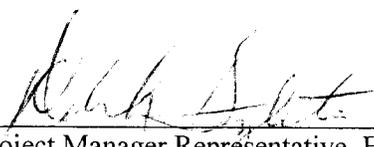


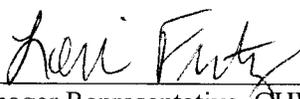
## Meeting Minutes Transmittal

Low Level Burial Grounds  
 Project Managers Meeting  
 825 Jadwin/Room 340  
 Richland, Washington  
 February 26, 2009

The undersigned indicate by their signatures that these meeting minutes reflect the actual occurrences of the above dated Project Managers Meeting. Signatures denote concurrence with the content only and are not intended to imply agreement to any commitments.

  
 \_\_\_\_\_ Date: 3/24/2009  
 Project Manager Representative, Ecology

  
 \_\_\_\_\_ Date: 26 March 2009  
 Project Manager Representative, RL

  
 \_\_\_\_\_ Date: 3.26.09  
 Project Manager Representative, OHPRC

LLBG Administrative Record	H6-08
MS Collins	A6-38
DG Singleton	H0-57
BM Barnes	T4-52
LL Fritz	T3-11

**RECEIVED**  
 MAY 22 2009  
**EDMC**

Low Level Burial Grounds (LLBG) Meeting Minutes  
 Project Managers Meeting (PMM)  
 825 Jadwin/Room 340/700 Area  
 Richland, Washington

February 26, 2009

- I. Approval of January 22, 2009 LLBG PMM minutes (Ecology/DOE-RL/CHPRC).
  - A. The PMM minutes were approved.

- II. Operational Status

- A. Waste Received and Transferred During January 2009 (see tables)

	Volume	From	To	Containers*
Mixed Waste Received (includes inter-facility transfers)	48.84 M <sup>3</sup>	PFNW	LLBG	13
Mixed Waste Transferred Onsite	60.0 M <sup>3</sup> 2 M <sup>3</sup>	LLBG LLBG	ETF ERDF	2 1
Mixed Waste Shipped Offsite	0M <sup>3</sup>	LLBG	NA	0

\*Includes containers of all sizes (55-gallon drums, 85-gallon drums, 5'x5'x9' boxes, etc.)

- B.

Defueled Reactor Compartments Received - January 2009	0
---	---

- III. Status of Previous Agreements and Commitments

- A. There were no previous agreements and commitments to status.

- IV. New Agreements and Commitments

- A. There were no new agreements and commitments.

- V. Near Term Schedules and Ongoing Activities (Milestones, TSD Unit)

- A. LLBG Permit Status

Deborah Singleton (Ecology) stated that five addendums are ready to send to RL/CHPRC for comment. The groundwater monitoring addendum is not resolved and will not be included. Ms. Singleton is comparing conditions formulated by the Ecology hydrogeologist with the groundwater monitoring plan submitted by RL/CHPRC.

Tony Miskho (CHPRC) initiated a discussion regarding alternative monitoring requirements, which would eliminate the need for a groundwater monitoring plan. Ms. Singleton stated that a decision has been made that there are circumstances where the alternative could be used, but for some sites that would not be the best approach. Ms. Singleton indicated that LLBG would probably have a groundwater monitoring plan. Mr. Miskho referred to language in the ZP-1 Record of Decision (ROD) that Ecology would consider alternative monitoring requirements for WMA 3 and 4. Ms. Singleton will confer with John Price (Ecology) regarding the issue.

There was some discussion regarding splitting the used and un-used areas for closure. Ms. Singleton indicated Ecology would likely withdraw its intent to split the used and un-used. Discussion on this subject will continue.

B. Groundwater Sampling

Stuart Luttrell (CHPRC) reported that Waste Management Area 1 and 3 (WMA-1, 3) are scheduled for sampling in March, and WMA-2 is scheduled for April. All eight wells were sampled in February in WMA-4, and three of those wells are scheduled for assessment monitoring in March. Ms. Singleton will send an e-mail confirming Ecology's acceptance of the assessment monitoring plan for LLBG and NRDWL.

VI. Approved Changes Signed off in Accordance with TPA Section 12.2

A. There were no approved changes signed.

VII. General Discussion

A. There were no topics for general discussion.

VIII. Actions

A. There were no actions to status.

Description	Status	Date

IX. Documents for Submittal to the Administrative Record

A. The e-mail and letter regarding notification that groundwater indicator parameter results from LLWMA-4 exceeded critical mean comparison values will be attached to the minutes for today's PMM. (Letter number 09-AMCP-0062 from RL to Ecology, dated January 30, 2009.)

X. Next Project Managers Meeting - 11:00 a.m. March 26, 2009.

**LLBG PROJECT MANAGERS MEETING**

825 Jadwin/Room 340

Richland, Washington

February 26, 2009

**Attendance List**

Name	Organization	Phone Number
Brian Dixon	CHPRC	376-7053
Tony Mischel	CHPRC	376-7313
Michael Collins	RL	376-6536
Stuart Luttrell	CHPRC	376-4531
WOLFRITZ	CHPRC	376-0350
Larry Romine	RL	376-4747
Weberch Singleton	Ecology	312-7923
Michelle Mandis	Ecology	2-7970
Joni Norton	DOE-RL	376-6202
Kathy Kury	Knox Court Reporting	946-5535
PAUL W. MARSH	CHPRC	376-6620
Brett Barnes	CHPRC	376-3640
HC Boynton	CHPRC	372-0478

**Dixon, Brian J**

---

**Subject:** FW: Notification that indicator parameter results exceeded critical mean

---

**From:** Hildebrand, R D (Doug)  
**Sent:** Thursday, January 15, 2009 4:35 PM  
**To:** Goswami, Dibakar  
**Cc:** Charboneau, Briant L; Morse, John G; Hildebrand, R D (Doug)  
**Subject:** Notification that indicator parameter results exceeded critical mean

Dib

This message provides notification that indicator parameter results exceeded critical mean comparison values for two treatment, storage, and/or disposal (TSD) units regulated under requirements of the Dangerous Waste Regulations at WAC 173-303-400, which references 40 CFR 265 subpart F. The two TSD units are the Non-Radioactive Dangerous Waste Landfill (NRDWL) and the Low-Level Burial Grounds, Low-Level Waste Management Area (LLWMA) -4. These results indicate the units may be affecting groundwater quality, and as a result the following actions are required:

*"...the owner or operator must provide written notice to the Regional Administrator—within seven days ...that the facility may be affecting groundwater quality. [40 CFR 265.93(d)(1)]"* (In this context, 'Regional Administrator' means State of Washington Department of Ecology) and,

*"Within 15 days after the notification under paragraph (d)(1) of this section, the owner or operator must develop and submit to the Regional Administrator a specific plan... for a groundwater quality assessment program at the facility. [40 CFR 265.93(d)(2)]"* (In this context, 'Regional Administrator' means State of Washington Department of Ecology). Note that although EPA has removed the requirement to submit the plan, Ecology has retained the requirement through the Dangerous Waste Regulations.

The August 2008 sample results from downgradient well 699-25-34B at NRDWL exceeded the critical mean comparison value of 1,020 ug/L for total organic carbon (TOC). The quadruplicate results averaged 1,552 ug/L. The well was re-sampled in October 2008 and results of split samples from two laboratories averaged 2,025 ug/L and 2,325 ug/L, confirming the initial results.

The August 2008 sample results from downgradient well 299-W15-224 at LLWMA-4 exceeded the critical mean comparison value of 790 ug/L for TOC. The sample had been split for inter-laboratory evaluation, and TOC results averaged 898 ug/L from one lab and 1,250 ug/L from the other lab. The well was re-sampled in October 2008 (quadruplicate and split samples were not collected); a TOC of 2,100 ug/L confirmed the initial results.

This message fulfills the first requirement, with a formal letter to follow. The second requirement will be fulfilled by preparation and submittal of groundwater quality assessment plans to Ecology.

