



0073867

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

07-AMRC-0285

408 9 1 2007

Mr. Nicholas Ceto, Program Manager
Office of Environmental Cleanup
Hanford Project Office
U.S. Environmental Protection Agency
309 Bradley Blvd, Suite 115
Richland, Washington 99352

Dear Mr. Ceto:

ENVIRONMENTAL RESTORATION DISPOSAL FACILITY (ERDF) LEACHATE
SAMPLING AND ANALYSIS PLAN (LSAP)-WCH-173, REV. 0

Enclosed for your review and approval is a copy of the subject LSAP (Enclosure 1). This version updates the analyte lists and changes the Method Detection Limit (MDL) values to Practical Quantification Limit (PQL) values. To facilitate your review, also enclosed is a listing of the key changes between this revision and the current LSAP (Enclosure 2). This revision has been discussed with David Einan of your staff. If you or members of your staff have questions regarding this revision, they may contact me or Owen Robertson, of my staff, on (509) 373-6295.

Sincerely,

Joe R. Franco
Joe R. Franco, Assistant Manager
for the River Corridor

AMRC:OCR

Enclosures

cc w/encls:
D. R. Einan, EPA
J. A. Hedges, Ecology
Administrative Record, H6-08

cc w/o encls:
K. A. Hadley, WCH

RECEIVED
SEP 06 2007

EDMC

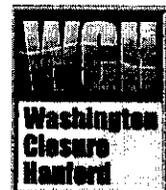
River Corridor Closure Contract

Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan

August 2007

Washington Closure Hanford

Prepared for the U.S. Department of Energy, Richland Operations Office
Office of Assistant Manager for River Corridor



TRADEMARK DISCLAIMER

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy.
Available in paper copy and microfiche.

Available for a processing fee to U.S. Department of Energy
and its contractors from:
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
(865) 576-8401
fax: (865) 576-5728
email: reports@adonis.osti.gov
online ordering: <http://www.doe.gov/bridge>

Available for sale to the public, in paper, from:
U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(800) 553-6847
fax: (703) 605.6900
email: orders@ntis.fedworld.gov
online ordering: <http://www.ntis.gov/ordering.htm>

Printed in the United States of America

DISCLM-5.CHP (11/99)

DOE-RL AND/OR REGULATOR APPROVAL PAGE

Title: Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan

Approval: O. C. Robertson
U.S. Department of Energy, Richland Operations Office

Signature

Date

D. R. Einan
U.S. Environmental Protection Agency

Signature

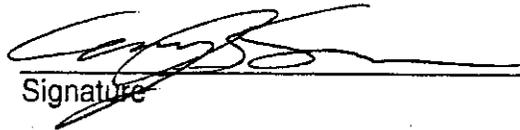
Date

STANDARD APPROVAL PAGE

Title: Environmental Restoration Disposal Facility Leachate Sampling and Analysis Plan

Author Name: J. L. Gilbert

Approval: G. B. Snow, Waste Operations Project Engineer



Signature

8/15/07

Date

The approval signature on this page indicates that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

**River Corridor
Closure Contract** 

**Environmental Restoration
Disposal Facility Leachate
Sampling and Analysis Plan**

August 2007

Author:

J. L. Gilbert



TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	SAMPLING OBJECTIVES.....	1
1.2	ANALYTICAL DESIGN.....	1
	1.2.1 Routine Test Parameters.....	15
	1.2.2 Rationale	16
	1.2.3 Sampling Strategy	17
1.3	PROJECT ORGANIZATION AND RESPONSIBILITY	18
	1.3.1 Project Responsibility	18
	1.3.2 Support Responsibilities	19
1.4	SAMPLE COLLECTION.....	19
	1.4.1 Sample Collection Techniques	19
	1.4.2 Sample Volume, Preservation, and Holding Times	19
	1.4.3 Sample Documentation	24
	1.4.4 Sample Identification and Labeling.....	24
	1.4.5 Chain-of-Custody Procedures	24
	1.4.6 Sample Packaging and Shipping.....	24
1.5	SAMPLING QUALITY ASSURANCE AND QUALITY CONTROL.....	25
	1.5.1 Equipment Operation and Calibration.....	25
	1.5.2 Preventive Maintenance	25
	1.5.3 Field Quality Control Requirements.....	25
1.6	LABORATORY ANALYSIS	26
	1.6.1 Analytical Methods.....	26
	1.6.2 Detection Limits	26
	1.6.3 Bendiocarb Analysis	27
	1.6.4 Laboratory Quality Assurance and Control.....	27
	1.6.5 Laboratory Quality Control Acceptance Criteria	28
1.7	DATA MANAGEMENT	28
	1.7.1 Data Reporting.....	28
	1.7.2 Data Validation	28
	1.7.3 Data Management	29
1.8	AUDITING AND ASSESSMENT	29
1.9	DATA QUALITY	29
1.10	CORRECTIVE ACTIONS.....	29

2.0 REFERENCES..... 30

FIGURE

1. Hanford Site Annual Precipitation Values, 1946-2006 17

TABLES

1. ERDF Delisting Levels and Comparison to Analytical Results..... 2
2. Contaminants of Concern Having No Established Delisting Levels..... 6
3. COC Analytical Methods, Delisting Levels, and Quantification Limits..... 7
4. Sampling and Holding Time Requirements for the Contaminants of Concern
Analytical Methods 21

ACRONYMS

COC	contaminant of concern
DOE	U.S. Department of Energy
DRAS	delisting risk assessment software
ENRE	Environmental Restoration database
EPA	U.S. Environmental Protection Agency
EPL	Environmental Project Lead
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
HASQARD	<i>Hanford Analytical Services Quality Assurance Requirements (DOE/RL-96-68)</i>
LWPF	Liquid Waste Processing Facility
PQL	practical quantification limit
QA	quality assurance
QC	quality control
ROD	record of decision
SAF	sample authorization form
SAP	sampling and analysis plan
STR	Subcontract Technical Representative
TIC	tentatively identified compound
WCH	Washington Closure Hanford

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>
Length			Length		
inches	25.4	millimeters	millimeters	0.039	inches
inches	2.54	centimeters	centimeters	0.394	inches
feet	0.305	meters	meters	3.281	feet
yards	0.914	meters	meters	1.094	yards
miles	1.609	kilometers	kilometers	0.621	miles
Area			Area		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	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
Mass (weight)			Mass (weight)		
ounces	28.35	grams	grams	0.035	ounces
pounds	0.454	kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			Volume		
teaspoons	5	milliliters	milliliters	0.033	fluid ounces
tablespoons	15	milliliters	liters	2.1	pints
fluid ounces	30	milliliters	liters	1.057	quarts
cups	0.24	liters	liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			Radioactivity		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

1.0 INTRODUCTION

This document provides the sampling and analysis plan (SAP) and sampling objectives for the Environmental Restoration Disposal Facility (ERDF) leachate. Approved handling methods, conditional delisting of the leachate, and possible additions to groundwater monitoring contaminants of concern (COCs) will be based on the requirements of this SAP and its implementing documents.

