008 hydraulic slug tests were completed at wells 299-E26-77 and 299-E26-79, constructed with a 10.2 cm (4 in.) diameter wire wrapped screens and 0.5 mm (0.020 in.) slot width. A 10-20 silica sand filter pack encases the screen interval. A slug test at well 299-E26-11 also was included in 2008. This subsection summarizes the 2008

results for each well, and SGW-41072 provides further discussion. Finally, a 2011 constant rate pumping test was completed at well 299-E26-14, which was constructed with 10.2 cm (4 in.) diameter wire wrapped screens and 0.5 mm (0.020 in.) slot width. A 10-20 silica sand filter pack encases the screen interval. Because several of the well screens cross various formations, a summary of the screen interval is provided in the following text and in Table D-4. When heterogeneous conditions exist, the hydraulic results are an arithmetic average of the individual formational layers based on a weighted-thickness (PNNL-14804).

Well 299-E26-9 (now sample dry) was screened only in the Hanford formation. The 1990 slug test derived transmissivity values for well 299-E26-9 ranged from 11 to 230 m^2/day (118 to 2,476 ft^2/day). The derived hydraulic conductivity ranged between approximately 6 to 120 m/day (20 to 394 ft/day), assuming an aquifer thickness of 2 m (6.6 ft).

Well 299-E26-10 is screened primarily across the Hanford formation with a small section across the EMB flow top (0.5 m [1.6 ft]). Transmissivity values for well 299-E26-10 were not derived for the 1990 tests because of the fast recovery response (e.g., less than 3 seconds). In 2003, four hydraulic slug tests, two low and two high stress, were performed at well 299-E26-10. The results produced a hydraulic conductivity range, based on the Kansas Geological Survey (KGS) type-curve method, of 36.7 to 42.8 m/day for both stress-level tests (KGS, 1991, *Seismic-Reflection Processing Demonstration Using Eavesdropper*). The KGS type-curve method was used to derive the hydraulic conductivity as explained in PNNL-14804. The 2003 screened thickness across the saturated Hanford formation was 1.48 m (4.85 ft). Four additional hydraulic tests were completed at this well in 2003. The tracer-dilution test provided qualitative evidence that the overlying Hanford formation sediments had a considerably higher hydraulic conductivity than the EMB flow top. The tracer-pumpback test was used to derive the effective porosity; however, due to test complexities, the calculation did not appear representative of the aquifer conditions. The constant-rate pumping test provided another means of deriving the hydraulic conductivity, which was reported at 36.2 m/d with a transmissivity of 71.6 m^2/day. Based on the consistency of the 2003 results, the hydraulic conductivity ranges between 36.2 and 42.8 m/day.

Well 299-E26-11 is screened only across the EMB flow top. The 1990-derived transmissivity value for well 299-E26-11 was 6.1 m^2/d (20 ft^2/d) with a hydraulic conductivity of 11.2 m/day (120 ft/day). Five additional hydraulic slug tests were completed at well 299-E26-11 in 2003, which derived a range of hydraulic conductivity values from 5.85 to 6.8 m/day. Four additional slug tests were performed in 2008 producing a reported hydraulic conductivity value of 10 m/day. The hydraulic conductivity values for the three times range from 5.85 to 11.2 m/day. Because of the analysis methods used by PNNL-14804, the most representative value appears to be 6.3 m/day.

Well 299-E26-14 was completed in 2011 with 5.5 m (18 ft) of screen across the Ringold and Hanford sediments. Only a small portion (0.27 m or 0.9 ft) of the Ringold sediments are adjacent to the bottom of the well screen. A 27.3 gal/min constant pump test was completed on November 26, 2011. A transducer was installed to collect changing water table elevations during the 75 minute pumping test. In total, 2,048 gal were pumped during the test, as described in the field activity log. Because no hydraulic parameters were calculated from the field activity records, type-curve matching methods were used to derive transmissivity and hydraulic conductivity results for this well. The computer program AQTESOLV was used for curve matching. AQTESOLV uses a nonlinear least squares procedure to match a type-curve or straight-line solution for the data provided. Through a sequence of iterations, the procedure systematically adjusts the values of hydraulic properties to achieve the best statistical match between a solution (type-curve) and the test data. Each iteration seeks to minimize the sum of squared residuals. AQTESOLV provides five different solution methods for unconfined aquifer pumping tests. Initially, the Theis and Cooper-Jacob methods were evaluated against the field data, but the curve matching associated with these solution methods did not align (Theis, 1935, "The Relation Between the Lowering of the

Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-Water Storage;" Cooper and Jacob, 1946, "A Generalized Graphical Method of Evaluating Formation Constants and Summarizing Well-Field History"). The Moench method provides independent parameters for wellbore storage, wellbore skin, and delayed gravity response in anisotropic unconfined aquifers (Moench, 1997, "Flow to a well of finite diameter in a homogeneous, anisotropic water table aquifer"). After manual manipulation of the independent parameter for the wellbore skin factor and delayed drainage parameter, the Moench derived curve nearly matched the field results as provided in Figure D-15. The derived hydraulic conductivity from this curve matching solution was 27.3 m/d. Another solution method, Neuman, with less independent parameters for manipulation, produced the type-curve in Figure D-16 (Neuman, 1974, "Effect of Partial Penetration on Flow in Unconfined Aquifers Considering Delayed Gravity Response"). The derived hydraulic conductivity from this curve matching solution was 24.4 m/day. These results agree with the slug results derived for the other wells in the LERF vicinity. The best estimate is considered 27.3 m/day.