Doug Hildebrand



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

09-AMCP-0062

JAN 30 2009

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

Dear Ms. Hedges:

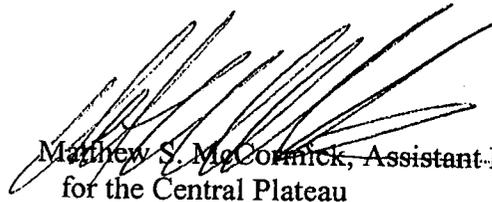
FIRST DETERMINATION RESOURCE CONSERVATION AND RECOVERY ACT  
GROUNDWATER QUALITY ASSESSMENT PLANS FOR THE NON-RADIOACTIVE  
DANGEROUS WASTE LANDFILL AND THE LOW-LEVEL BURIAL GROUNDS  
LOW-LEVEL WASTE MANAGEMENT AREA - 4, SGW-40211, REVISION 0

This letter transmits the First Determination Resource Conservation and Recovery Act Groundwater Quality Assessment Plans for the Non-Radioactive Dangerous Waste Landfill (NRDWL) and the Low-Level Burial Grounds Low-Level Waste Management Area - 4 (LLWMA-4), SGW-40211, Revision 0 for your information as required by 40 CFR 265.93(d)(2).

Indicator parameter results exceeded critical mean comparison values at two treatment, storage, and/or disposal units regulated under requirements of the Dangerous Waste Regulations (WAC-173-303-400) which references 40 CFR 265 Subpart F. Specifically, down gradient Well 699-25-34B at NRDWL and down gradient Well 299W-15-22 at LLWMA-4 exceeded critical mean comparison values for total organic carbon. Notification was previously provided in our letter 09-AMCP-0058, dated January 20, 2009.

If you have any questions, please contact me, or your staff may contact Briant Charboneau, of my staff, on (509) 373-6137.

Sincerely,



Matthew S. McCormick, Assistant Manager  
for the Central Plateau

AMCP:MSC

Attachments

cc: See Page 2

Ms. J. A. Hedges  
09-AMCP-0062

-2-

JAN 30 2009

cc w/attachs:

G. Bohnee, NPT  
L. Buck, Wanapum  
R. R. Campbell, EPA  
S. Harris, CTUIR  
M. N. Jaraysi, CHPRC  
R. Jim, YN  
G. J. LeBaron, CHPRC  
S. L. Leckband, HAB  
K. Niles, ODOE  
J. G. Vance, FFS  
Administrative Record  
Environmental Portal

SGW-40274  
Revision 0

# Groundwater Quality Assessment Plan for the Non-Radioactive Dangerous Waste Landfill

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

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



P.O. Box 1600  
Richland, Washington 99352

Approved for Public Release,  
Further Dissemination Unlimited

# Groundwater Quality Assessment Plan for the Non-Radioactive Dangerous Waste Landfill

Document Type: TI                      Program/Project: SGW

S. P. Luttrell  
CH2M HILL Plateau Remediation Company

Date Published  
February 2009

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

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



P.O. Box 1600  
Richland, Washington

*S. P. Luttrell*                      01/30/2009  
Release Approval                      Date

Approved for Public Release.  
Further Dissemination Unlimited

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**LIST OF TERMS**

CAS	Chemical Abstract Services
CFR	<i>Code of Federal Regulations</i>
CRDL	contract-required detection limit
DOE	U.S. Department of Energy
NRDWL	Nonradioactive Dangerous Waste Landfill
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
TOC	total organic carbon
TPH	total petroleum hydrocarbon
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
WAC	<i>Washington Administrative Code</i>

## METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>	<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
<b>Length</b>			<b>Length</b>		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
<b>Area</b>			<b>Area</b>		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
<b>Mass (weight)</b>			<b>Mass (weight)</b>		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
<b>Volume</b>			<b>Volume</b>		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
<b>Temperature</b>			<b>Temperature</b>		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
<b>Radioactivity</b>			<b>Radioactivity</b>		
picocuries	37	millibecquerels	millibecquerels	0.027	picocuries

## 1.0 INTRODUCTION

The groundwater beneath the Nonradioactive Dangerous Waste Landfill (NRDWL) has been monitored under the *Resource, Conservation, and Recovery Act of 1976* (RCRA) in interim status under a groundwater indicator parameters evaluation program (*Washington Administrative Code* [WAC] 173-303-400, "Dangerous Waste Regulations; Interim Status Facility Standards"; and by reference, 40 *Code of Federal Regulations* [CFR] 265.92, "Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Sampling and Analysis") (*Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill* [PNNL-12227] and ICN-1).

Results from August 24, 2008, samples from downgradient wells 699-25-34A and 699-25-34B exceeded the critical mean value of 1,020 µg/L for total organic carbon (TOC), an indicator parameter. The quadruplicate results averaged 1,525 µg/L for well 699-25-34A and 1,803 µg/L for well 699-25-34B. The wells were re-sampled on October 29, 2008, and the resulting quadruplicate average for well 699-25-34A was below the laboratory detection level of 200 µg/L, but the result for well 699-25-34B averaged 2,025 µg/L. Verification sampling results for well 699-25-34B confirmed the initial results, indicating that the NRDWL may be impacting groundwater quality.

The source of the elevated organic carbon is uncertain. One possible source is chlorinated hydrocarbons, which were disposed at the NRDWL and at the adjacent Solid Waste Landfill (Figure 1). Although low levels (less than 1 µg/L) of chlorinated hydrocarbons are detected in the NRDWL well network, the concentrations are too low to cause TOC levels as high as 2,000 µg/L. Sewage was disposed to two liquid discharge trenches at the nearby Solid Waste Landfill (*Groundwater Monitoring Plan for the Solid Waste Landfill* [PNNL-13014]) and is a more likely source for the elevated TOC.