1.1 SAMPLING OBJECTIVES

There are two alternatives for handling the ERDF leachate: store the leachate and reuse it at the ERDF, or transfer the leachate to the Effluent Treatment Facility (ETF) for treatment. Authorized alternatives for reuse of the leachate include dust suppression and waste compaction within the trench. Regardless of the disposition pathway for leachate, sampling and analysis are required to confirm ongoing compliance with the delisting criteria. Characterization data also are required if the leachate is to be disposed of at the ETF. Further, as part of the groundwater protection program leachate data are evaluated on an annual basis to identify potential impacts to groundwater in the vicinity of the ERDF, and to determine if it is necessary to add constituents to the ERDF groundwater monitoring COC list. The objectives of ongoing leachate sampling and analysis are summarized as follows:

1. Evaluate the continuing compliance of the leachate with delisting criteria.
2. Verify that liquid to be transferred to the ETF meets the ETF waste acceptance criteria.
3. Identify potential impacts to groundwater and determine whether the ERDF groundwater monitoring COC list is appropriate.

The sampling logic for completing these objectives is provided in the *Environmental Restoration Disposal Facility Leachate Delisting Petition* (DOE-RL 1999) and the *Groundwater Protection Plan for the Environmental Restoration Disposal Facility* (FH 2007). The initial eligibility of the leachate for delisting was previously determined through analysis of characterization samples. Future sampling will provide data to support the above three objectives. The basic premise of the sampling logic is that all COCs are placed into one of two groups: those that will be monitored on a confirmatory basis, and those that will be monitored on a more frequent routine basis.

1.2 ANALYTICAL DESIGN

The organic and inorganic COC list for characterization consolidates the following:

- Regulated constituents previously detected in the leachate
- The list of constituents and test parameters derived in the delisting petition (DOE-RL 1999) and subsequent evaluations of delisting parameters (Table 1)

- Constituents not currently having established delisting levels but determined to require monitoring (Table 2)
- All constituents required by the ETF waste acceptance criteria (FH 2005)
- Constituents included in the routine groundwater sampling program.

Table 1. ERDF Delisting Levels and Comparison to Analytical Results. (5 Pages)

CAS #	Constituent	Delisting Level ^a	Primary Sample ^b	Duplicate Sample ^b
100-25-4	1,4-Dinitrobenzene	240	10 U	10 U
100-41-4	Ethyl benzene	1680000	5 U	5 U
100-42-5	Styrene	2400	5 U	5 U
100-51-6	Benzyl alcohol	240000	10 U	10 U
1024-57-3	Heptachlor Epoxide	4.8	0.05 U	0.05 U
105-67-9	2,4-Dimethylphenol	16800	10 U	10 U
106-46-7	1,4-Dichlorobenzene	96	10 UJ	10 UJ
106-50-3	p-Phenylenediamine	168000	10 U	10 U
106-93-4	Ethylene dibromide	1.2	10 U	10 U
107-02-8	Acrolein	16800	20 U	20 U
107-05-1	3-Chloropropene (Allyl chloride)	96	10 U	10 U
107-06-2	1,2-Dichloroethane	120	5 U	5 U
107-13-1	Acrylonitrile	4.8	5 U	5 U
108-05-4	Acetic acid vinyl ester (Vinyl acetate)	960000	10 U	10 U
108-10-1	4-Methyl-2-pentanone (MIBK)	48000	10 U	10 U
108-60-1	Bis(2-Chloroisopropyl) ether	24	10 U	10 U
108-88-3	Toluene	24000	5 U	5 U
108-90-7	Chlorobenzene	2400	5 U	5 U
108-95-2	Phenol	480000	10 U	10 U
110-86-1	Pyridine	960	10 U	10 U
111-44-4	Bis(2-chloroethyl) ether	1.92	10 U	10 U
117-81-7	Bis(2-ethylhexyl) phthalate	144	10 U	10 U
117-84-0	Di-n-octylphthalate	16800	10 U	10 U
120-12-7	Anthracene	240000	10 U	10 U
120-82-1	1,2,4-Trichlorobenzene	1680	10 UJ	10 UJ
120-83-2	2,4-Dichlorophenol	2400	10 U	10 U
122-39-4	N,N-Diphenylamine	21600	10 U	10 U
122-66-7	1,2-Diphenylhydrazine	2.4	10 U	10 U
123-91-1	1,4-Dioxane	192	10 U	10 U
124-48-1	Dibromochloromethane	24	5 U	5 U

Table 1. ERDF Delisting Levels and Comparison to Analytical Results. (5 Pages)

CAS #	Constituent	Delisting Level ^a	Primary Sample ^b	Duplicate Sample ^b
126-98-7	2-Methyl-2-propenenitrile (Methacrylonitrile)	96	10 U	10 U
127-18-4	1,1,2,2-Tetrachloroethene	120	5 U	5 U
129-00-0	Pyrene	24000	10 U	10 U
131-11-3	Dimethyl phthalate	9600000	10 U	10 U
1319-77-3	Cresols, total	48000	10U	10U
1330-20-7	Xylene	240000	5 U	5 U
1336-36-3	Polychlorinated biphenyls (PCBs)	12	2U	2U
141-78-6	Acetic acid ethyl ester (Ethyl acetate)	720000	10 U	10 U
14797-55-8	Nitrate	1,062,000	418,000 ^c JD	373,000 ^c JD
156-59-2	1,2-cis-Dichloroethene	9600	5 U	5 U
156-60-5	1,2-trans-Dichloroethene	16800	5 U	5 U
16984-48-8	Fluoride	96000	2500 ^c UD	2500 ^c UD
18540-29-9	Hexavalent chromium	620	^d	^d
193-39-5	Indeno(1,2,3-cd)pyrene	5.04	0.44 U	0.44 U
205-99-2	Benzo(b)fluoranthene	1.704	0.18 U	0.18 U
206-44-0	Fluoranthene	24000	10 U	10 U
207-08-9	Benzo(k)fluoranthene	604.8	0.17 U	0.17 U
218-01-9	Chrysene	64.8	1.5 U	1.5 U
309-00-2	Aldrin	0.12	0.05 U	0.05 U
319-84-6	alpha-BHC	0.24	0.05 U	0.05 U
319-85-7	beta-BHC	1.2	0.05 U	0.05 U
50-00-0	Formaldehyde	168000	12 UJ	12 UJ
50-29-3	4,4-DDT	7.2	0.1 U	0.1 U
50-32-8	Benzo(a)pyrene	4.8	0.23 U	0.23 U
51-28-5	2,4-Dinitrophenol	1680	25 U	25 U
53-70-3	Dibenz[a,h]anthracene	0.264	0.31 U	0.31 U
541-73-1	1,3-Dichlorobenzene	45360	10 UJ	10 UJ
542-75-6	1,3-Dichloropropene	12	5 U	5 U
56-23-5	Carbon tetrachloride	120	5 UJ	5 U
56-55-3	Benzo(a)anthracene	1.848	0.13 U	0.13 U
57-12-5	Cyanide	4800	5 U	10 U
57-97-6	7,12-Dimethylbenz[a]anthracene	.00031	10 ^{c,d} U	10 ^{c,d} U
58-89-9	Gamma-BHC (lindane)	4.8	0.05 U	0.05 U
59-50-7	4-Chloro-3-methylphenol	30240	10 U	10 U
60-29-7	Ethyl ether	168000	10 U	10 U
60-57-1	Dieldrin	0.12	0.1 U	0.1 U

Table 1. ERDF Delisting Levels and Comparison to Analytical Results. (5 Pages)