Well 299-E26-77 was completed in 2008 with 6.1 m (20.1 ft) of screen across the EMB flow top and 0.71 m (2.3 ft) across the overlying silty sandy gravel Hanford formation. The 2008 derived hydraulic conductivity was reported in SGW-41072 at several tens of meters/day. Because there were no specific values presented in this report, the data from the two slug withdraw tests were retrieved and reanalyzed with type-curve methods, as discussed in PNNL-14804. Briefly, the type-curve method is useful for analyzing unconfined aquifer conditions because it uses all or any part of the slug test response. The computer program AQTESOLV was used for curve matching, as discussed previously. The automated matching option with default setting was applied to the KGS Model, KGS model with skin effects, and the Springer-Gelhar inertial effects method (Water-Resources Investigation Report 91-4034, *U.S. Geological Survey Toxic Substances Hydrology Program—Proceedings of the technical meeting, Monterey, California, March 11-15, 1991*). The most comparable slug test derived curve was the Springer-Gelhar critically dampened method. This method nearly matched the second slug withdraw results, as shown in Figure D-17. One of the assumptions for this type-curve is a quasi steady-state of the aquifer. A quasi steady-state flow neglects specific storage, unlike the Cooper-Bredehoeft-Papadopulos method (Cooper et al., 1967, "Response of a Finite-Diameter Well to an Instantaneous Charge of Water"). When the Cooper-Bredehoeft-Papadopulos method was run, it did not converge with the test data, indicating the aquifer conditions are more suitable for the Springer-Gelhar method. In addition, the Barker-Black fractured aquifer solution method failed to converge (Barker and Black, 1983, "Slug Test in Fissured Aquifers"). The Springer-Gelhar results derived a hydraulic conductivity of 134 m/d. For comparison, three additional methods (Bouwer-Rice, Hvorslev, and Barker-Black double porosity fractured aquifer method) also were analyzed; however, the curve-type matching alignment with the data was either significantly different and did not converge or only visually applied to the later recovering slug test results using line-matching, which produced much greater hydraulic conductivity results (Bouwer and Rice, 1976, "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells;" Hvorslev, 1951, *Time Lag and Soil Permeability in Ground-Water Observations*). As discussed in PNNL-14804, the semi-empirical nature of the Bouwer and Rice method for complex well/aquifer conditions can lead to declining levels of accuracy beyond 30 percent. Thus, the best estimate of the hydraulic conductivity for well 299-E26-77 is 134 m/d using the Springer-Gelhar solution. Because hydraulic conductivity results from other tests in the area produce much lower results for the Hanford formation, the fractured flow top appears to be the dominant flow regime at this well. If the fractured flow top is thinner and the borehole diameter within the basalt is smaller, the hydraulic conductivity value would be even higher. Conversely, if the flow top is thicker and the borehole diameter is larger, the hydraulic conductivity value would be smaller.

Well 299-E26-79 was completed in 2008 with 4 m (13.2 ft) of screen across the EMB flow top and 2.7 m (8.9 ft) across the overlying Ringold and Hanford sediments. The 2008 derived hydraulic conductivity was reported in SGW-41072 at several tens of meters/day. Because there were no specific values presented in this report, the two slug withdraw test data were retrieved and reanalyzed with type-curve methods, as discussed previously for well 299-E26-77. The early slug test data could not be fit by any of the AQTESOLV solution methods. Fitting the remaining portion of the data produced significantly larger hydraulic conductivity results by one to two orders of magnitude than at well 299-E26-77. Because the results are not consistent with the other LERF well results, the data do not appear to be useable; therefore, no hydraulic conductivity results were generated for this well.

Well 299-E35-2 (now sample dry) was screened mainly across the sediments above the EMB flow top (1.9 m [6.2 ft]) with a portion of the screen across the EMB flow top (0.4 m [1.3 ft]). The 1990 derived transmissivity value for well 299-E35-2 was 6 m^2/day (20 ft^2/day), with a hydraulic conductivity of 39.7 m/day (130 ft/day).

In summary, the multiple slug test results at six of the seven wells described in this subsection adequately define the hydraulic conductivity for the basalt flow top and Hanford sediments. The basalt flow top slug test data produced varying results of hydraulic conductivity. To the east, the results were low, while results to the south and west of LERF were significantly greater than the overlying Ringold and Hanford sediment results. The range of hydraulic conductivity beneath and west of LERF appears to exceed 100 m/day. A best estimate is 134 m/day. The overlying suprabasalt sediments were consistent with a hydraulic conductivity range of 24.4 to 42.8 m/day, with a best estimate of 39.5 m/day. These values will be used to derive the rate of flow for LERF. Although effective porosity was not derived from tests completed at LERF, the effective porosity to be used for flow rate calculations at LERF is 0.1. This value was chosen because of the evaluation process discussed in SGW-54508, *WMA C September 2012 Quarterly Groundwater Monitoring Report*.

D2.2.2 Flow Dynamics

Regional groundwater flow was initially from west to east but was impacted by groundwater mounding resulting from wastewater discharges primarily to the east. These impacts have diminished significantly and do not appear to contribute to the flow regime beneath LERF; however, they still appear to affect the groundwater quality at well 299-E26-11.

Recently, statistical methods have been applied to deriving the flow direction. Table D-5 provides the gradient and magnitude associated with the statistically corrected calculations since the installation and water level collection at well 299-E26-14. Although the p-value indicates the derived values have a moderate amount of uncertainty (e.g., 20 to 30 percent), the direction has been very constant ranging between 186 and 198 degrees from north (e.g., southwest of south flow). The average direction is 190 degrees from north. In addition, the gradient magnitude has been constant, ranging between 2.39E-04 and 2.98E-04, with an average of 2.7E-4. If these average values are applied to the following formula $V=(K*G)/n_e$ (Driscoll, 1986, *Groundwater and Wells*); where V is the flow rate, K is the hydraulic conductivity, G is the gradient, and n_e is the effective porosity, then the average flow rate in the suprabasalt sediments could be 0.11 m/day or 38.9 m/year. This value correlates with the movement of a sulfate plume originating to the northwest and west of LERF, as explained in Section 2.10.3.6 and displayed in Figure 2.10-42 of DOE/RL-2008-01, *Hanford Site Groundwater Monitoring for Fiscal Year 2007*.