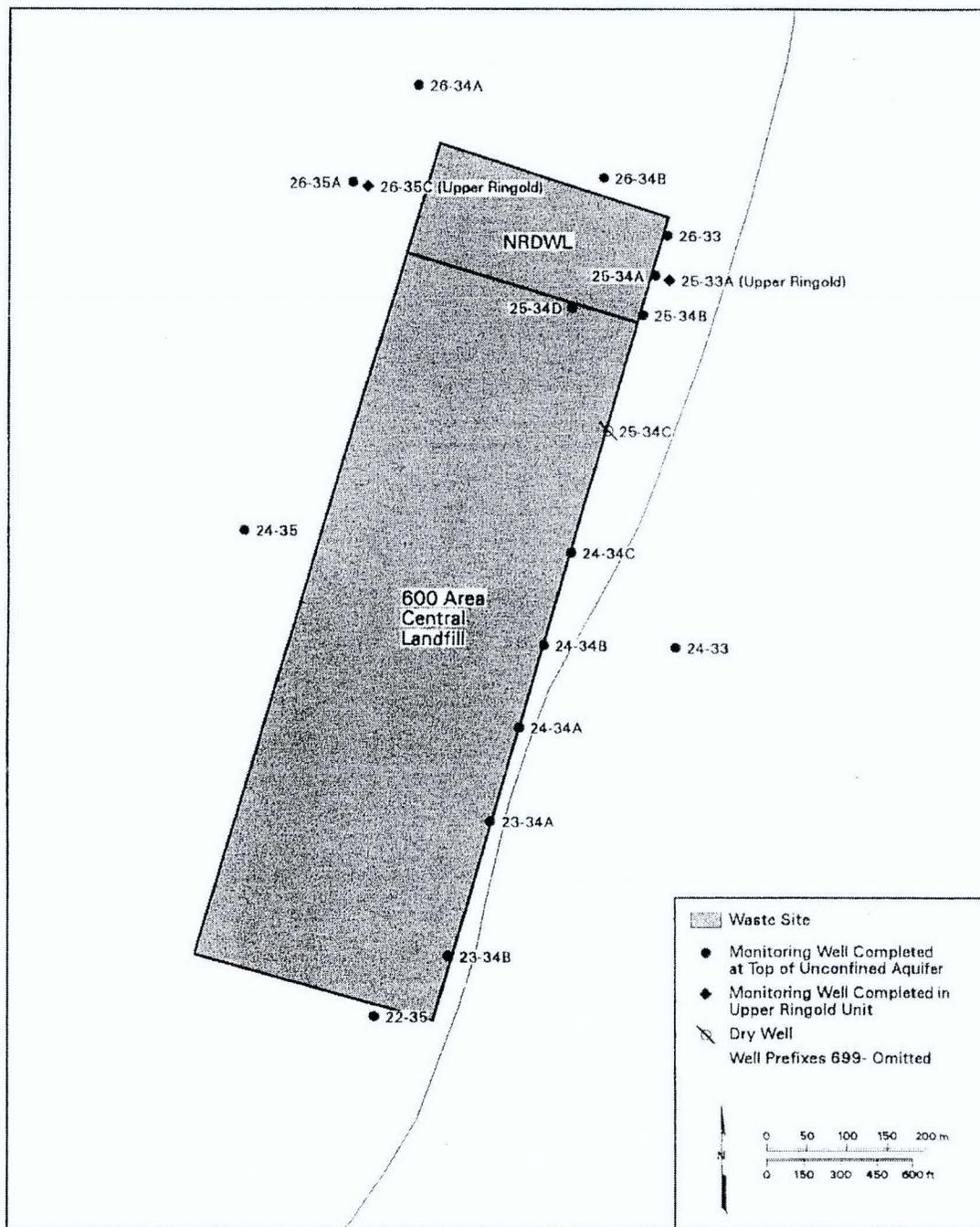
## 2.0 THE ASSESSMENT PLAN

In accordance with WAC 173-303-400 (and by reference to 40 CFR 265.93[d][2], "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Preparation, Evaluation, and Response"), this groundwater assessment will be carried out in two parts. The first part of the assessment will consist of a "first determination" (40 CFR 265.93[d][4]) to evaluate specific organic compounds to determine whether they are present in groundwater. The presence of potential dangerous waste or dangerous waste constituents in groundwater will be determined by monitoring well 699-25-34B and nearby wells 699-25-34A and 699-25-34D (Figure 1) for 40 CFR 264, Appendix IX<sup>1</sup>, "Standards for Owners and Operator of Hazardous Waste Treatment, Storage, and Disposal Facilities; Ground-Water Monitoring List," organic constituents and other constituents potentially responsible for elevated TOC. Additional constituents will include total petroleum hydrocarbons (TPH) and parameters

<sup>1</sup> The U.S. Department of Energy (DOE) is proposing to use 40 CFR 264, Appendix IX in order to be consistent with the final status requirements in WAC 173-303-645, and that all Hanford treatment, storage, and disposal units must be closed to final status standards in the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), Section 5.3 (Ecology et al. 2003). Otherwise, the interim status requirements would result in a different conclusion.

to investigate possible sewage impacts from the adjacent Solid Waste Landfill. Both new and existing data will be evaluated. If dangerous waste or 40 CFR 264, Appendix IX constituents are below their respective contract-required detection limits (CRDLs), it will be concluded that the NRDWL has not impacted groundwater quality, and the indicator parameter evaluation program for groundwater monitoring will be reinstated.

Figure 1. Location of Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill Groundwater Monitoring Wells.



If results from the first determination indicate the presence of dangerous waste or other constituents identified in 40 CFR 264, Appendix IX above the respective CRDL, the second part of assessment will be initiated by expanding this assessment plan to assess the rate and extent of migration of dangerous constituents<sup>1</sup> and concentrations in groundwater.

Details of the first determination portion of the assessment are provided below.

## **2.1 NUMBER, LOCATION, AND DEPTH OF WELLS**

Three of the NRDWL downgradient groundwater monitoring wells (Figure 1 and Table 1) will be sampled initially. All three wells are screened at the water table and are compliant with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells." The water table lies at approximately 40 to 43 m below ground surface, at an elevation of approximately 122 m. Groundwater flow direction is generally toward the east-southeast, and these wells are considered adequate for the first determination to evaluate potential contamination that may have impacted groundwater in well 699-25-34B.

The remainder of the wells in the NRDWL monitoring network may be included if groundwater monitoring continues under a groundwater quality assessment program, under an expanded assessment plan, for the second part of the assessment.

## **2.2 SAMPLING AND ANALYSIS METHODS**

The indicator parameter exceeding its critical mean was TOC. Therefore, the groundwater analytes will include the organic compounds portion of the 40 CFR 264, Appendix IX constituent list; TPH for oil, gas, and diesel; and oil and grease. The analyses will also include coliform bacteria and chemical oxygen demand because of the potential that the elevated TOC was caused by the sewage disposed at the Solid Waste Landfill. Field parameters, temperature, and pH will be measured (as well as TOC) for comparison to previous measurements and any other detected analytes.

General analysis groups, analytical methods, and CRDLs for key constituents are provided in Table 2. The list of organic constituents from 40 CFR 264, Appendix IX that will be requested is provided in Table 3, with respective Chemical Abstract Services (CAS) registry numbers. The routine analyses, including anions and metals, will continue as described in the original groundwater monitoring plan (PNNL-12227 and ICN-1).

### **2.2.1 Sampling**

Sampling methods will be consistent with current sample collection, preservation, documentation, shipment, and chain-of-custody requirements. Three wells in the NRDWL network will be sampled once. If constituents identified in 40 CFR 264, Appendix IX are detected above CRDLs, sampling and analysis will be performed in these wells for the specific constituents detected to confirm the presence of these constituents.

---

<sup>1</sup> DOE is proposing to use the definition of "dangerous constituent" in WAC 173-303-645(4), "Dangerous Waste Regulations"; "Releases from Regulated Units," for the purposes of groundwater monitoring in order to be consistent with final status requirements.

Table 1. Monitoring Wells That Will Be Evaluated in First Determination for the Nonradioactive Dangerous Waste Landfill.

Well Number	Upgradient/Downgradient	Date Completed	WAC Compliant?	Depth to Water August 2008	Water Remaining In Well
699-25-34A	Downgradient	1986	Yes	40.7 m	2.9 m
699-25-34B	Downgradient	1986	Yes	40.5 m	3.4 m
699-25-34D	Downgradient	1992	Yes	43.2 m	8.3 m

WAC = Washington Administrative Code

Table 2. Preservation Techniques, Analytical Methods, and Contract-Required Detection Limit for Selected Organic Constituents. (2 sheets)

Constituent	Collection and Preservation <sup>a,b</sup>	Analysis Methods <sup>c</sup>	Method Quantitation Limit (µg/L) <sup>d</sup>
<b>Pesticides</b>			
Endrin	G, none	SW-846 <sup>c</sup> , #8081A	0.1
Methoxychlor			0.5
Toxaphene			2
Lindane (four isomers)			0.05
<b>Herbicides</b>			
2,4-D	G, none	SW-846, #8151A	20
2,4,5-TP silvex			1
2,4,5-T			1
<b>Volatile Organic Analyses</b>			
Carbon tetrachloride	G, no headspace	SW-846, #8260B	5
Benzene			5
Methyl ethyl ketone			10
Toluene			5
1,1,1-trichloroethane			5
1,1,2-trichloroethane			5
Trichloroethylene			5
Tetrachloroethylene			5
Xylene-o, p			10
Chloroform			5
1, 1-dichloroethane			10
1, 2-dichloroethane			5
Trans-1, 2-dichloroethylene			5
Methylene chloride			5
Vinyl chloride			10
Xylene-m			10
Methyl isobutyl ketone			10
Acetone by volatile organic analysis			20
Tetrahydrofuran			50
P-dichlorobenzene			5

Table 2. Preservation Techniques, Analytical Methods, and Contract-Required Detection Limit for Selected Organic Constituents. (2 sheets)

Constituent	Collection and Preservation <sup>a,b</sup>	Analysis Methods <sup>c</sup>	Method Quantitation Limit ( $\mu\text{g/L}$ ) <sup>d</sup>
<b>Semi-Volatile Organic Analyses</b>			
Bis(2ethylhexyl)phthalate (DEHP)	Amber glass, cool to 4°C	SW-846, #8270D	10
Cresol (o,p,m)			10
n-nitrosodimethylamine			10
<b>Other</b>			
Coliform bacteria	P, none	SW-846, #9223 <sup>f</sup>	2.2 <sup>g</sup>
Chemical oxygen demand	P,G, H <sub>2</sub> SO <sub>4</sub> to pH<2	EPA, 410.4	10,000
Oil and grease	G, HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2	EPA, 413.1	2,000
		SW-846, #9070	1,000
Total petroleum hydrocarbons	G, HCl to pH <2	EPA, 418.1	500
Total organic carbon	G, HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2	SW-846, #9060	1,000

<sup>a</sup> P = plastic; G = glass.

<sup>b</sup> All samples will be cooled to 4°C upon collection.

<sup>c</sup> Constituents grouped together are analyzed by the same method, unless otherwise indicated.

<sup>d</sup> Detection limit units, except where indicated.