CAS #	Constituent	Delisting Level ^a	Primary Sample ^b	Duplicate Sample ^b
608-93-5	Pentachlorobenzene	3400	10 ^{c,d} U	10 ^{c,d} U
621-64-7	N-Nitroso-di-n-propylamine	0.24	10 U	10 U
62-50-0	Ethyl methanesulfonate	0.0072	10 U	10 U
62-53-3	Aniline	240	10 U	10 U
62-75-9	N-Nitroso-N,N-dimethylamine	0.048	10 U	10 U
64-18-6	Formic acid	293000	^d	^d
67-56-1	Methyl alcohol	480000	5000 ^c U	5000 ^c U
67-64-1	2-Propanone (Acetone)	96000	10 U	10 U
67-66-3	Chloroform	2400	5 U	5 U
67-72-1	Hexachloroethane	144	10 UJ	10 UJ
70-30-4	Hexachlorophene	240	100 U	100 U
71-36-3	n-Butyl alcohol	96000	250 U	250 U
71-43-2	Benzene	120	5 U	5 U
71-55-6	1,1,1-Trichloroethane	4800	5 U	5 U
72-20-8	Endrin	48	0.1 U	0.1 U
72-54-8	4,4-DDD	9.6	0.1 U	0.1 U
72-55-9	4,4-DDE	7.2	0.1 U	0.1 U
7439-92-1	Lead	360	1.6 ^c U	1.6 ^c U
7439-96-5	Manganese	2400	0.2 U	0.2 U
7439-97-6	Mercury	48	0.1 U	0.1 U
7440-02-0	Nickel	2400	22.7 ^c	18.7 ^c
7440-22-4	Silver	4800	0.9 U	0.9 U
7440-28-0	Thallium	48	4 B	3.7 U
7440-31-5	Tin	504000	3.6 ^c U	3.6 ^c U
7440-36-0	Antimony	144	2.5 ^c U	2.5 ^c U
7440-38-2	Arsenic	1200	7.3 ^c	6.6 ^c
7440-39-3	Barium	48000	127 ^c C	127 ^c C
7440-41-7	Beryllium	96	0.12 U	0.16 U
7440-43-9	Cadmium	120	0.4 U	0.4 U
7440-47-3	Chromium	2400	29.6 ^c	28.5 ^c
7440-48-4	Cobalt	50400	0.6 U	0.6 U
7440-50-8	Copper	31200	9 ^c	9.1 ^c
7440-62-2	Vanadium	7200	16.9 ^c	17 ^c
7440-66-6	Zinc	240000	5.7 ^c	6.7 ^c
74-83-9	Bromomethane	1200	10 U	10 U
74-87-3	Chloromethane	808.8	10 U	10 U

Table 1. ERDF Delisting Levels and Comparison to Analytical Results. (5 Pages)

CAS #	Constituent	Delisting Level ^a	Primary Sample ^b	Duplicate Sample ^b
74-95-2	Dibromomethane	1460	10 ^{c,d} U	10 ^{c,d} U
75-00-3	Chloroethane	134	10 ^{c,d} U	10 ^{c,d} U
75-01-4	1-Chloroethene (vinyl chloride)	48	10 U	10 U
75-05-8	Acetonitrile	4800	20 U	20 U
75-09-2	Dichloromethane (methylene chloride)	120	3 BJ	2 BJ
75-15-0	Carbon disulfide	96000	5 U	5 U
75-25-2	Tribromomethane (Bromoform)	2400	5 U	5 U
75-27-4	Bromodichloromethane	33.6	5 U	5 U
75-34-3	1,1-Dichloroethane	21.6	5 U	5 U
75-35-4	1,1-Dichloroethene	168	5 U	5 U
75-69-4	Trichlorofluoromethane	240000	5 ^c J	5 ^c
75-71-8	Dichlorodifluoromethane	168000	10 U	10 U
76-13-1	1,2,2-Trichlorotrifluoroethane (Freon 113)	24000000	10 U	10 U
76-44-8	Heptachlor	2.4	0.05 U	0.05 U
7782-49-2	Selenium	1200	6.4 ^c	4.5 ^c
78-59-1	Isophorone	2160	10 U	10 U
78-83-1	2-Methylpropyl alcohol (Isobutyl alcohol)	240000	100 U	100 U
78-87-5	1,2-Dichloropropane	120	5 U	5 U
78-93-3	2-Butanone (MEK)	480000	10 U	10 U
79-00-5	1,1,2-Trichloroethane	120	5 U	5 U
79-01-6	1,1,2-Trichloroethylene	192	5 U	5 U
79-34-5	1,1,2,2-Tetrachloroethane	9.6	5 U	5 U
8001-35-2	Toxaphene	72	5 U	5 U
83-32-9	Acenaphthene	48000	10 U	10 U
84-66-2	Diethyl phthalate	720000	10 U	10 U
84-74-2	Di-n-butylphthalate	96000	0.5 J	0.5 J
85-68-7	Butylbenzylphthalate	168000	10 U	10 U
86-30-6	N-Nitrosodiphenylamine	480	10 U	10 U
86-73-7	Fluorene	24000	10 U	10 U
87-68-3	Hexachlorobutadiene	24	10 UJ	10 UJ
87-86-5	Pentachlorophenol	16.8	25 U	25 U
88-06-2	2,4,6-Trichlorophenol	192	10 U	10 U
88-87-7	2-secButyl-4,6-dinitrophenol	33.6	10 ^{c,d} U	10 ^{c,d} U
91-20-3	Naphthalene	24000	10 U	10 U
91-58-7	2-Chloronaphthalene	72000	10 UJ	10 UJ
91-59-8	2-Naphthylamine	2.4	10 U	10 U

Table 1. ERDF Delisting Levels and Comparison to Analytical Results. (5 Pages)

CAS #	Constituent	Delisting Level ^a	Primary Sample ^b	Duplicate Sample ^b
94-47-6	o-xylene	7800	10 ^{c,d,e} U	10 ^{c,d,e} U
94-75-7	2,4-D	1680	1 U	1 U
95-50-1	1,2-Dichlorobenzene	14400	10 UJ	10 UJ
95-57-8	2-Chlorophenol	4800	10 U	10 U
95-70-5	2,5-Diamintoluene	230400	f	f
95-95-4	2,4,5-Trichlorophenol	96000	25 U	25 U
98-82-8	(1-Methylethyl)benzene	24000	10 ^c U	10 ^c U
98-86-2	Acetophenone	96000	10 U	10 U
98-95-3	Nitrobenzene	480	10 U	10 U
99-65-0	1,3-Dinitrobenzene	96	10 U	10 U

^a Delisting level = 24 times the docket value.

^b Sampling event of January 12, 1999, unless otherwise noted. All values reported in µg/L.

^c Sampling event of December 2006.

^d Not included in 1999 lists, added February 2005 (BHI 2005b). Hexavalent chromium and formic acid analyses were not directly performed in December 2006.

^e Reported as total xylenes.

^f This analyte degrades during analysis, no useable values can be reported.