Although the derived gradient magnitude and associated flow rate beneath LERF is consistent with other observances of migrating plume rates, as discussed in the previous paragraph, the 190 degree flow direction and increasing anion and cation concentrations at well 299-E26-14 (Figure D-18) do not correlate with the perceived source of anion and cation increases. One of the most distinguishable

constituents associated with the anion and cation increases is sulfate. Sulfate was initially observed increasing at significant levels at well 299-E34-7, located northwest of LERF, in the mid-1990s, as shown in Figure D-19. This well became sample dry in 2005, two years after concentrations had peaked at 671 mg/L. The extent and source of the sulfate is uncertain; however, various conceptual models have been discussed to a limited degree. Movement of the sulfate also has been discussed in several of the Hanford Site Groundwater Monitoring Reports over the past two decades, and an interpreted snapshot of the sulfate plume is provided for 2008 and 2013 (Figure D-20). Historically, sulfate increases along the west side of the LERF monitoring network appear to be associated with transverse dispersivity because of the lack of vadose zone moisture during drilling well 299-E26-77, the derived southward flow direction from monitoring network, and smaller slope of sulfate increase at well 299-E26-10 than at well 299-E34-7 (Figure D-19).

More recently, the rate and direction of groundwater flow appear to be in a state of change regionally. Sulfate concentrations leveled off between 2009 and 2011 near LERF, when the regional flow conditions were considered to be at a minimum compared to previous years (Figure D-18). Since the middle of 2011, when the Columbia River elevation began to exceed the 200 East groundwater elevations, concentrations have been increasing at a greater rate in wells farther east than at well 299-E26-10 (Figure D-18). Three explanations are provided for what may be occurring:

- The northwest sulfate source may be diminishing and because well 299-E26-10 is spatially closer to the source, it is beginning to decrease with the decreasing front, while wells 299-E26-14 and 299-E26-79, farther spatially from the proposed northwest source, are still within the increasing front of the sulfate plume.
- The flow direction has shifted to a southeast of east to an easterly flow direction, causing greater concentrations to migrate preferentially toward wells 299-E26-14 and 299-E26-79.
- The source of sulfate increases may be from a more regional source as sulfate increases have also been seen at well 299-E26-11, but to a smaller degree, and delayed compared to well 299-E26-10 (Figure D-21).

Because of the consistent flow direction derived by the current monitoring network and the larger influence of sulfate increases seen across the LERF monitoring network, the sulfate increases are considered to be from a larger regional source. As such, well 299-E26-14 provides a sufficient representation of the groundwater quality migrating into the area from the north. However, to ensure that conditions continue to reflect this conceptual flow model, well 299-E26-77 will be monitored but considered a crossgradient monitoring well and not included in upgradient statistical measurements. Water levels will continue to be collected at wells 299-E26-10 and 299-E26-77 to maintain statistical analyses of the flow direction. Should conditions change in the statistically derived flow direction or groundwater quality parameters at well 299-E26-77 suggest a change in sulfate migration, then the information will be relayed in the *Resource Conservation and Recovery Act of 1976* (RCRA) quarterly report with a proposed action.

Based on the accepted southward flow direction, well 299-E26-79 is the only downgradient well currently at LERF. Because the basalt flow top appears to be connected hydraulically to the suprabasalt sediments and provides a potentially more transmissive pathway, well 299-E26-79 does not appear to be sufficiently located to monitor the easternmost basin.

D2.3 Groundwater Chemistry

Groundwater chemistry in the uppermost aquifer beneath LERF was affected by several years of diluted liquid waste discharge to the 216-B-3 Pond System, which ceased in 1997. Figure D-22 provides an

illustration of the groundwater chemical facies at various LERF wells from the early 1990s to 2013 using Stiff Diagrams. As can be seen in the figure during the early to mid-1990s, the groundwater chemical facies was calcium-bicarbonate, except to the west of LERF where a calcium-bicarbonate-sulfate facies was present at well 299-E34-7. By 1999, the groundwater at well 299-E34-7 was a strong calcium-sulfate facies, and well 299-E26-10, located to the southeast of well 299-E34-7, was changing to a calcium-sulfate facies. In 2001, well 299-E26-10 was a calcium-sulfate facies.

In 2006, well 299-E26-11, located to the east of LERF, was beginning to show signs of changing from a calcium-bicarbonate facies. By 2011, well 299-E26-11 also had changed to a calcium-sulfate facies. Although well 299-E26-11 saw a change in the chemical nature of the groundwater after wells to the west, it has had a greater water elevation than the wells to the west. This indicates the water facies change must be from north of well 299-E26-11. Further east at well 699-45-42, located east of well 299-E26-11, a calcium-bicarbonate chemical facies was still present in 2012.

The wells to the north and south of LERF portray an intermediate chemical facies, which is between the strong calcium-sulfate facies to the west and the more dilute calcium-sulfate facies to the east. For comparison, the calcium and sulfate milliequivalents in well 299-E26-10 in January of 2013 were 6.4 to 5.5, respectively. The milliequivalents at well 299-E26-11 in January 2013 were 2.6 for both calcium and sulfate. The January 2013 milliequivalent results for wells 299-E26-14 and 299-E26-79 were 3.9 to 3.3 and 3.7 to 3.0, respectively. Thus, the chemical facies is slightly stronger to the north of LERF than south, which is downgradient of LERF.

The fact that all the wells near LERF are showing chemical facies changes to a calcium-sulfate indicates that the wells are hydraulically connected and that there is a sulfate source to the north of LERF. Water quality parameters will continue to be collected semiannually for purposes of further evaluation, as shown in Table D-6.