<sup>e</sup> EPA SW-846, *Methods for Evaluation of Solid Waste, Physical/Chemical Methods*.

<sup>f</sup> Enzyme substrate test.

<sup>g</sup> Most probable number.

EPA = U.S. Environmental Protection Agency

Table 3. Selected 40 CFR 264, Appendix IX Groundwater Constituents for Nonradioactive Dangerous Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number <sup>a</sup>
1,1,1,2-Tetrachloroethane	630-20-6
1,1,1-Trichloroethane; Methylchloroform	71-55-6
1,1,2,2-Tetrachloroethane	79-34-5
1,1,2-Trichloroethane	79-00-5
1,1-Dichloroethane	75-34-3
1,1-Dichloroethylene; Vinylidene chloride	75-35-4
1,2,3-Trichloropropane	96-18-4
1,2,4,5-Tetrachlorobenzene	95-94-3
1,2,4-Trichlorobenzene	120-82-1
1,2-Dibromo-3-chloropropane; DBCP	96-12-8
1,2-Dibromoethane; Ethylene dibromide	106-93-4
1,2-Dichloroethane; Ethylene dichloride	107-06-2
1,2-Dichloropropane	78-87-5
1,4-Dioxane	123-91-1
1,4-Naphthoquinone	130-15-4

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Nonradioactive Dangerous  
Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number *
1-Naphthylamine	134-32-7
2,3,4,6-Tetrachlorophenol	58-90-2
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p- dioxin	1746-01-6
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7
2,4-Dichlorophenol	120-83-2
2,4-Dimethylphenol	105-67-9
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dichlorophenol	87-65-0
2,6-Dinitrotoluene	606-20-2
2-Acetylaminofluorene; 2-AAF	53-96-3
2-Chloronaphthalene	91-58-7
2-Chlorophenol	95-57-8
2-Hexanone	591-78-6
2-Methylnaphthalene	91-57-6
2-Naphthylamine	91-59-8
2-Picoline	109-06-8
3,3[prime]-Dichlorobenzidine	91-94-1
3,3[prime]-Dimethylbenzidine	119-93-7
3-Methylcholanthrene	56-49-5
4,4[prime]-DDD	72-54-8
4,4[prime]-DDE	72-55-9
4,4[prime]-DDT	50-29-3
4,6-Dinitro-o-cresol	534-52-1
4-Aminobiphenyl	92-67-1
4-Bromophenyl phenyl ether	101-55-3
4-Chlorophenyl phenyl ether	7005-72-3
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1
4-Nitroquinoline 1-oxide	56-57-5
5-Nitro-o-toluidine	99-55-8
7,12-Dimethylbenz[a]anthracene	57-97-6
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Acetone	67-64-1

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Nonradioactive Dangerous  
Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number *
Acetonitrile; Methyl cyanide	75-05-8
Acetophenone	98-86-2
Acrolein	107-02-8
Acrylonitrile	107-13-1
Aldrin	309-00-2
Allyl chloride	107-05-1
alpha, alpha-Dimethylphenethylamine	122-09-8
alpha-BHC	319-84-6
Aniline	62-53-3
Anthracene	120-12-7
Aramite	140-57-8
Benzene	71-43-2
Benzo[a]anthracene; Benzanthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[ghi]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Benzyl alcohol	100-51-6
beta-BHC	319-85-7
Bis(2-chloro-1-methylethyl) ether; 2,2[prime]-Di- chlorodiisopropyl ether	108-60-1
Bis(2-chloroethoxy)methane	111-91-1
Bis(2-chloroethyl)ether	111-44-4
Bis(2-ethylhexyl) phthalate	117-81-7
Bromodichloromethane	75-27-4
Bromoform; Tribromomethane	75-25-2
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7
Carbon tetrachloride	56-23-5
Chlordane	57-74-9
Chlorobenzene	108-90-7
Chlorobenzilate	510-15-6
Chloroethane; Ethyl chloride	75-00-3
Chloroform	67-66-3
Chloroprene	126-99-8
Chrysene	218-01-9
cis-1,3-Dichloropropene	10061-01-5
Delta-BHC	319-86-8
Diallate	2303-16-4

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Nonradioactive Dangerous  
Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number *
Dibenz[a,h]anthracene	53-70-3
Dibenzofuran	132-64-9
Dibromochloromethane; Chlorodibromomethane	124-48-1
Dichlorodifluoromethane	75-71-8
Dieldrin	60-57-1
Diethyl phthalate	84-66-2
Dimethoate	60-51-5
Dimethyl phthalate	131-11-3
Di-n-butyl phthalate	84-74-2
Di-n-octyl phthalate	117-84-0
Dinoseb; DNBP; 2-sec-Butyl- 4,6-dinitrophenol	88-85-7
Diphenylamine	122-39-4
Disulfoton	298-04-4
Endosulfan I	959-98-8
Endosulfan II	33213-65-9
Endosulfan sulfate	1031-07-8
Endrin aldehyde	7421-93-4
Endrin	72-20-8
Ethyl methacrylate	97-63-2
Ethyl methanesulfonate	62-50-0
Ethylbenzene	100-41-4
Famphur	52-85-7
Fluoranthene	206-44-0
Fluorene	86-73-7
Gamma-BHC; Lindane	58-89-9
Heptachlor epoxide	1024-57-3
Heptachlor	76-44-8
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Hexachlorophene	70-30-4
Hexachloropropene	1888-71-7
Indeno(1,2,3-cd)pyrene	193-39-5
Isobutyl alcohol	78-83-1
Isodrin	465-73-6
Isophorone	78-59-1

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Nonradioactive Dangerous  
Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number <sup>a</sup>
Isosafrole	120-58-1
Kepone	143-50-0
m-Cresol	108-39-4
m-Dichlorobenzene	541-73-1
m-Dinitrobenzene	99-65-0
Methacrylonitrile	126-98-7
Methapyrilene	91-80-5
Methoxychlor	72-43-5
Methyl bromide; Bromomethane	74-83-9
Methyl chloride; Chloromethane	74-87-3
Methyl ethyl ketone; MEK	78-93-3
Methyl iodide; Iodomethane	74-88-4
Methyl methacrylate	80-62-6
Methyl methanesulfonate	66-27-3
Methyl parathion; Parathion methyl	298-00-0
Methylene bromide; Dibromomethane	74-95-3
Methylene chloride; Dichloromethane	75-09-2
m-Nitroaniline	99-09-2
Naphthalene	91-20-3
Nitrobenzene	98-95-3
N-Nitrosodiethylamine	55-18-5
N-Nitrosodimethylamine	62-75-9
N-Nitrosodi-n-butylamine	924-16-3
N-Nitrosodiphenylamine	86-30-6
N-Nitrosodipropylamine; Di-n-propylnitrosamine	621-64-7
N-Nitrosomethylethylamine	10595-95-6
N-Nitrosomorpholine	59-89-2
N-Nitrosopiperidine	100-75-4
N-Nitrosopyrrolidine	930-55-2
O,O,O-Triethyl phosphorothioate	126-68-1
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2
o-Cresol	95-48-7
o-Dichlorobenzene	95-50-1
o-Nitroaniline	88-74-4
o-Nitrophenol	88-75-5
o-Toluidine	95-53-4
p-(Dimethylamino)azobenzene	60-11-7

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Nonradioactive Dangerous  
Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number <sup>a</sup>
Parathion	56-38-2
p-Chloroaniline	106-47-8
p-Chloro-m-cresol	59-50-7
p-Cresol	106-44-5
p-Dichlorobenzene	106-46-7
Pentachlorobenzene	608-93-5
Pentachloroethane	76-01-7
Pentachloronitrobenzene	82-68-8
Pentachlorophenol	87-86-5
Phenacetin	62-44-2
Phenanthrene	85-01-8
Phenol	108-95-2
Phorate	298-02-2
p-Nitroaniline	100-01-6
p-Nitrophenol	100-02-7
Polychlorinated biphenyls; PCBs	1336-36-3 <sup>b</sup>
Polychlorinated dibenzofurans; PCDFs	d
Polychlorinated dibenzo-p-dioxins; PCDDs	c
p-Phenylenediamine	106-50-3
Pronamide	23950-58-5
Propionitrile; Ethyl cyanide	107-12-0
Pyrene	129-00-0
Pyridine	110-86-1
Safrole	94-59-7
Silvex; 2,4,5-TP	93-72-1
Styrene	100-42-5
sym-Trinitrobenzene	99-35-4
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene	127-18-4
Tetraethyl dithiopyrophosphate; Sulfotepp	3689-24-5
Toluene	108-88-3
Toxaphene	8001-35-2
trans-1,2-Dichloroethylene	156-60-5
trans-1,3-Dichloropropene	10061-02-6
trans-1,4-Dichloro-2-butene	110-57-6
Trichloroethylene; Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
Vinyl acetate	108-05-4

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Nonradioactive Dangerous  
Waste Landfill First Determination Assessment. (7 sheets)

Common Name	CAS Number <sup>a</sup>
Vinyl chloride	75-01-4
Xylene (total)	1330-20-7

<sup>a</sup> Chemical Abstract Services (CAS) registry number.