B = qualifier denotes the organic analyte was detected in the associated quality control blank and in the sample

C = qualifier denotes the inorganic analyte was detected in the associated laboratory batch blank

D = qualifier denotes that results were reported from secondary dilution of the sample

J = qualifier denotes estimated value

U = qualifier denotes not detected

CAS = Chemical Abstracts Service

Table 2. Contaminants of Concern Having No Established Delisting Levels. (2 Pages)

CAS#	Constituent	Concentration Reported in Leachate ^a
100-02-7	4-Nitrophenol	25 U
101-55-3	4-Bromophenylphenyl ether	10 U
106-99-0	1,3-Butadiene	ND
109-99-9	Tetrahydrofuran (THF – furan indicator)	ND
110-75-8	2-Chloroethyl vinyl ether	10 U
111-91-1	Bis(2-Chloroethoxy)methane	10 U
126-68-1	O,O,O-Triethyl phosphorothioate	ND
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	ND
134-32-7	alpha-Naphthylamine	10 U
14265-44-2	Phosphate	NA
14797-65-0	Nitrite	2500 UJ
14808-79-8	Sulfate	570000
1634-02-2	Tetrabutylthiuram disulfide	Evaluated as sulfide - 12000
16887-00-6	Chloride	224000

Table 2. Contaminants of Concern Having No Established Delisting Levels. (2 Pages)

CAS#	Constituent	Concentration Reported in Leachate ^a
22781-23-3	Bendiocarb	NA
24959-67-9	Bromide	2500 UD
26545-73-3	Dichloropropanol	ND
59-89-2	N-Nitrosomorpholine	10 U
591-08-2	1-Acetyl-2-thiourea	ND
7429-90-5	Aluminum	63.2 U
7439-95-4	Magnesium	76600
7440-21-3	Silicon	20000 J
75-70-7	Trichloromethanethiol	ND
NH3-N	Nitrogen in ammonia	100 U
WTPH-G ^b	Total petroleum hydrocarbons – Gasoline Range	30 U
WTPH-D ^b	Total petroleum hydrocarbons – Diesel Range	300

^a All results in µg/L except where noted. Results are from December 2006 sampling.

^b Not included in 1999 lists, added February 2005 (BHI 2005b).

ND = not detected via spectral search

J = qualifier denotes estimated value

U = qualifier denotes not detected

CAS = Chemical Abstracts Service

NA = not analyzed

The leachate sampling and analysis process is discussed in detail in the following sections. The complete list of constituents undergoing continuing evaluation and their corresponding analytical methods are presented in Table 3. Note that Table 3 is a comprehensive list of all analytes included in the confirmatory sampling program, some of which are not actually classified as COCs.

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
100-02-7	4-Nitrophenol	8270C	^b	25	
100-25-4	1,4-Dinitrobenzene	8270C	240	10	
100-41-4	Ethyl benzene	8260B	1680000	5	
100-42-5	Styrene	8260B	2400	5	
100-51-6	Benzyl alcohol	8270C	240000	10	
10061-01-5	cis-1,3-Dichloropropene	8260B	12	5	^c
10061-02-6	trans-1,3-Dichloropropene	8260B	12	5	^c
101-55-3	4-Bromophenylphenyl ether	8270C	^b	10	
1024-57-3	Heptachlor epoxide	8081A	4.8	.05	
105-67-9	2,4-Dimethylphenol	8270C	16800	10	
106-46-7	1,4-Dichlorobenzene	8270C	96	10	

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
106-50-3	p-Phenylenediamine	8270C	168000	10	
106-93-4	<i>Ethylene dibromide (1,2 Dibromoethane)</i>	8260B	1.2	10	^c
106-99-0	1,3-Butadiene	8260B	^b		Evaluated via TIC Search
107-02-8	Acrolein	8260B	16800	20	
107-05-1	3-Chloropropene (allyl chloride)	8260B	96	10	^c
107-06-2	1,2-Dichloroethane	8260B	120	5	
107-13-1	<i>Acrylonitrile</i>	8260B	4.8	5	^c
108-05-4	Acetic acid vinyl ester (vinyl acetate)	8260B	960000	10	
108-10-1	4-Methyl-2-pentanone (MIBK)	8260B	48000	10	
108-60-1	Bis(2-Chloroisopropyl) ether	8270C	24	10	
108-88-3	Toluene	8260B	24000	5	
108-90-7	Chlorobenzene	8260B	2400	5	
108-95-2	Phenol	8270C	480000	10	
109-99-9	Tetrahydrofuran (THF – furan indicator)	8260C	^b		Evaluated via TIC search
110-75-8	2-Chloroethyl vinyl ether	8260B	^b	10	
110-86-1	Pyridine	8270C	960	10	
111-44-4	<i>Bis(2-chloroethyl) ether</i>	8270C	1.92	10	
111-91-1	Bis(2-Chloroethoxy)methane	8270C	^b	10	
117-81-7	Bis(2-ethylhexyl) phthalate	8270C	144	10	
117-84-0	Di-n-octylphthalate	8270C	16800	10	
120-12-7	Anthracene	8270C or 8310	240000	10 0.1	
120-82-1	1,2,4-Trichlorobenzene	8270C	1680	10	
120-83-2	2,4-Dichlorophenol	8270C	2400	10	
122-39-4	N,N-Diphenylamine (Diphenylamine)	8270C	21600	10	
122-66-7	<i>1,2-Diphenylhydrazine</i>	8270C	2.4	10	
123-91-1	1,4-Dioxane	8270C	192	10	
124-48-1	Dibromochloromethane	8260B	24	5	^c
126-68-1	O,O,O-Triethyl phosphorothioate	8270C	^b	10	
126-98-7	2-Methyl-2-propenenitrile (methacrylonitrile)	8260B	96	10	^c

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
127-18-4	1,1,2,2-Tetrachloroethene (Tetrachloroethene)	8260B	120	5	
129-00-0	Pyrene	8270C and 8310	24000	10 0.1	
131-11-3	Dimethyl phthalate	8270C	9600000	10	
131-89-5	2-Cyclohexyl-4,6-dinitrophenol	8270C	b		Evaluated via TIC search
1319-77-3	Cresols, total	8270C	48000	As Isomers	
1330-20-7	Xylene	8260B	240000	5	
1336-36-3	Polychlorinated biphenyls (PCBs)	8082	12	0.4 – 1	Depending on Aroclor
134-32-7	Alpha-Naphthylamine (1-Naphthylamine)	8270C	b	10	
141-78-6	Acetic acid ethyl ester (Ethyl Acetate)	8260B	720000	10	
14265-44-2	Phosphate	9056	b	250	
14797-55-8	Nitrate	9056	240000	250	
14797-65-0	Nitrite	9056	b	250	
14808-79-8	Sulfate	9056	b	250	
156-59-2	1,2-cis-Dichloroethene	8260B	9600	5	
156-60-5	1,2-trans-Dichloroethene	8260B	16800	5	
1634-02-2 18496-25-8	Tetrabutylthiuram disulfide Sulfide	9030B	b	1000	This compound is likely to dissociate to sulfide. Sulfide analysis is specified.
16887-00-6	Chloride	9056	b	250	
16984-48-8	Fluoride	9056	96000	250	
18540-29-9	Hexavalent Chromium	7196A	620	10	
193-39-5	Indeno(1,2,3-cd)pyrene	8270C and 8310	5.04	10 0.1	
205-99-2	Benzo(b)fluoranthene	8270C and 8310	1.704	10 0.1	
206-44-0	Fluoranthene	8270C and 8310	24000	10 0.1	
207-08-9	Benzo(k)fluoranthene	8270C and 8310	604.8	10 0.1	
218-01-9	Chrysene	8270C and 8310	64.8	10 0.1	
22781-23-3	Bendiocarb	8318	b		See discussion in Section 1.6.3
24959-67-9	Bromide	9056	b	250	