D2.4 Well Completions and Conditions

The basic well information is summarized in Table D-4 and in Figures D-23 through D-27. Five wells are provided for discussions related to the geology and hydrogeology; however, only four of the wells (299-E26-10, 299-E26-14, 299-E26-77, and 299-E26-79) are being used for monitoring the groundwater near LERF. The four wells allow use of statistical measures to derive a groundwater gradient and direction.

All four wells extend beyond 61 m (200 ft) in depth. Although the new wells extend 5.5 to 6.1 m (18 to 20 ft) into the EMB, the screened intervals in all four wells intercept the unconfined aquifer as discussed in Section D2.2.1.

The initial LERF groundwater monitoring wells were installed in 1990 and included three downgradient wells on the west end of the facility boundary and one upgradient well at the east end of the facility. This configuration was based on the east-to-west groundwater flow direction, caused by the recharge mound created by years of liquid effluent disposal to B Pond. Wells 299-E26-9, 299-E26-10, and 299-E35-2 were originally installed as downgradient wells and well 299-E26-11 as an upgradient well. Wells 299-E26-77 and 299-E26-79 were installed in 2008. Well 299-E26-77 is adjacent to the location of well 299-E26-9, and well 299-E26-79 is south of LERF between Basins 42 and 43 (Figure D-2). Well 299-E26-10 (Figure D-23) has a 4.5 m (15 ft) screen, screening across the entire saturated suprabasalt sediments. The well screen in 299-E26-10 penetrates approximately 0.5 m (1.8 ft) into the basalt. Well 299-E26-11 (Figure D-3 and D.24) was completed with a 1.5 m (5 ft) long channel-pack screen placed completely within the basalt flow top and includes a sand pack that extends 1.3 m (4.4 ft) above the screen top.

Well 299-E26-14 encountered groundwater at approximately 60.5 m (198.4 ft) bgs and was drilled to a total depth of 73.3 m (240.6 ft) bgs (Figure D-25). The well is constructed with 6.1 m (20 ft) total length of screen installed across approximately 5.5 m (18 ft) of Ringold and Hanford sediments. Only a small portion (0.27 m or 0.9 ft) of the Ringold sediments are adjacent the bottom of the well screen. The screen is 10 cm (4 in.) in diameter, 20 slot, stainless-steel wire-wrap. The well has a 1 m (3 ft) blank sump below the screen. The casing from the top of the screen to land surface is 10 cm (4 in.) diameter stainless steel.

Well 299-E26-77 encountered groundwater at approximately 63.4 m (208 ft) bgs and was drilled to a total depth of 71 m (232.8 ft) bgs (Figure D-26). The well is constructed with 7.6 m (25 ft) total length of screen installed across approximately 1.4 m (4.6 ft) of sediments and 6.2 m (21.4 ft) of basalt flow top. Well 299-E26-79 encountered groundwater at 61.5 m (201.7 ft) bgs and was drilled to a total depth of 68.5 m (224.8 ft) bgs (Figure D-27). The well is constructed with 7.6 m (25 ft) total length of screen installed across approximately 3.7 m (12 ft) of sediments and 3.9 m (13 ft) of basalt flow top. The screens are 10 cm (4 in.) in diameter, 20-slot, stainless-steel wire-wrap. Both wells have a 1 m (3 ft) blank sump below the screens. The casing from the top of the screen to land surface is 10 cm (4 in.) diameter stainless steel.

The longevity of the operable monitoring lifetime for the remaining LERF wells is not a concern as water levels are only being collected from well 299-E26-10 and, based on recent water level declines, should be useable for decades. The other three wells have significant water for sample collection and should not go dry, based on pre-Hanford groundwater elevations.

D3 Groundwater-Monitoring Program

Groundwater monitoring at LERF is in detection monitoring and the indicator parameters are discussed further in Section D3.6.1. The indicator parameters were derived as summarized in Section D3.2 and discussed in further detail in Section D1.5. The detection monitoring sample frequency is semiannual as discussed in Section D3.6.2. Sampling procedures and required documentation is provided in Sections D3.6.3 and D3.6.4, respectively. The analytical procedures, analytical quality control (QC), data management are discussed in Sections D3.9, D3.9.1, and D3.9.2, respectively.

Statistical methods are employed to determine local background conditions for the upgradient well 299-E26-14 as provided in Section D3.9.3. Detection monitoring at LERF is discussed in Section D3.4. Should indicator parameter results exceed local background levels then resampling will be implemented for determining if a false positive result has occurred or if assessment monitoring must be undertaken as discussed in Sections D3.3, D3.9.3, and D3.11.

Reporting will be annually through the Hanford Site Annual Groundwater Monitoring Report unless a significant exceedance of the background values determined for the upgradient well 299-E26-14 is verified. If an exceedance is verified then the notification process discussed in Section D3.11 will be followed.

As discussed in Sections D1 and D2 and their subsections, the following characteristics describe the hydrogeology in the LERF area:

- Representative groundwater samples can be collected from the uppermost aquifer.
- Upgradient background samples at well 299-E26-14 are representative of unaffected groundwater from LERF.
- Groundwater samples collected at well 299-E26-79 are representative of the quality of groundwater passing the LERF point of compliances.

Hydraulic characterization tests conducted over the past two decades and the groundwater chemical facies changes indicate the hydrostratigraphic units underlying the LERF basins constitute an aquifer unit that is continuous beneath the LERF basins and is capable of yielding representative groundwater samples.

D3.1 Objectives of Dangerous Waste Groundwater Monitoring and Past Monitoring Results

A groundwater monitoring program, in accordance with the requirements of WAC 173-303-645, is designed to determine whether there is statistically significant evidence of contamination in the uppermost aquifer attributable to the LERF basins. The statistical parametric *t*-test approach at LERF compares two distinct statistical populations for true differences in population means as discussed further in Section D3.9.3.