<sup>b</sup> Polychlorinated biphenyls contains congener chemicals, including aroclors.

<sup>c</sup> This category contains congener chemicals including dioxins.

<sup>d</sup> This category contains congener chemicals including benzofurans.

### 2.2.2 Evaluation Procedures

Data evaluation will initially include quality assurance reviews to ensure that the requested analyses were received and meet the analytical performance requirements. The evaluation of results will primarily consist of determining if the selected analytes are detected in concentrations greater than the respective CRDLs. Data evaluation will also include evaluating concentrations of TPH (oil and grease), coliform bacteria, and chemical oxygen demand. The presence of these may indicate an impact from the Solid Waste Landfill. If constituents identified in 40 CFR 264, Appendix IX are not detected above CRDLs, then an indicator parameter evaluation program will be reinstated.

If constituents identified in 40 CFR 264, Appendix IX are detected and confirmed, this assessment plan will be revised and the second part of the assessment will be initiated to evaluate the rate and extent of contaminant migration.

## 3.0 SCHEDULE

The first sampling event will occur as soon as practical after the Washington State Department of Ecology's receipt of this assessment plan. The next scheduled sampling month for NRDWL is February 2009. However, this sampling event will be delayed, tentatively to March 2009, to include the analyses required under this plan. Laboratory analysis results should be received within 45 days of sample collection, and the data are expected to be available to complete the first determination by June 30, 2009, if constituents identified in 40 CFR 264, Appendix IX are not detected.

If constituents identified in 40 CFR 264, Appendix IX are detected above CRDLs, sampling and analysis to confirm the presence of these constituents will add approximately 6 weeks to the schedule to complete the first determination.

After the data are evaluated and conclusions are reached, a report will be transmitted to the Washington State Department of Ecology within 15 days, stating whether groundwater monitoring will return to indicator evaluation, or if a groundwater quality assessment program will be continued.

#### 4.0 REFERENCES

- 40 CFR 264, Appendix IX, "Standards for Owners and Operator of Hazardous Waste Treatment, Storage, and Disposal Facilities; Ground-Water Monitoring List," *Code of Federal Regulations*.
- 40 CFR 265.92, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Sampling and Analysis," *Code of Federal Regulations*.
- 40 CFR 265.93, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities; Preparation, Evaluation, and Response," *Code of Federal Regulations*.
- APHA, AWWA, and WEF, 1998, *Standard Methods for the Examination of Water and Wastewater, 20<sup>th</sup> Edition*, American Public Health Association, American Water Works Association, and Water Environmental Federation, Washington, D.C.
- Ecology, EPA, and DOE, 2003, *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), 2 vols., as amended, 89-10, Rev. 6, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
- EPA-600/4-84-017, 1984, *Test Methods for Determination of Inorganic Anions in Water by Ion Chromatography*, EPA Method 300.0, U.S. Environmental Protection Agency, Washington, D.C.
- PNNL-12227, 1999, *Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill*, Rev. 0, Pacific Northwest National Laboratory, Richland, Washington.
- PNNL-12227-ICN-1, 2001, *Groundwater Monitoring Plan for the Nonradioactive Dangerous Waste Landfill*, Rev. 0, Pacific Northwest National Laboratory, Richland, Washington.
- PNNL-13014, 2000, *Groundwater Monitoring Plan for the Solid Waste Landfill*, Rev. 0, Pacific Northwest National Laboratory, Richland, Washington.
- Resource Conservation and Recovery Act of 1976*, 42 U.S.C. 6901, et seq.
- SW-846, 1997, *Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods*, 3<sup>rd</sup> edition (as amended by Update I [July 1992], Update IIA [August, 1993], Update IIB [January 1995], and Update III), U.S. Environmental Protection Agency, Washington, D.C.
- WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*.
- WAC 173-303-400, "Dangerous Waste Regulations; Interim Status Facility Standards," *Washington Administrative Code*.
- WAC 173-303-645, "Dangerous Waste Regulations"; "Releases from Regulated Units," *Washington Administrative Code*.

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# First Determination RCRA Groundwater Quality Assessment Plan for the Low-Level Burial Grounds Low-Level Waste Management Area - 4

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

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



**CH2MHILL**  
Plateau Remediation Company

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# First Determination RCRA Groundwater Quality Assessment Plan for the Low-Level Burial Grounds Low-Level Waste Management Area - 4

Document Type: TI                      Program/Project: SGW

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CH2M HILL Plateau Remediation Company

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Assistant Secretary for Environmental Management

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## LIST OF TERMS

CAS	Chemical Abstract Services
CFR	<i>Code of Federal Regulations</i>
CRDL	contract-required detection limit
EPA	U.S. Environmental Protection Agency
LLWMA	low-level waste management area
NAVD88	North American Vertical Datum of 1988
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
TOC	total organic carbon
TPH	total petroleum hydrocarbon
Tri-Party Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
WAC	<i>Washington Administrative Code</i>

## METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>	<i>If You Know</i>	<i>Multiply By</i>	<i>To Get</i>
<b>Length</b>			<b>Length</b>		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
<b>Area</b>			<b>Area</b>		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	hectares	2.47	acres
<b>Mass (weight)</b>			<b>Mass (weight)</b>		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
<b>Volume</b>			<b>Volume</b>		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
<b>Temperature</b>			<b>Temperature</b>		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
<b>Radioactivity</b>			<b>Radioactivity</b>		
picocuries	37	millibecquerels	millibecquerels	0.027	picocuries

## 1.0 INTRODUCTION

Groundwater beneath Low-Level Waste Management Area-4 (LLWMA-4) (Figure 1) has been monitored under the *Resource, Conservation, and Recovery Act of 1976* (RCRA) in interim status under a groundwater indicator parameters evaluation program in accordance with *Washington Administrative Code* (WAC) 173-303-400 (and by reference, 40 *Code of Federal Regulations* [CFR] 265.92) (*Interim Status Groundwater Monitoring Plan for Low-Level Waste Management Areas 1 to 4, RCRA Facilities, Hanford, Washington* [PNNL-14859 and related ICN-1, ICN-2]). In a sample collected August 11, 2008, sample results from downgradient well 299-W15-224 exceeded the critical mean value of 790  $\mu\text{g/L}$  for total organic carbon (TOC), which is an indicator parameter. The concentrations ranged between 1,090 and 1,300  $\mu\text{g/L}$  (eight data points from duplicate, quadruplicate samples). The well was resampled for verification on October 21, 2008, and the results were 2,100 and 2,200  $\mu\text{g/L}$  TOC. Because the values exceed the critical mean, the results indicate that LLWMA-4 may be impacting groundwater quality.

The regional carbon tetrachloride plume in the 200 West Area has been documented as the cause of elevated total organic halides at LLWMA-4 in the past, but that plume does not appear to be the cause of recent high concentrations of TOC. Carbon tetrachloride and TOC are not correlated in the well, and the level of carbon tetrachloride combined with other hydrocarbons is far below what is expected to yield 2,000  $\mu\text{g/L}$  TOC.