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
26545-73-3	Dichloropropanol	8260B	^b		Evaluated via TIC search
309-00-2	Aldrin	8081A	0.12	0.05	
319-84-6	Alpha-BHC	8081A	0.24	0.05	
319-85-7	beta-BHC (beta 1,2,3,4,5,6-Hexachlorovenezene)	8081A	1.2	0.05	
50-00-0	Formaldehyde	8315A	168000	25	
50-29-3	4,4-DDT	8081A	7.2	0.05	
50-32-8	Benzo(a)pyrene	8270C and 8310	4.8	10 0.1	
51-28-5	2,4-Dinitrophenol	8270C	1680	25	
53-70-3	Dibenz[a,h]anthracene	8270C and 8310	0.264	10 0.1	
541-73-1	1,3-Dichlorobenzene	8270C	45360	10	
542-75-6	1,3-Dichloropropene	8260B	12	As Isomers	
56-23-5	Carbon tetrachloride	8260B	120	5	
56-55-3	Benzo(a)anthracene	8270C and 8310	1.848	10 0.1	
57-12-5	Cyanide	9010B	4800	5	
57-97-6	7,12-Dimethylbenz[a]anthracene	8270C	0.00031	10	
58-89-9	Gamma-BHC (lindane)	8081A	4.8	0.05	
591-08-2	1-Acetyl-2-thiourea	8270C	^b		Evaluated via TIC search
59-50-7	4-Chloro-3-methylphenol	8270C	30240	10	
59-89-2	N-Nitrosomorpholine	8270C	^b	10	
59473-04-0	Total Organic Halides	9020	^b	20	
60-29-7	Ethyl ether (Diethyl ether)	8260B	168000	10	
60-57-1	Dieldrin	8081A	0.12	0.05	
608-93-5	Pentachlorobenzene	8270C	3400	10	
621-64-7	N-Nitroso-di-n-propylamine	8270C or 8070A	0.24	10 NA	8070A is not commercially available
62-50-0	Ethyl methanesulfonate	8270C	0.0072	10	
62-53-3	Aniline	8270C	240	10	
62-75-9	N-Nitroso-N,N-dimethylamine	8270C or 8070A	0.048	10 NA	8070A is not commercially available
64-18-6	Formic acid	300.0 Modified	293000	250	Analysis capability may be limited
65794-96-9	3+4 Methylphenol (m+p Cresol)	8270C	48000	10	

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
67-56-1	Methyl alcohol (Methanol)	8015	480000	5000	
67-64-1	2-Propanone (acetone)	8260B	96000	10	
67-66-3	Chloroform	8260B	2400	5	
67-72-1	Hexachloroethane	8270C	144	10	
70-30-4	Hexachlorophene	8270C	240	50	
71-36-3	n-Butyl alcohol	8260B	96000	50	
71-43-2	Benzene	8260B	120	5	
71-55-6	1,1,1-Trichloroethane	8260B	4800	5	
72-20-8	Endrin	8081A	48	0.05	
72-54-8	4,4-DDD	8081A	9.6	0.05	
72-55-9	4,4-DDE	8081A	7.2	0.05	
7429-90-5	Aluminum	6010B	^b	25	
7439-92-1	Lead	6010B	360	2	
7439-95-4	Magnesium	6010B	^b	5	
7439-96-5	Manganese	6010B	2400	1	
7439-97-6	Mercury	7470A	48	0.2	
7440-02-0	Nickel	6010B	2400	3	
7440-21-3	Silicon	6010B	^b	10	
7440-22-4	Silver	6010B	4800	1	
7440-28-0	Thallium	6010B	48	6	
7440-31-5	Tin	6010B	504000	4	
7440-36-0	Antimony	6010B	144	3	
7440-38-2	Arsenic	6010B	1200	4	
7440-39-3	Barium	6010B	48000	1	
7440-41-7	Beryllium	6010B	96	1	
7440-43-9	Cadmium	6010B	120	1	
7440-47-3	Chromium	6010B	2400	2	
7440-48-4	Cobalt	6010B	50400	1	
7440-50-8	Copper	6010B	3120	1	
7440-62-2	Vanadium	6010B	7200	1	
7440-66-6	Zinc	6010B	240000	1	
74-83-9	Bromomethane	8260B	1200	10	
74-87-3	Chloromethane	8260B	808.8	10	
74-97-3	Dibromoethane	8260B	1460	10	
75-00-3	Chloroethane	8260B	134	10	
75-01-4	1-Chloroethene (vinyl chloride)	8260B	48	10	^c

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
75-05-8	Acetonitrile	8260B	4800	20	
75-09-2	Dichloromethane (methylene chloride)	8260B	120	5	
75-15-0	Carbon disulfide	8260B	96000	5	
75-25-2	Tribromomethane (bromoform)	8260B	2400	5	
75-27-4	Bromodichloromethane	8260B	33.6	5	^c
75-34-3	1,1-Dichloroethane	8260B	21.6	5	^c
75-35-4	1,1-Dichloroethene	8260B	168	5	
75-69-4	Trichlorofluoromethane	8260B	240000	5	
75-70-7	Trichloromethanethiol	8260B	^b		Evaluated via TIC search
75-71-8	Dichlorodifluoromethane	8260B	168000	10	
76-13-1	1,2,2-Trichlorotrifluoroethane (Freon 113)	8260B	24000000	10	
76-44-8	Heptachlor	8081A	2.4	0.05	
7782-49-2	Selenium	6010B	1200	5	
78-59-1	Isophorone	8270C	2160	10	
78-83-1	2-Methylpropyl alcohol (isobutyl alcohol)	8260B	240000	50	
78-87-5	1,2-Dichloropropane	8260B	120	5	
78-93-3	2-Butanone (MEK)	8260B	480000	10	
79-00-5	1,1,2-Trichloroethane	8260B	120	5	
79-01-6	1,1,2-Trichloroethylene (Trichloroethene)	8260B	192	5	
79-34-5	1,1,2,2-Tetrachloroethane	8260B	9.6	5	^c
8001-35-2	Toxaphene	8081A	72	0.5	
83-32-9	Acenaphthene	8270C and 8310	48000	10 1	
84-66-2	Diethyl phthalate	8270C	720000	10	
84-74-2	Di-n-butylphthalate	8270C	96000	10	
85-68-7	Butylbenzylphthalate	8270C	168000	10	
86-30-6	N-Nitrosodiphenylamine	8270C	480	10	
86-73-7	Fluorene	8270C and 8310	24000	10 0.1	
87-68-3	Hexachlorobutadiene	8270C	24	10	
87-86-5	Pentachlorophenol	8270C and 8151	16.8	25 0.5	
88-06-2	2,4,6-Trichlorophenol	8270C	192	10	

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
88-85-7	2-secButyl-4,6-dinitrophenol	8270C	33.6	10	
91-20-3	Naphthalene	8270C and 8310	24000	10 1	
91-58-7	2-Chloronaphthalene	8270C	72000	10	
91-59-8	2-Naphthylamine	8270C	2.4	10	
94-75-7	2,4-D	8151A	1680	0.5	
95-47-6	o-xylene	8260B	7880	10	Analyzed as total xylenes
95-48-7	o-Cresol	8270C	48000	10	
95-50-1	1,2-Dichlorobenzene	8270C	14400	10	
95-57-8	2-Chlorophenol	8270C	4800	10	
95-70-5	2,5-Diaminotoluene	8270C	2304000		Degrades during extraction ^d
95-95-4	2,4,5-Trichlorophenol	8270C	96000	25	
98-82-8	(1-Methylethyl)benzene (Isopropylbenzene)	8260B	24000	5	
98-86-2	Acetophenone	8270C	96000	10	
98-95-3	Nitrobenzene	8270C	480	10	
99-65-0	1,3-Dinitrobenzene (m-Dinitrobenzene)	8270C	96	10	
ALKALINITY	Alkalinity	310.1	^b	5000	
CONDUCT	Specific conductance	9050A	^b	1umhos/cm	
NH3-N	Nitrogen in Ammonia	350.3	^b	100	
OIL/ GREASE	Oil and grease	9070	^b	1100	
PH	pH	9040	^b	0.1 pH unit	
TDS	Total dissolved solids	160.1	^b	10000	
TOC	Total organic carbon	9060	^b	500	
TOX	Total organic halides				
TSS	Total suspended solids	160.2	^b	5000	
WTPH-G	Total petroleum hydrocarbons – gasoline range	NWTPHG	^b	30	
WTPH-D	Total petroleum hydrocarbons – diesel range	NWTPHD	^b	300	
Multiple	Gamma Scan	GEA	^b	15	Multiple isotope reporting. Value is for Cs-137
14762-75-5	Carbon-14	C-14	^b	200	