By the date of this permit, the action leakage rate has not been exceeded during operations, and results of the LERF groundwater monitoring program indicate the LERF basins have not impacted groundwater quality beneath the site. Past monitoring results from former downgradient wells 299-E26-10 and 299-E26-11, and more recent results from newer wells 299-E26-77 and 299-E26-79, have not indicated dangerous constituents above background levels, with the exception of one positive carbon tetrachloride result at each well. Because the detections were followed by a series of non-detect values and the results were associated with out-of-limit QC samples, the reported concentrations appeared to be associated with a laboratory error and were flagged as suspect. As a result, a detection monitoring program in accordance with WAC 173-303-645(9) is appropriate for the site to provide compliance with the requirements of WAC 173-303-645.

D3.2 Dangerous Constituents

A list of dangerous and/or mixed aqueous waste that can be accepted in LERF is defined by the requirements of Addendum B (Waste Analysis Plan).

Dangerous constituents and suitable indicator parameters that provide a reliable indication of the presence of dangerous constituents in groundwater for purposes of groundwater monitoring were based on target parameter constituents from Addendum B (Waste Analysis Plan), and results of LERF basin water samples collected between July 1999 and June 2013. Several target parameters in the Waste Analysis Plan (Addendum B) occur in the LERF basin influent data and were evaluated relative to the dangerous waste characteristics (groundwater monitoring list in WAC 173-303-090, "Dangerous Waste Characteristics," and Ecology Publication 97-407, *Chemical Testing Methods for Designating Dangerous Waste: WAC 173-303-090 & -100*, Appendix 5. As discussed in Section D1.5, dangerous waste constituents measured as part of routine liquid sampling in the LERF basins were included as indicator parameters.

Tables D-1 through D-3 present a list of dangerous constituents measured as part of routine liquid sampling in the LERF basins from as early as February of 2000 through 2011. The results were further evaluated to identify reliable parameters for the indication or identification of dangerous waste constituents in groundwater, as discussed in Section D1.5. The full list of groundwater monitoring indicator parameters is provided in Section D3.6.1.

D3.3 Concentration Limits

A series of events that triggers the shift from detection monitoring to compliance monitoring is prescribed in WAC 173-303-645. If there is statistically significant evidence of contamination, as required in WAC 173-303-645(9)(f), groundwater protection standards and concentration limits will be established subsequently in accordance with WAC 173-303-645(9)(g)(iv)(D). Section D3.11, Evaluation and Notification, provides the process and schedule for actions, notification, and permit modification, if necessary.

If a tolerance limit is exceeded at a statistically significant level, additional measurements will be conducted to verify that a detection event has occurred. If the detection of a dangerous constituent is verified, as discussed in Section D3.11, compliance monitoring will be implemented in accordance with WAC 173-303-645(10).

D3.4 Groundwater Monitoring System and Point of Compliance

The groundwater monitoring system for LERF uses existing wells, 299-E26-14 and 299-E26-79. Well 299-E26-14 is an upgradient well and well 299-E26-79 is a downgradient well based on the flow direction presented in Section D2.2.2. A third detection monitoring well will need to be installed just south of the open interval between Basin 43 and 44 in order to compare the groundwater quality downgradient of LERF Basin 44 (Figure D-28). All three of these wells will be monitored in accordance with the requirements provided in this permit. The additional well to be installed, 299-E26-15, will be planned through Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) Milestone M-024, which is updated on a yearly basis. The well is tentatively planned to be installed prior before fiscal year 2016.

D3.5 Compliance Period

The compliance period will be the number of years equal to the active life of the waste management area including any additional years required for corrective actions, if necessary. Any additional years associated with corrective actions will be completed after three consecutive years in which the groundwater protective standard for any specific dangerous waste constituent has not been exceeded in accordance with WAC 173-303-645(7).

D3.6 Sampling and Analysis

This section describes the groundwater detection sampling and analysis program for the three LERF regulated units (Basins 42, 43, and 44), including monitoring parameters, analytical methods, monitoring frequency, and sampling protocols.

D3.6.1 Monitoring Parameters

Monitoring parameters include the indicator and geochemical parameters. The monitoring of these two parameters is similar, and sampling and analysis frequencies are the same and will be done concurrently on a semiannual basis.

As identified in Section D1.5, carbon tetrachloride and TOX are reliable indicator parameters for the presence of dangerous constituents associated with LERF. In addition, the standard parameters of pH, specific conductance, and TOC provide the requirements of detection monitoring in accordance with WAC 173-303-645(9)(a). Table D-7 provides a list of these constituents and the frequency of sampling.

Samples will also be collected semiannually and analyzed for major anions, cations, and alkalinity to evaluate groundwater geochemistry, as discussed in Table D-6.

Samples also will be collected for Cr(VI) for evaluation as an additional indicator parameter, as discussed in Section D1.5.

D3.6.2 Sampling Frequency

Samples will be collected semiannually from wells 299-E26-14 and 299-E26-79 to determine whether there is statistically significant evidence of contamination for the indicator parameters established in Section D3.6.1.

Samples will be collected semiannually and analyzed for major anions, cations, and alkalinity to evaluate groundwater geochemistry, as discussed in Section D2.3 and shown in Table D-6.

Finally, samples will be collected semiannually for Cr(VI) evaluation as an indicator parameter, as discussed in Section D1.5 and Table D-7.

D3.6.3 Sampling Procedures

Groundwater sampling procedures, sample collection documentation, sample preservation and shipment, and chain-of-custody requirements are described in this subsection. The Permittees will develop, maintain, and conduct work according to procedures consistent with, and no less stringent than, those described to be conducted. The Permittees will maintain current copies of these procedures in the Hanford Facility Operating Record, LERF, and 200 Area ETF file, as required by Permit Condition II.I.1.