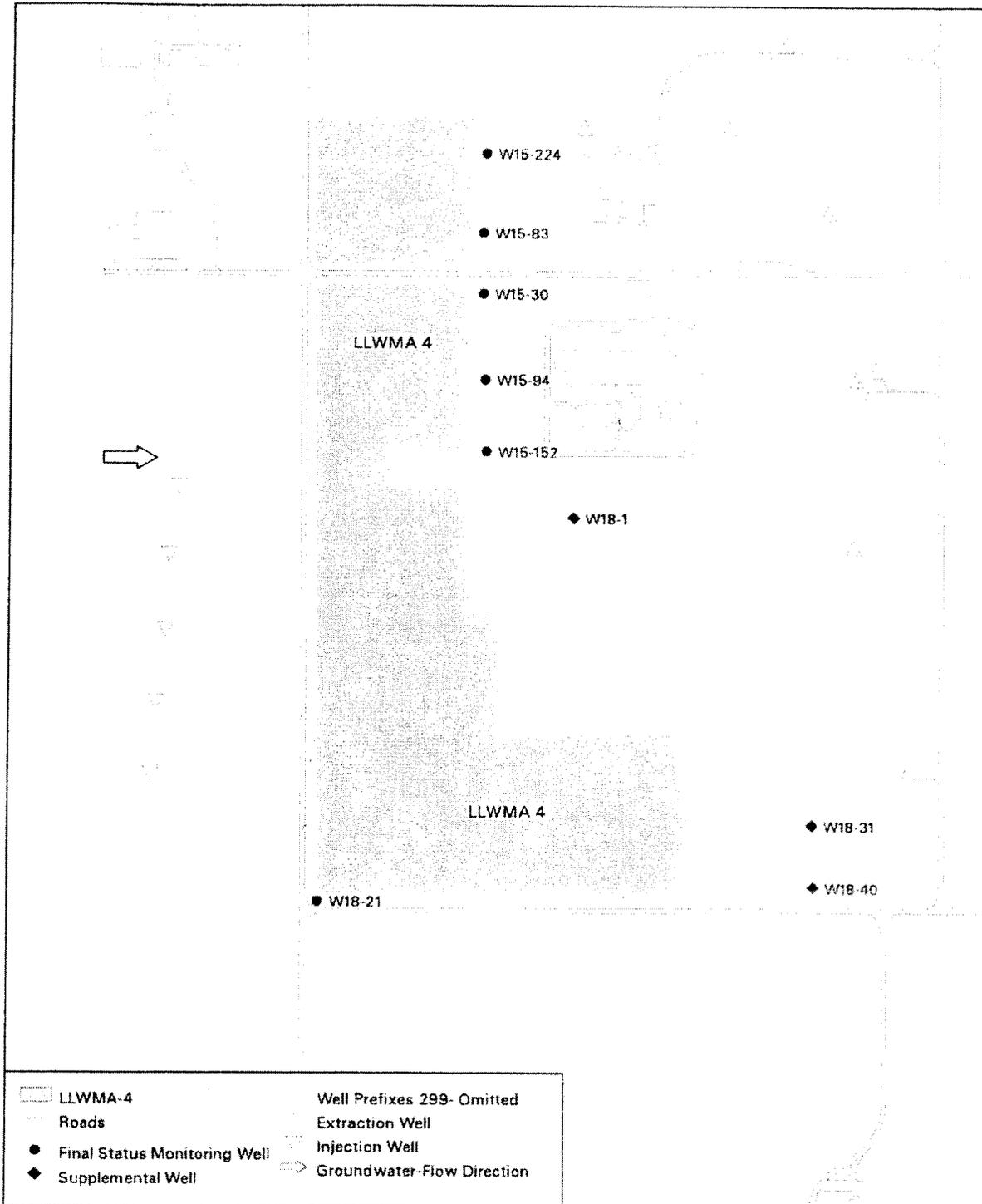
## 2.0 ASSESSMENT PLAN

The groundwater assessment will be carried out in two parts. The first part of the assessment will consist of a "first determination" to evaluate specific organic compounds to determine whether they are present in groundwater. The well information is provided in Table 1. A special sampling of well 299-W15-224 was performed on December 18, 2008, to analyze an extended list of volatile organic compounds, semi-volatile organic compounds, and total petroleum hydrocarbons (TPHs) (diesel and gas). All of the results are not yet available but will be reviewed and evaluated as they are received from the laboratory. If these results do not indicate the presence of dangerous waste or other constituents that would explain the elevated TOC, wells 299-W15-224, 299-W15-83, and 299-W15-30 will be sampled for analysis of 40 CFR 264 ("Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"), Appendix IX<sup>1</sup> organic constituents and other constituents potentially responsible for elevated TOC. Additional constituents will include TPHs and parameters to investigate possible sewage disposal impacts from septic disposal systems used earlier. If dangerous waste or 40 CFR 264, Appendix IX organic constituents are below their respective contract-required detection limit (CRDL), it will be concluded that LLWMA-4 has not impacted groundwater quality, and the indicator parameter evaluation program for groundwater monitoring will be reinstated.

---

<sup>1</sup> The U.S. Department of Energy is proposing to use 40 CFR 264, Appendix IX ("Standards for Owners and Operator of Hazardous Waste Treatment, Storage, and Disposal Facilities"; Ground-Water Monitoring List") in order to be consistent with the final status requirements in WAC 173-303-645 ("Dangerous Waste Regulations"; "Releases from Regulated Units"), and that all Hanford treatment, storage, and disposal units must be closed to final status standards in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 2003), Section 5.3. Otherwise, the interim status requirements would result in a different conclusion.

Figure 1. Location of Low-Level Waste Management Area-4 and Groundwater Monitoring Wells.



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Table 1. Groundwater Monitoring Wells for LLWMA-4 First Determination Assessment.

Well Name	Screened Interval (m) NAVD88	Water level (m) NAVD88 (March 2007)	Water Remaining (m) (March 2007)	Monitoring Objective
299-W15-224	125.9 to 136.5	135.89	10	Downgradient chemistry; central
299-W15-83	126.2 to 137.2	136.11	9.9	Downgradient chemistry; north
299-W15-30	130.7 to 142.9	136.28 <sup>a</sup>	5.6	Downgradient chemistry; north

NOTE: All wells constructed to standards of WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," resource protection wells.

<sup>a</sup> January 2007 measurement date.

<sup>b</sup> Perforated carbon steel casing. Partial annular seal.

<sup>c</sup> October 2005 measurement date.

LLWMA = Low-Level Waste Management Area

NAVD88 = North American Vertical Datum of 1988

WAC = *Washington Administrative Code*

If results from the "first determination" indicate the presence of dangerous waste or other constituents in 40 CFR 264, Appendix IX above the respective CRDL, the second part of assessment will be initiated by expanding this assessment plan to assess the rate and extent of migration of dangerous constituents<sup>2</sup> and concentrations in groundwater.

Details of the "first determination" portion of the assessment are provided below.

### 3.0 NUMBER, LOCATION, AND DEPTH OF WELLS

Three monitoring wells in the LLWMA-4 network will be sampled if the December 18, 2008, sample analysis results do not indicate the presence of dangerous waste or other constituents that would explain the elevated TOC. The well information is provided in Table 1. The wells are screened at the water table and are compliant with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells." Groundwater flow direction is from west to east (Figure 1), and the downgradient wells are located east of LLWMA-4. These wells are considered adequate for the "first determination" to evaluate potential groundwater contamination that may have impacted groundwater in well 299-W15-224.

The remainder of the wells in the LLWMA-4 monitoring network may be included if groundwater monitoring continues under a groundwater quality assessment program expanded for the second part of the assessment.

### 4.0 SAMPLING AND ANALYSIS METHODS

The indicator parameter exceeding its critical mean was TOC. Therefore, the groundwater analytes will include the organic compounds portion of the 40 CFR 264, Appendix IX constituent list, plus TPH for oil, gas, and diesel. The field parameters of temperature and pH will be measured, as well as TOC so it can continue to be compared to previous measurements

<sup>2</sup> DOE is proposing to use the definition of dangerous constituent in WAC 173-303-645(4) for the purposes of groundwater monitoring in order to be consistent with final status requirements.

and any other detected analytes. Coliform bacteria and chemical oxygen demand will be analyzed to evaluate possible impacts of earlier sewage disposal to septic drain field systems.

General analysis groups, analytical methods, and CRDLs for key constituents are provided in Table 2. The list of organic constituents from 40 CFR 264, Appendix IX that will be requested if necessary is provided in Table 3 with respective Chemical Abstract Services (CAS) registry numbers. The routine analyses, including for anions and metals, will continue as described in the original groundwater monitoring plan (PNNL-14859, and ICN-1, ICN-2).