Table 3. COC Analytical Methods, Delisting Levels, and Quantification Limits. (8 Pages)

CAS#	Constituent	Method ID	Delisting Level ^a	PQL ^a	Comments
15046-84-1	Iodine-129	I-129	^b	5	
14133-76-7	Technetium-99	Tc-99	^b	15	
ALPHA-RA	Radium	ALPHA-RA	^b	1	
14133-76-7	Total uranium	U	^b	1 µg/L	
12587-46-1	Gross alpha	GA/GB	^b	3	
12587-47-2	Gross beta	GA/GB	^b	4	

NOTE: Shading indicated analytes where the PQL is less than the delisting level, but greater than one-tenth of the delisting level. Shading and *italics* indicate analytes where PQL is above or equal to delisting levels.

^a Unless otherwise noted, all values are in µg/L. Radioanalytical values are in pCi/L and are minimum detectable activities.

^b No delisting level is currently specified for these analytes, or they were added to meet ETF waste acceptance criteria and are not part of the delisting.

^c A larger purge volume will be investigated (25 mL instead of 5 mL), which should decrease PQLs.

^d Degradation and hydrolysis are discussed in method 8270C.

CAS = Chemical Abstracts Service

GA = gross alpha

GB = gross beta

ETF = Effluent Treatment Facility

PQL = practical quantification limit

TDS = total dissolved solid

TIC = tentatively identified compound

TOC = total organic carbon

TOX = total organic halides

TSS = total suspended solids

WTPH-G = total petroleum hydrocarbons – gasoline range

WTPH-D = total petroleum hydrocarbons – diesel range

The baseline characterization sampling program provided thorough quarterly analyses of the leachate over a period extending from April 1999 until December 2000. The results of these analyses were compared to the delisting levels provided in Table 1, and the U.S. Department of Energy (DOE) and U.S. Environmental Protection Agency (EPA) determined that delisting was appropriate. When leachate achieves compliance with delisting levels, it is managed as nonhazardous waste.

Those COCs whose analytical results from baseline sampling indicate that their concentrations are below 10% of the delisting level have been moved into a confirmatory sampling and analysis regimen, occurring every 2 years. COCs that are not above 10% of the delisting level are considered to be below regulatory concern. COCs detected at concentrations greater than 10% of the delisting level shall be monitored on a routine basis occurring every 6 months. DOE may elect to include additional constituents in the routine sampling list after evaluation of analytical results.

Routine sampling and analyses will take place every 6 months. Routine analyses will address the following combination of constituents:

- All COCs identified in the characterization samples at levels greater than 10% of their delisting level

- All constituents required by the ETF waste acceptance criteria (FH 2005)
- All constituents required by the routine groundwater monitoring program (BHI 2005a), with the exception of turbidity measurement.

The above constituents are summarized in Section 1.2.1. Every 2 years, confirmatory samples will be taken and analyzed for the full suite of constituents identified in Table 3.

The 1999 Record of Decision (ROD) amendment (EPA 1999) requires that the EPA waste delisting docket be periodically evaluated to determine if values have been established for COCs historically or potentially used at the Hanford Site, but not listed in previous versions of the docket. The ROD amendment also requires that waste profiles be evaluated every 2 years for the presence of constituents that are not on record as previously contained in ERDF, with any such constituents compared with the EPA docket list. Since the time of the ROD amendment, EPA has begun using a software program known as the "delisting risk assessment software" (DRAS) for establishing delisting limits in lieu of revising the delisting docket. Consistent with the intent of the ROD amendment, the evaluations previously conducted using the updated docket lists will now be performed using the most recent version of the DRAS program. For COCs historically used at the Hanford Site but not listed in the docket at the time of the ROD amendment (Table 2), an evaluation against DRAS will occur annually; any newly established delisting values will be factored into the confirmatory sampling program and if necessary into the routine sampling program. For compounds not previously disposed of in ERDF, an evaluation of DRAS will occur every 2 years. Results of these evaluations will be documented as appropriate in the calendar year groundwater and leachate monitoring report, with a copy of this report provided to EPA.

1.2.1 Routine Test Parameters

The following list of constituents will be included in the routine sampling and analysis regimen, occurring every 6 months:

- Arsenic
- Barium
- Beryllium
- Calcium
- Chromium
- Lead
- Potassium
- Selenium
- Silicon/silica
- Sodium
- Thallium
- Tin
- Vanadium
- Zinc
- Chloride
- Fluoride
- Bromide
- Nitrite/nitrate
- Sulfate
- Phosphate
- Carbon tetrachloride
- Trichloroethylene
- Total dissolved solids
- Total suspended solids
- Total organic halides
- Gamma scan
- Carbon-14
- Iodine-129
- Technetium-99
- Radium
- Total uranium
- Gross alpha
- Gross beta
- pH
- Alkalinity
- Specific conductance

The above list will be modified as needed, to meet the requirement for inclusion of COCs found to occur in the leachate at greater than 10% of their respective delisting levels.

1.2.2 Rationale

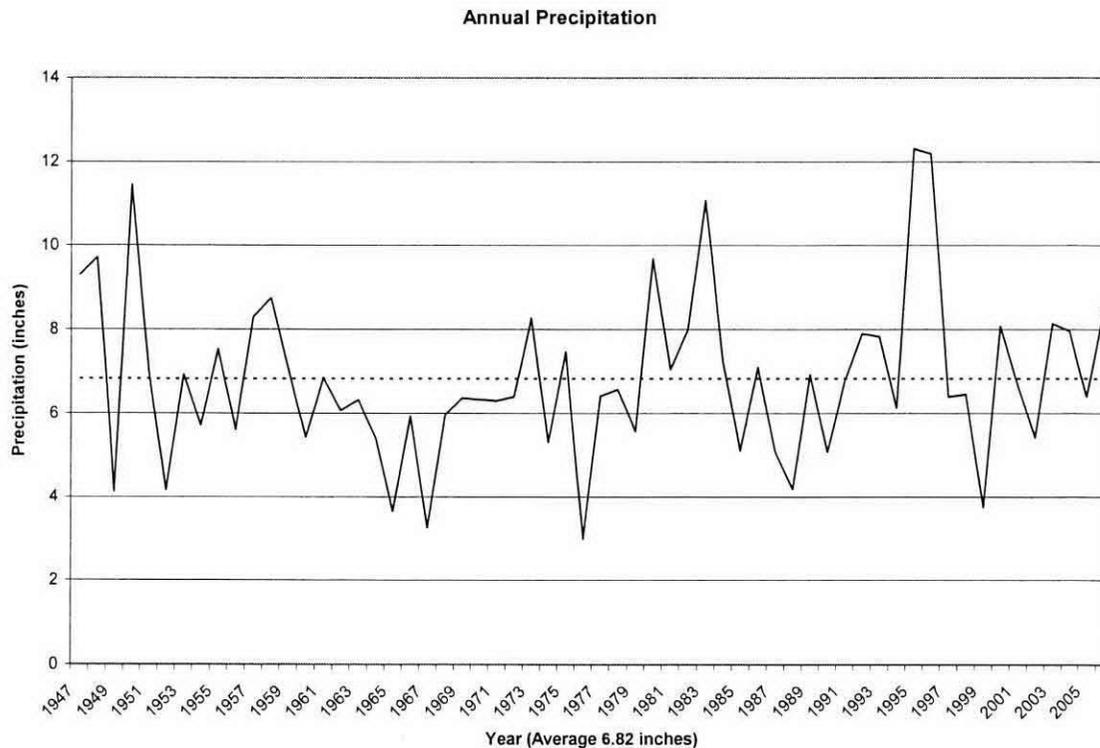
Several factors may contribute to the variability of leachate characteristics and should be considered when determining the frequency of sample collection. Factors that may affect chemical, physical, and biological processes occurring within the facility include seasonal variations, waste streams, configuration of ERDF, and operational changes that may occur over time. Seasonal variations in temperature and precipitation may also affect the composition of the leachate.