Samplers fill out groundwater sample report forms as they purge and sample each well. Field personnel measure water levels in each well before sampling and then purge stagnant water from the well. Field personnel also record time of sampling, which allows correlation with barometric pressure measurements at the Hanford Meteorological Station. Water levels are typically measured with laminated-steel electrical sounding tapes with a precision of 2 mm. Procedures require sample collection after three casing volumes of water have been purged from the well and after field parameters (pH, temperature, specific conductance, and turbidity) have stabilized. Field parameters are measured in a flow-through chamber. Both filtered and unfiltered samples are collected for metals analyses. Filtering is performed in the field with 0.45-micron, in-line, disposable filters to ensure that results represent dissolved metals and do not include particulates. Dissolved trace metals analysis (from filtered samples) will be used for statistical analyses of trace metal arsenic.

Sample preservation techniques will follow generally accepted practices (e.g., U.S. Environmental Protection Agency [EPA]-approved guidelines such as SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*, Table 11-1, or equivalent) and will be documented in sample authorization forms generated by the Sample and Data Management organization. Chemical preservatives are added to collection bottles before use in the field. A chemical preservative label is affixed to the sample container listing the specific preservative. The preservative's brand name, lot number, concentration, and date opened are recorded. As part of sample preservation, samples may be refrigerated or stored on ice as necessary prior to delivery to the analyzing laboratory.

D3.6.4 Sample Chain-of-Custody

Groundwater samplers use chain-of-custody forms to document the integrity of groundwater samples from the time of collection through data reporting. The forms are generated during scheduling and are managed through a documented procedure. Required information recorded on the forms includes the following:

- Sampler's name
- Method of shipment and destination
- Collection date and time
- Sample identification numbers
- Analysis methods
- Preservation methods

Samples are labeled and sealed with evidence tape, wrapped with bubble wrap, and placed in a U.S. Department of Transportation-approved container with ice, as appropriate. The packaging parameters for samples are determined by associated hazards. Samples for offsite laboratories are shipped according to U.S. Department of Transportation regulations. A chain-of-custody form accompanies all samples.

When samples are transferred from one custodian to another (e.g., from sampler to shipper, or from shipper to analytical laboratory), the receiving custodian inspects the form and the samples, noting any deficiencies. Each transfer of custody is documented by the printed names and signatures of the custodian relinquishing the samples and the custodian receiving the samples, as well as the time and date of transfer. Commercial shippers do not sign chain-of-custody forms, but the forms are signed by the receiving laboratory, and sample integrity is verified by inspecting the bottle seals.

D3.7 Decontamination of Drilling and Sampling Equipment

The following information is included relative to well drilling equipment for new wells installed at LERF for this Permit. Well drilling equipment is decontaminated using high temperature and pressure washing. The equipment then is rinsed with clean water.

Equipment for collecting soil samples during drilling for later chemical analysis is decontaminated. Equipment is washed with phosphate-free detergent, rinsed three times with de-ionized water, rinsed once with nitric acid (glass or stainless-steel equipment only), rinsed three more times with de-ionized water, and then finally rinsed with hexane. After heat drying, equipment is wrapped in unused aluminum foil and sealed with tape until needed. The tape shall not come into contact with the equipment to avoid any contamination from the materials in the tape.

Monitoring wells for LERF shall be equipped with dedicated sampling pumps. Sample pumps are placed at approximately mid-depth within the screen interval. Water-level measuring tapes are cleaned with potable or deionized water and a clean towel. Sample manifolds used at the well head require decontamination as follows: wash with a phosphate-free detergent, rinse three times in high-purity water, rinse in a 1 M solution of nitric acid, rinse three more times in high-purity water, then rinse in hexane, and finally dry in drying chamber. These are done in accordance with established procedures.

D3.8 Quality Objectives and Criteria

The QC program is designed to assess and assure the reliability and validity of groundwater data, and to document whether the resulting data are of the quantity and quality necessary for the intended decision-making purpose. In groundwater detection monitoring, the primary decision-making purpose is to determine whether a statistically significant increase in a dangerous constituent concentration is observed in groundwater downgradient from the permitted site. Consequently, data quality is monitored by evaluating the results of QC samples, conducting audits, validating groundwater data, and comparing these results to data quality requirements established in this groundwater monitoring plan. Accuracy, precision, and detection are the primary parameters used to assess data quality. Data for these parameters are obtained from two categories of QC samples: field QC samples that provide checks on field and laboratory activities, and laboratory QC samples that monitor laboratory performance. Table D-8 summarizes the types of samples in each category and the sample frequencies and characteristics evaluated.

D3.9 Analytical Procedures

All field and laboratory instrumentation are calibrated using approved procedures, and analytical measurements are generated according to approved procedures. These procedures include quality checks to ensure the resulting analytical values are of known quality.

Instruments for field measurements (e.g., pH, specific conductance, temperature, and turbidity) are verified using standard solutions before use. These include, for pH, 4, 7, and 10 buffer/standard solutions; for specific conductance, 445 μS/cm and 1,413 μS/cm solutions; and for turbidity, Gelex standards 0-10, 0-100, and 0-1,000 nephelometric turbidity units. Instruments are operated in accordance with the

manufacturer's instructions. Each instrument is assigned a unique number that is tracked via calibration documentation and field logbooks and sampling reports.

Laboratory analytical methods are specified in Table D-9 and are generally specified in contracts with the laboratories. Laboratory methods for chemical parameters are typically standard methods from SW-846; EPA-600/4-79-020, *Methods for Chemical Analysis of Water and Wastes*; or APHA/AWWA/WEF, 2012, *Standard Methods for the Examination of Water and Wastewater*. Analytes, analytical methods, and required maximum practical quantitation limits are shown in Table D-9.