Table 2. Preservation Techniques, Analytical Methods, and Contractually Required Detection Limit for Selected Organic Constituents. (2 sheets)

Constituent	Collection and Preservation <sup>a,b</sup>	Analysis Methods <sup>c</sup>	Contract Required Detection Limit (µg/L) <sup>d</sup>
<b>Pesticides</b>			
Endrin	G, none	SW-846 <sup>c</sup> , #8081A	0.1
Methoxychlor			0.5
Toxaphene			2
Lindane (four isomers)			0.05
<b>Herbicides</b>			
2,4-D	G, none	SW-846, #8151A	20
2,4-5-TP silvex			1
2,4,5-T			1
<b>Volatile Organic Analyses</b>			
Carbon tetrachloride	G, no headspace	SW-846, #8260B	5
Benzene			5
Methyl ethyl ketone			10
Toluene			5
1,1,1-trichloroethane			5
1,1,2-trichloroethane			5
Trichloroethylene			5
Tetrachloroethylene			5
Xylene-o, p			10
Chloroform			5
1, 1-dichloroethane			10
1, 2-dichloroethane			5
Trans-1, 2-dichloroethylene			5
Methylene chloride			5
Vinyl chloride			10
Xylene-m			10
Methyl isobutyl ketone			10
Acetone by VOA			20
Tetrahydrofuran			50

Table 2. Preservation Techniques, Analytical Methods, and Contractually Required Detection Limit for Selected Organic Constituents. (2 sheets)

Constituent	Collection and Preservation <sup>a,b</sup>	Analysis Methods <sup>c</sup>	Contract Required Detection Limit (µg/L) <sup>d</sup>
P-dichlorobenzene			5
<b>Semi-Volatile Organic Analyses</b>			
Bis(2ethylhexyl)phthalate (DEHP)	Amber glass, cool to 4°C	SW-846, #8270D	10
Cresol (o,p,m)			10
n-nitrosodimethylamine			10
<b>Other</b>			
Coliform bacteria	P, none	SW-846, #9223 <sup>f</sup>	2.2 <sup>g</sup>
Chemical oxygen demand	P,G, H <sub>2</sub> SO <sub>4</sub> to pH<2	EPA, 410.4	10000
Oil and grease	G, HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2	EPA, 413.1	2,000
		SW-846, #9070	1,000
Total petroleum hydrocarbons	G, HCl to pH <2	EPA, 418.1	500
Total organic carbon	G, HCl or H <sub>2</sub> SO <sub>4</sub> to pH<2	SW-846, #9060	1,000

<sup>a</sup> P = plastic; G = glass.

<sup>b</sup> All samples will be cooled to 4°C upon collection.

<sup>c</sup> Constituents grouped together are analyzed by the same method, unless otherwise indicated.

<sup>d</sup> Detection limit units, except where indicated.

<sup>e</sup> EPA SW-846, *Methods for Evaluation of Solid Waste, Physical/Chemical Methods*.

<sup>f</sup> Enzyme substrate test.

<sup>g</sup> Most probable number.

EPA = U.S. Environmental Protection Agency

#### 4.1 SAMPLING

Sampling methods will be consistent with current sample collection, preservation, documentation, shipment, and chain-of-custody requirements. Three wells will be sampled if the December 18, 2008, sample analysis results do not indicate a source of the elevated TOC. If constituents identified in 40 CFR 264, Appendix IX are detected above CRDLs, sampling and analysis will again be performed in these wells for the specific constituents detected to confirm the presence of these constituents.

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Low-Level Waste Management Area 4  
First Determination Assessment. (6 sheets)

Common Name	CAS Number <sup>a</sup>
1,1,1,2-Tetrachloroethane	630-20-6
1,1,1-Trichloroethane; Methylchloroform	71-55-6
1,1,1,2,2-Tetrachloroethane	79-34-5
1,1,2-Trichloroethane	79-00-5
1,1-Dichloroethane	75-34-3
1,1-Dichloroethylene; Vinylidene chloride	75-35-4
1,2,3-Trichloropropane	96-18-4
1,2,4,5-Tetrachlorobenzene	95-94-3
1,2,4-Trichlorobenzene	120-82-1
1,2-Dibromo-3-chloropropane; DBCP	96-12-8
1,2-Dibromoethane; Ethylene dibromide	106-93-4
1,2-Dichloroethane; Ethylene dichloride	107-06-2
1,2-Dichloropropane	78-87-5
1,4-Dioxane	123-91-1
1,4-Naphthoquinone	130-15-4
1-Naphthylamine	134-32-7
2,3,4,6-Tetrachlorophenol	58-90-2
2,3,7,8-TCDD; 2,3,7,8-Tetrachlorodibenzo-p- dioxin	1746-01-6
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7
2,4-Dichlorophenol	120-83-2
2,4-Dimethylphenol	105-67-9
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dichlorophenol	87-65-0
2,6-Dinitrotoluene	606-20-2
2-Acetylaminofluorene; 2-AAF	53-96-3
2-Chloronaphthalene	91-58-7
2-Chlorophenol	95-57-8
2-Hexanone	591-78-6
2-Methylnaphthalene	91-57-6
2-Naphthylamine	91-59-8
2-Picoline	109-06-8
3,3[prime]-Dichlorobenzidine	91-94-1
3,3[prime]-Dimethylbenzidine	119-93-7

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Low-Level Waste Management Area 4  
First Determination Assessment. (6 sheets)

Common Name	CAS Number <sup>a</sup>
3-Methylcholanthrene	56-49-5
4,4[prime]-DDD	72-54-8
4,4[prime]-DDE	72-55-9
4,4[prime]-DDT	50-29-3
4,6-Dinitro-o-cresol	534-52-1
4-Aminobiphenyl	92-67-1
4-Bromophenyl phenyl ether	101-55-3
4-Chlorophenyl phenyl ether	7005-72-3
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1
4-Nitroquinoline 1-oxide	56-57-5
5-Nitro-o-toluidine	99-55-8
7,12-Dimethylbenz[a]anthracene	57-97-6
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Acetone	67-64-1
Acetonitrile; Methyl cyanide	75-05-8
Acetophenone	98-86-2
Acrolein	107-02-8
Acrylonitrile	107-13-1
Aldrin	309-00-2
Allyl chloride	107-05-1
alpha, alpha-Dimethylphenethylamine	122-09-8
alpha-BHC	319-84-6
Aniline	62-53-3
Anthracene	120-12-7
Aramite	140-57-8
Benzene	71-43-2
Benzo[a]anthracene; Benzanthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[ghi]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Benzyl alcohol	100-51-6
beta-BHC	319-85-7
Bis(2-chloro-1-methylethyl) ether; 2,2[prime]-Di- chlorodiisopropyl ether.	108-60-1
Bis(2-chloroethoxy)methane	111-91-1
Bis(2-chloroethyl)ether	111-44-4

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Low-Level Waste Management Area 4  
First Determination Assessment. (6 sheets)

Common Name	CAS Number <sup>a</sup>
Bis(2-ethylhexyl) phthalate	117-81-7
Bromodichloromethane	75-27-4
Bromoform; Tribromomethane	75-25-2
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7
Carbon tetrachloride	56-23-5
Chlordane	57-74-9
Chlorobenzene	108-90-7
Chlorobenzilate	510-15-6
Chloroethane; Ethyl chloride	75-00-3
Chloroform	67-66-3
Chloroprene	126-99-8
Chrysene	218-01-9
cis-1,3-Dichloropropene	10061-01-5
delta-BHC	319-86-8
Diallate	2303-16-4
Dibenz[a,h]anthracene	53-70-3
Dibenzofuran	132-64-9
Dibromochloromethane; Chlorodibromomethane	124-48-1
Dichlorodifluoromethane	75-71-8
Dieldrin	60-57-1
Diethyl phthalate	84-66-2
Dimethoate	60-51-5
Dimethyl phthalate	131-11-3
Di-n-butyl phthalate	84-74-2
Di-n-octyl phthalate	117-84-0
Dinoseb; DNBP; 2-sec-Butyl- 4,6-dinitrophenol	88-85-7
Diphenylamine	122-39-4
Disulfoton	298-04-4
Endosulfan I	959-98-8
Endosulfan II	33213-65-9
Endosulfan sulfate	1031-07-8
Endrin aldehyde	7421-93-4
Endrin	72-20-8
Ethyl methacrylate	97-63-2
Ethyl methanesulfonate	62-50-0
Ethylbenzene	100-41-4
Famphur	52-85-7
Fluoranthene	206-44-0