Seasonal and annual climate changes can significantly affect the volume of leachate generated at the ERDF. Beginning in July 1996, ERDF generated approximately 6,400,000 L (1.7 million gal) of leachate from disposal cell 1. During the second year of operation beginning in July 1997, ERDF generated approximately 1,500,000 L (0.4 million gal) of leachate from the combined operation of cells 1 and 2. The large difference in leachate generation between the two years was primarily a result of differences in precipitation and the amount of material in the cells. The yearly total precipitation for the 1996-1997 operation was 28.9 cm (11.4 in.); for 1997-1998 the total was approximately 16.3 cm (6.4 in.). For comparison, the average annual precipitation from 1947 through 2006 has been 17.32 cm (6.82 in.). Figure 1 illustrates the average precipitation values at the Hanford Site for the past 60 years. Based on average precipitation, ERDF would be expected to collect from 760,000 to 1,100,000 L (0.2 to 0.3 million gal) of leachate per operating disposal cell per year. ERDF is expected to have up to three disposal cells operating at one time after an expansion, which could generate 2,300,000 to 3,400,000 L (0.6 to 0.9 million gal) annually during years of average precipitation. However, the leachate generated could be substantially more during years of high precipitation, as experienced in 1995 and 1996 (31.3 and 30.9 cm [12.31 and 12.19 in.], respectively). Smaller volumes of material in a cell result in faster conversion of precipitation to leachate, due to shorter travel time through the soil column than would be experienced with higher cell loading. Smaller volumes also result in less surface contact of pore water with wastes and, therefore, less potential for contamination in leachate.

The "wet" season at the Hanford Site typically occurs between November and February, which also generally correspond to the coldest months of the year. June through September are typically the driest months, which correspond to the warmest months. The sampling program is capable of characterizing any seasonal variations.

ERDF currently consists of six waste cells, and construction of two additional cells is scheduled to begin in late fall of 2007. Placement of waste within the first two cells has been completed. As new cells are constructed and full cells are capped, the volume and composition of the leachate may be affected by variations in the waste matrices exposed to precipitation (i.e., waste within a capped cell may not promote as much leachate, and a cell that is open but receiving only limited quantities of waste will promote "cleaner" leachate than a cell receiving larger quantities of waste). It is difficult to determine the effects on the leachate from differing configurations of the facility; however, sampling is expected to be frequent enough to identify changes that may be attributed to variations in open cells. The leachate storage system is designed to consolidate leachate from all cells into two storage units for management. Additional sampling is not proposed when the configuration of the facility changes.

Figure 1. Hanford Site Annual Precipitation Values, 1946-2006.



The final factor considered for its effects on the leachate is operational changes at ERDF. Such changes may include the amount of liquid used for dust suppression and compaction or the opening of a new cell for waste placement. In 2004, ERDF transferred nearly 5,600,000 L (1,500,000 gal) of leachate to the ETF, even though there was not an unusual amount of precipitation that year. Since much of this leachate was transferred during the spring months, it was very likely the result of water application for dust suppression. Conversely, removal of the floating covers from the storage units or redesign of the leachate storage facility could result in higher evaporation rates, concentrating some COCs in the leachate.

1.2.3 Sampling Strategy

The leachate that is stored in the disposal cell sumps and holding tank(s) is considered to be representative of liquids that have been generated from the ERDF over a period of time. Leachate is currently being stored for transfer to the ETF. Representative samples are taken to support routine and confirmatory sampling programs, using one of the following methods:

- Composite samples will be taken from varying levels within the leachate storage units.
- Composite samples will be taken from the leachate sump crest pads.
- A flow-proportional device will be used to obtain composite samples during transfers to ETF.

ERDF may accept waste from many different areas within the Hanford Site, but generally only receives waste from a small subset of these areas during any given time period. The waste

physical form or matrix, as well as the COCs associated with it, may influence leachate concentration. Therefore, at least every 6 months the waste matrix shall be evaluated by the Environmental Project Lead (EPL) for variability. If waste matrices not previously received begin entering the facility, the monitoring program will be evaluated to consider the regulated contaminants of potential concern that are defined in the waste profile, but that are not currently being monitored during routine testing. This evaluation will include risk drivers, as identified on the EPA DRAS, that are being placed in ERDF in significantly greater volumes than previously disposed.

Over time, compounds may be placed in ERDF that have not been evaluated through previous analysis of the leachate. Every 2 years, profiles of waste streams that had not previously been placed in ERDF will be evaluated by the EPL for the presence of compounds that are not on record as being contained in ERDF wastes. These compounds will be evaluated against the baseline list of COCs and it will be determined whether they are regulated, can be analyzed for, and are identified as risk drivers on the EPA DRAS. Constituents that remain after this screen (the same process that was used to develop the baseline COC list) will be included as COCs in the routine (6-month) sampling program. If, after 1 year, these COCs are not detected above 10% of their delisting levels, they will be eliminated from the routine monitoring list and will be placed in the confirmatory sampling program.

1.3 PROJECT ORGANIZATION AND RESPONSIBILITY

This section provides the organizational roles and responsibilities for sample collection, laboratory analysis, data management, and data assessment for ERDF leachate characterization and monitoring activities.

1.3.1 Project Responsibility

Waste Operations Group: Washington Closure Hanford (WCH) Waste Operations will coordinate efforts of Operations as needed to complete required tasks. The Waste Operations Group, in concert with the EPL, will also determine the timing and volume of leachate transfers.

ERDF Project Engineer: The ERDF Project Engineer will assess incoming waste profiles to evaluate the need for additional sample analysis and make recommendations accordingly to the ERDF EPL.

ERDF Environmental Project Lead: The WCH EPL will periodically review waste matrices, waste stream profiles, and delisting values using the DRAS program and determine required additions or changes to sampling and analysis activities. The EPL will be assisted in this effort by the Environmental Protection Group. The EPL will identify needed changes/additions to sampling and analysis documents (sample authorization forms [SAFs]), and review/ approve changes to SAFs. The EPL will oversee and direct leachate sampling performed by the Sample/Data Management Group. The EPL will also interface with the regulators to ensure that the characterization objectives for the leachate are consistent with regulatory requirements. Included will be discussions regarding the scope of routine laboratory analyses and recommendations for addition or deletion of selected constituents in the routine analyses regimen, if appropriate.