D3.9.1 Quality Control

QC data are evaluated based on acceptance criteria for each QC sample type, as summarized by constituent in Table D-10. These criteria limits are intended to provide confidence that the analytical and field methods are in control and provide data of known quality. For field and method blanks, the acceptance limit is two times the instrument detection limit (metals) or method detection limit (other chemical parameters), except for the common laboratory contaminants 2-butanone, acetone, methylene chloride, toluene, and phthalate esters where the limit is five times the method detection limit. Groundwater samples that are associated (i.e., collected on the same date and analyzed by the same method) with out-of-limit field blanks are given a review qualifier of "Q" in the Hanford Environmental Information System (HEIS) database to indicate a potential problem, and then recorded in the Hanford Facility Operating Record, LERF, and 200 Area ETF file pursuant to Permit Condition III.3.D.1.b.

Field duplicates must agree within 20 percent (as measured by relative percent difference) to be acceptable. Only those field duplicates with at least one result greater than five times the appropriate detection limit shall be evaluated. In the case where one result is a non-detect, the detection limit is used to calculate the relative percent difference. Unacceptable field duplicate results are given a review qualifier of "Q" in the database and recorded in the Hanford Facility Operating Record, LERF, and 200 Area ETF file.

The specified frequency for laboratory duplicates, matrix spikes, matrix spike duplicates, surrogates, and laboratory control samples are defined in Table D-10 in accordance with SW-846. The acceptance criteria for the associated parameter data shall be analyzed and recorded in accordance with Section D3.10.2.

Sample holding times depend on the analyte and are specified in the Environmental Quality Assurance Program Plan. Data associated with exceeded holding times are given a review qualifier of "H" in the HEIS database and noted in the Hanford Facility Operating Record, LERF, and 200 Area ETF file. Data exceeding holding times shall be maintained but potentially may not be used in statistical analyses.

Table D-11 lists the acceptable accuracy for the blind standards for carbon tetrachloride and TOX. These samples are prepared by spiking Hanford background well water (currently, wells 699-19-88 and 699-49-100C) with known concentrations of constituents of interest. Spiking concentrations range from the detection limit to the upper limit of concentration determined in groundwater on the Hanford Site. Investigations shall be conducted for blind standards that are outside of acceptance limits. The results from these standards shall be used to determine acceptability of the associated parameter data.

Additional QC measures include laboratory audits and participation in nationally based performance evaluation studies. Audit results are used to improve performance. Summaries of audit results and performance evaluation studies shall be incorporated into the Hanford Facility Operating Record, LERF, and 200 Area ETF file as appropriate to substantiate data quality objectives (DQOs) and data acceptance criteria.

D3.9.2 Data Management

This section describes data management practices.

Loading Data

The contract laboratories report analytical results electronically and in hardcopy. The electronic results shall be loaded into the HEIS database as they are received from the laboratories. The appropriate sections of the HEIS shall be incorporated by reference into the Hanford Facility Operating Record, LERF, and 200 Area ETF file to satisfy Permit Condition III.3D.1.b. Field data (e.g., specific conductance, pH, temperature, turbidity, and depth to water) are recorded on field records. Data management staff enter field data into the HEIS database manually through data-entry screens and verify each value against the hardcopy. An electronic field data collection system may be implemented soon, which would replace the manual field data collection and the manual data entry process when it is implemented.

Data not available electronically may include well logbooks, borehole videos, geologic descriptions, field screening data, or other information.

Data Review, Verification, Validation, and Usability

The final data review shall determine whether data meet the criteria specified in this subsection. The work activities shall follow documented procedures and processes for data validation and verification. Validation of groundwater data involves assessing whether the data collected and measured meet contractual quality requirements. Verification involves assessing data accuracy, completeness, consistency, availability, and internal control practices to determine overall reliability of the data collected. Other DQOs that shall be met include the proper chain-of-custody, sample handling, use of proper analytical techniques for each constituent, and the quality and acceptability of the laboratory analyses conducted.

Groundwater monitoring staff performs checks on laboratory electronic data files for formatting, allowed values, data flagging (qualifiers), and completeness. A percentage of hardcopy results are verified to check for completeness; notes on condition of samples upon receipt by the laboratory; notes on problems that arose during the analysis of the samples; and correct reporting of results. If data are incomplete or deficient, staff will work with the laboratory to correct the problem discovered during the analysis.

The data validation process provides the requirements and guidance for validating groundwater data that are routinely collected. Validation is a systematic process of reviewing verified data against a set of criteria (listed in Table D-10) to determine whether the data are acceptable for their intended use.

Results of laboratory and field QC evaluations, blind sample results, laboratory performance evaluation samples, and holding-time criteria are considered when determining data usability. Staff review the data to identify whether observed changes reflect changes in groundwater quality or potential data errors, and they may request data reviews of laboratory, field, or water-level data for usability purposes. The laboratory may be requested to check calculations or reanalyze the sample, or the well may be resampled. Results of the data reviews are used to determine what appropriate review qualifier should be applied to the analytical results in the HEIS database (e.g., "R" for reject, "Y" for suspect, or "G" for good) and/or to add comments.

Upon final data acceptance, both the raw data and the accepted/validated data shall be incorporated into the Hanford Facility Operating Record, LERF, and 200 Area ETF file.

Data Review Corrective Actions

The responses to data quality defects are identified through the verification/validation process. Corrective actions are shown in Table D-8.

D3.9.3 Statistical Analysis of Groundwater Monitoring Data

Groundwater monitoring constituents have been identified for the LERF basins and are listed in Table D-10. The dangerous constituents and indicator parameters used to indicate the presence of contamination (WAC 173-303-645(9)(a)) and subject to statistical evaluation are listed in Table D-7 and include carbon tetrachloride, pH, specific conductance, TOC, and TOX.

To establish background conditions, the previous data collected over the past two years will be used. Every year, background results will be evaluated for updating the critical mean for each indicator parameter identified in Table D-8. Sample collection and analysis will continue on a semiannual basis.