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Low-Level Waste Management Area 4  
First Determination Assessment. (6 sheets)

Common Name	CAS Number*
Fluorene	86-73-7
gamma-BHC; Lindane	58-89-9
Heptachlor epoxide	1024-57-3
Heptachlor	76-44-8
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Hexachlorophene	70-30-4
Hexachloropropene	1888-71-7
Indeno(1,2,3-cd)pyrene	193-39-5
Isobutyl alcohol	78-83-1
Isodrin	465-73-6
Isophorone	78-59-1
Isosafrole	120-58-1
Kepone	143-50-0
m-Cresol	108-39-4
m-Dichlorobenzene	541-73-1
m-Dinitrobenzene	99-65-0
Methacrylonitrile	126-98-7
Methapyrilene	91-80-5
Methoxychlor	72-43-5
Methyl bromide; Bromomethane	74-83-9
Methyl chloride; Chloromethane	74-87-3
Methyl ethyl ketone; MEK	78-93-3
Methyl iodide; Iodomethane	74-88-4
Methyl methacrylate	80-62-6
Methyl methanesulfonate	66-27-3
Methyl parathion; Parathion methyl	298-00-0
Methylene bromide; Dibromomethane	74-95-3
Methylene chloride; Dichloromethane	75-09-2
m-Nitroaniline	99-09-2
Naphthalene	91-20-3
Nitrobenzene	98-95-3
N-Nitrosodiethylamine	55-18-5
N-Nitrosodimethylamine	62-75-9
N-Nitrosodi-n-butylamine	924-16-3
N-Nitrosodiphenylamine	86-30-6

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Low-Level Waste Management Area 4  
First Determination Assessment. (6 sheets)

Common Name	CAS Number <sup>a</sup>
N-Nitrosodipropylamine; Di-n-propyl nitrosamine	621-64-7
N-Nitrosomethylethylamine	10595-95-6
N-Nitrosomorpholine	59-89-2
N-Nitrosopiperidine	100-75-4
N-Nitrosopyrrolidine	930-55-2
O,O,O-Triethyl phosphorothioate	126-68-1
O,O-Diethyl O-2-pyrazinyl phosphorothioate; Thionazin	297-97-2
o-Cresol	95-48-7
o-Dichlorobenzene	95-50-1
o-Nitroaniline	88-74-4
o-Nitrophenol	88-75-5
o-Toluidine	95-53-4
p-(Dimethylamino)azobenzene	60-11-7
Parathion	56-38-2
p-Chloroaniline	106-47-8
p-Chloro-m-cresol	59-50-7
p-Cresol	106-44-5
p-Dichlorobenzene	106-46-7
Pentachlorobenzene	608-93-5
Pentachloroethane	76-01-7
Pentachloronitrobenzene	82-68-8
Pentachlorophenol	87-86-5
Phenacetin	62-44-2
Phenanthrene	85-01-8
Phenol	108-95-2
Phorate	298-02-2
p-Nitroaniline	100-01-6
p-Nitrophenol	100-02-7
Polychlorinated biphenyls; PCBs	1336-36-3 <sup>b</sup>
Polychlorinated dibenzofurans; PCDFs	See footnote d
Polychlorinated dibenzo-p-dioxins; PCDDs	See footnote c
p-Phenylenediamine	106-50-3
Pronamide	23950-58-5
Propionitrile; Ethyl cyanide	107-12-0
Pyrene	129-00-0
Pyridine	110-86-1
Safrole	94-59-7

Table 3. Selected 40 CFR 264, Appendix IX  
Groundwater Constituents for Low-Level Waste Management Area 4  
First Determination Assessment. (6 sheets)

Common Name	CAS Number <sup>a</sup>
Silvex; 2,4,5-TP	93-72-1
Styrene	100-42-5
sym-Trinitrobenzene	4
Tetrachloroethylene; Perchloroethylene; Tetrachloroethene	127-18-4
Tetraethyl dithiopyrophosphate; Sulfotepp	3689-24-5
Toluene	108-88-3
Toxaphene	8001-35-2
trans-1,2-Dichloroethylene	156-60-5
trans-1,3-Dichloropropene	10061-02-6
trans-1,4-Dichloro-2-butene	110-57-6
Trichloroethylene; Trichloroethene	79-01-6
Trichlorofluoromethane	75-69-4
Vinyl acetate	108-05-4
Vinyl chloride	75-01-4
Xylene (total)	1330-20-7

<sup>a</sup> Chemical Abstracts Services (CAS) registry number.

<sup>b</sup> Polychlorinated biphenyls contains congener chemicals, including aroclors.

<sup>c</sup> This category contains congener chemicals, including dioxins.

<sup>d</sup> This category contains congener chemicals, including benzofurans.

CFR = Code of Federal Regulations

LLWMA = low-level waste management area

## 4.2 EVALUATION PROCEDURES

Data evaluation will initially include quality assurance reviews to ensure that the requested analyses were received and meet the analytical performance requirements. The evaluation of results will primarily consist of determining if the selected analytes are detected in concentrations greater than the respective CRDLs. Data evaluation will also include the concentrations of TPHs, oil and grease, coliform bacteria, and chemical oxygen demand. The presence of these may indicate an impact from previously used nearby septic drain fields. If constituents identified in 40 CFR 264, Appendix IX are not detected above CRDLs, an indicator parameter evaluation program will then be reinstated.

If constituents identified in 40 CFR 264, Appendix IX are detected and confirmed, this assessment plan will be revised, and the second part of the assessment will be initiated.

## 5.0 SCHEDULE

The first sampling event will occur as soon as practical after Washington State Department of Ecology's receipt of this assessment plan. The next scheduled sampling month for LLWMA-4 is in January 2009 and will be performed as scheduled. If the December 18, 2008, sample analysis results do not indicate a source of the elevated TOC, wells 299-W15-224, 299-W15-83, and 299-W15-30 for the "first determination" will be planned for March 2009. Laboratory analysis results should be received within 45 days of sample collection and the data available to complete the "first determination" by June 30, 2009, if constituents identified in 40 CFR 264, Appendix IX are not detected.

If constituents identified in 40 CFR 264, Appendix IX are detected above CRDLs, sampling and analysis to confirm the presence of these constituents will add approximately 6 weeks to the schedule to complete the "first determination."

After the data are evaluated and conclusions are reached, a report will be transmitted to the Washington State Department of Ecology within 15 days, stating whether groundwater monitoring will return to indicator evaluation or continue with a groundwater quality assessment program.

## 6.0 REFERENCES

- 40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*.
- 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*.
- APHA, AWWA, and WEF, 1998, *Standard Methods for the Examination of Water and Wastewater, 20<sup>th</sup> Edition*, American Public Health Association, American Water Works Association, and Water Environmental Federation, Washington, D.C.
- Ecology, EPA, and DOE, 2003, *Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement)*, 2 vols., as amended, 89-10, Rev. 6, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
- EPA-600/4-84-017, 1984, *Test Methods for Determination of Inorganic Anions in Water by Ion Chromatography*, EPA Method 300.0, U.S. Environmental Protection Agency, Washington, D.C.
- PNNL-14859, 2004, *Interim Status Groundwater Monitoring Plan for Low-Level Waste Management Areas 1 to 4, RCRA Facilities, Hanford, Washington*, Pacific Northwest National Laboratory, Richland, Washington.
- PNNL-14859-ICN-1, 2006, *Interim Status Groundwater Monitoring Plan for Low-Level Waste Management Areas 1 to 4, RCRA Facilities, Hanford, Washington*, Pacific Northwest National Laboratory, Richland, Washington.
- PNNL-14859-ICN-2, 2007, *Interim Status Groundwater Monitoring Plan for Low-Level Waste Management Areas 1 to 4, RCRA Facilities, Hanford, Washington*, Pacific Northwest National Laboratory, Richland, Washington.

*Resource Conservation and Recovery Act of 1976*, Public Law 94-580, as amended, 90 Stat. 2795, 42 U.S.C. 6901, et seq.

SW-846, 1997, *Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods*, 3<sup>rd</sup> edition (as amended by Update I [July 1992], Update IIA [August, 1993], Update IIB [January 1995], and Update III), U.S. Environmental Protection Agency, Washington, D.C.

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

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*.