The statistical method for comparing baseline (background) groundwater quality with compliance-point groundwater quality is the Welch's *t*-test in accordance with WAC 173-303-645(8)(h)(i), and it is recommended for detection monitoring when population variances might differ between two groups, as stated in EPA 530/R-09-007, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance*. Applying this parametric *t*-test provides a reasonably robust statistical procedure and assurance when background data are at a minimum and the underlying populations may not meet normality. However, normality can usually be met by log transforming the data. As more background data is generated for well 299-E26-14, additional tests may be applied if spatial variability becomes an issue, such as the Wilcoxon Rank-sum Test.

The Welch's *t*-test procedure can be implemented as follows:

I. Compute the sample mean $\bar{x}$, standard deviation s, and variance s^2, in each of the background and compliance well data sets.

II. Compute Welch's *t*-statistic using the following equation $t = (\overline{X_c} - \overline{X_{BG}})/\sqrt{\frac{s^2_{BG}}{n_{BG}} + \frac{s^2_c}{n_c}}$

III. Compute the approximate degrees of freedom using the following equation

$$df = \left[\frac{s^2_{BG}}{n_{BG}} + \frac{s^2_c}{n_c}\right] / \left[\frac{(s^2_{BG}/n_{BG})^2}{n_{BG}-1} + \frac{(s^2_c/n_c)^2}{n_c - 1}\right]$$

IV. Use Table 16-1 of Appendix D in EPA 530/R-09-007 to assign the upper 95 percent critical mean based on the degrees of freedom.

V. Compare the t-statistic against the critical point, t_{cp}. When the condition $t \leq t_{cp}$, conclude there is no statistically significant difference between the background and compliance point population means. If, however, $t > t_{cp}$, conclude that the compliance point population mean is significantly greater than the background mean at the α level of significance.

As monitoring continues and the process is shown to be in control (i.e., there is no statistically significant evidence of facility impact to groundwater), the baseline mean and standard deviation should be updated periodically (e.g., every 1 or 2 years) to incorporate the new data (EPA 530/R-09-007). This reduces uncertainty in the background and helps adjust for groundwater influences from outside sources. This updating process should continue for the lifetime of the monitoring program.

If an exceedance occurs, resampling will be undertaken to verify or refute the original exceedance. The analytical result from the resample is substituted into the previous formulas in place of the original value obtained, and the Welch's *t*-test statistic is updated. If resampling does not confirm the exceedance, and *if the exceedance can be shown to be a measurement in error or a confirmed outlier, it should be excluded from the revised background. Otherwise, any disconfirmed exceedances (including any*

resamples that exceed the background limit but are disconfirmed by other resamples) should probably be included when updating the background. The reason is that background limits designed to incorporate retesting are computed as low as possible to ensure adequate statistical power (EPA 530/R-09-007).

D3.10 Reporting and Recordkeeping

Reporting of monitoring evaluations for LERF will be carried out through the Hanford Site Annual Groundwater Monitoring Report.

Pertinent information for groundwater monitoring and electronic files for groundwater data shall be maintained in the Hanford Facility Operating Record, LERF, and 200 Area ETF file required by Permit Condition II.I.1. Records may be stored in either electronic or hardcopy format.

The Hanford Facility Operating Record, LERF, and 200 Area ETF file will also include, consistent with Permit Condition III.3.D.1.b, the following items:

- Groundwater sample reports
- Chain-of-custody forms
- Sample receipt records

D3.11 Evaluation and Notification

Groundwater flow rate and direction in the uppermost aquifer will be evaluated and reported annually. Groundwater indicator parameter data collected under this permit will be reviewed semiannually to determine if there is statistically significant evidence of contamination (in accordance with WAC 173-303-645(9)(f)) using the statistical method provided in Section D3.9.3. The results of the statistical evaluation and associated information will be submitted to the Washington State Department of Ecology (Ecology) annually through the Hanford Site Annual Groundwater Monitoring Report (WAC 173-303-645(9)(c)).

If statistically significant evidence of contamination is determined for one or more of the dangerous constituents or indicator parameters, at any monitoring well at the compliance point, the owner or operator may resample within one month and repeat the analysis for the detected compounds in accordance with WAC 173-303-645(9)(g)(ii). The resample data will be compared with the control limit. If resampling confirms statistically significant evidence of contamination, the following actions will be performed in accordance with WAC 173-303-645(9)(g):

- Notify Ecology in writing within seven days of the finding, indicating which chemical parameters have shown statistically significant evidence of contamination.
- Sample the groundwater in all monitoring wells and determine if constituents included in Ecology Publication 97-407, *Chemical Testing Methods for Designating Dangerous Waste: WAC 173-303-090 & -100*, Appendix 5, are present, and if so, in what concentration. For any of these compounds detected, the owner or operator may resample within one month of receiving the results and repeat the analysis for those compounds detected. If the constituents are detected in the second analysis, they will form the basis for compliance monitoring.
- If dangerous constituent(s) are detected, submit an application for a Permit modification to Ecology within 90 days to establish a compliance monitoring program in accordance with WAC 173-303-645(9)(g)(iv).
- If dangerous constituents are not detected, continue to monitor in accordance with the detection monitoring program.

If a source other than LERF caused the contamination or the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in groundwater (as allowed by WAC 173-303-645(9)(g)(vi), the following guidelines will apply:

- Notify Ecology in writing within seven days of the finding (i.e., exceedance) and indicate the intent to make a demonstration to this effect.
- Submit a report to Ecology within 90 days. The report should demonstrate that a source other than the regulated unit caused the contamination, or that the contamination resulted from an error in sampling, analysis, evaluation, or natural variation in groundwater chemistry.
- Continue monitoring in accordance with the detection monitoring program.

If it is determined, in accordance with WAC 173-303-645(9)(h), that the detection monitoring program no longer satisfies the requirements of WAC 173-303-645(9), submit an application to Ecology for a Permit modification within 90 days to make any appropriate changes to the program.

D4 Compliance-Monitoring Program

Reserved.

D5 Corrective-Action Program

Reserved.

D6 References

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