1.3.2 Support Responsibilities

The following organizations will be responsible for performing services to the ERDF project in accordance with the requirements in this SAP.

Sample/Data Management Group: The Sample/Data Management Group will coordinate sample collection activities, and provide personnel who are trained and qualified to perform sample collection. This group will also collect, package, and ship leachate samples to the laboratory, with field support from ERDF operations.

Laboratory Services: Laboratory Services will coordinate laboratory analysis, data reporting, and data validation for leachate characterization. Additional responsibilities include handling and storage of deliverables generated throughout the process. Laboratory Services will also provide access to information stored in the Environmental Restoration (ENRE) database.

Chemist: The assigned chemist will ensure that validation is performed by qualified validators who may be WCH employees or qualified subcontractors. The chemist will assess the analytical data after validation and compare it to warning levels (10% of the delisting levels) and delisting levels. The chemist will also assess the data for trends and provide written input to the EPL. The chemist will coordinate with the EPL to ensure that analytes are added to and removed from the sampling program as appropriate.

Quality Assurance: WCH Quality Assurance will provide quality assurance (QA) assessments and surveillances upon the request of ERDF management.

1.4 SAMPLE COLLECTION

This section provides the requirements for collecting, packaging, and shipping leachate samples. Sample collection will be performed in accordance with this SAP and approved detailed procedures.

1.4.1 Sample Collection Techniques

Representative samples will be collected and composited from the leachate storage units, the leachate sump crest pads or the flow-proportional device in the ETF discharge line. Samples will be collected through use of portable or dedicated pumps as required. Care will be taken to ensure no contaminants are introduced by the sampling equipment being used.

1.4.2 Sample Volume, Preservation, and Holding Times

The volume of samples collected depends upon the type and number of analyses needed, as reflected in the parameters to be measured and the requirements of the analytical laboratory being used. Sample volume must be sufficient for all analyses, including laboratory QA/quality control (QC). Several constituents can be analyzed by one of two alternate methods; therefore, the total volume may depend on the methods selected. The total composite volume required for analyses will be specified in the SAF; SAF procedures are found in ENV-1, *Environmental Monitoring & Management*, ENV-1-2.10, "Sample Event Coordination."

Table 4 lists analytical methods and a prioritized list of those methods in the event insufficient sample volume is available for analysis of the complete list of constituents. Higher priorities are assigned to multi-analyte methods and higher health-risk associated analytes.

Sample preservation ensures the sample remains representative of the leachate from the time of collection until the time of analysis. Sample preservation techniques consist of refrigeration and pH adjustment. Samples are aliquoted into pre-preserved bottles for specific analyses, in accordance with the SAF and consistent with Table 4. Refrigeration continues using wet ice during sample shipment and until the sample is received in the laboratory for analysis.

In addition to preservation techniques, holding times between sample collection and analysis must be met for the sample data to be considered valid. The leachate composite becomes a sample upon collection. At that point, holding time limitations begin. Final sample holding times are specified in the SAF and are also shown in Table 4.

In the event of conflicts between the data shown in Table 4 and the requirements of the SAF, the SAF requirements will take precedence.

Table 4. Sampling and Holding Time Requirements for the Contaminants of Concern Analytical Methods. (3 Pages)

Analytical Method	Title	Preservation	Hold Time		Priority
			Sampling to Prep	Prep to Analysis	
6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry	HNO ₃ to pH<2	6 months		3
7196A	Chromium, hexavalent (colorimetric)	Cool, 4°C	24 hours		Lower priority
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)	HNO ₃ to pH<2	28 days		5
8070A ^a 8270C	Nitrosamines by GC	Cool, 4°C	7 days	40 days	2
8081A/8082	Organochlorine Pesticides by GC/PCBs by GC	Cool, 4°C	7 days	40 days	4
8151A	Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzoylation Derivatization: Capillary Column Techniques	Cool, 4°C	7 days	40 days	Lower priority
8270C ^b	Semivolatile Organic Compounds by GC/MS	Cool, 4°C	7 days	40 days	1
8315A	Determination of Carbonyl Compounds by HPLC	Cool, 4°C	3 days	3 days	Lower priority
8310 ^b	Solvent Extractable PAHs HPLC with UV and/or fluorescence	Cool, 4°C	7 days	40 days	Lower priority
8318 ^c	N-Methylcarbamates by HPLC	Cool, 4°C; adjust pH 4-5 with 0.1N chloroacetic acid	7 days	40 days	Lower priority
9010B	Total and Amenable Cyanide (Distillation/Automated Colorimetric)	Cool, 4°C; if oxidizing agents present add 5 mL 0.1N NaAsO ₂ per L or 0.06 g of ascorbic acid per L; adjust pH>12 with 10% NaOH	14 days		6
9020	Determination of Total Organic Halides	Cool, 4°C; adjust pH<2 with HCl or H ₂ SO ₄	28 days		Lower priority
9056	Determination of Inorganic Anions by Ion Chromatography	Cool, 4°C	48 hours for NO ₃ , NO ₂ , and PO ₄ ; others 28 days		7

Table 4. Sampling and Holding Time Requirements for the Contaminants of Concern Analytical Methods. (3 Pages)

Analytical Method	Title	Preservation	Hold Time		Priority
			Sampling to Prep	Prep to Analysis	
9060	Total Organic Carbon	Cool, 4°C; adjust pH<2 with HCl or H ₂ SO ₄	28 days		Lower priority
9050A	Specific Conductance	Cool, 4°C	28 days		Lower priority
9040	pH Electrometric Measurement	Cool, 4°C	Analyze immediately		8
160.1 ^d	Total Dissolved Solids	Cool, 4°C	7 days		Lower priority
160.2 ^e	Total Suspended Solids	Cool, 4°C	7 days		Lower priority
300.0M	Formic Acid by Ion Chromatography	Cool, 4°C	Not defined, analyze as soon as possible		Lower priority
310.1 ^f	Alkalinity	Cool, 4°C	14 days		Lower priority
350.2 (distill) followed by 350.1 or 350.3 ^g	Ammonia	Cool, 4°C; adjust pH<2 with H ₂ SO ₄	28 days		Lower priority
8015	Alcohols by GC	Cool, 4°C	14 days		3
8260B	Volatile Organic Compounds by GC/MS	Cool, 4°C, adjust pH<2 with H ₂ SO ₄ , HCl, or solid NaHSO ₄	14 days		2
9030B/ 9034 or 9215	Sulfide by distillation followed by Colorimetric or ISE	Cool, 4°C; add zinc acetate per 100 mL, adjust pH> with NaOH	7 days		6
NWTPHG	Total Petroleum Hydrocarbons – Gasoline Range by GC	Cool, 4°C	14 days		Lower priority
NWTPHD	Total Petroleum Hydrocarbons – Diesel Range by GC	Cool, 4°C	14 days		Lower priority
GEA	GEA	adjust pH<2 with HNO ₃	6 months		Lower priority
I-129	Iodine-129 by Chemical Separation Low Energy /GEA	adjust pH<2 with HNO ₃	6 months		Lower priority
C-14	Carbon-14 by Chemical Separation/Liquid Scintillation Counting	None	6 months		Lower priority

Table 4. Sampling and Holding Time Requirements for the Contaminants of Concern Analytical Methods. (3 Pages)

Analytical Method	Title	Preservation	Hold Time		Priority
			Sampling to Prep	Prep to Analysis	
Tc-99	Technetium-99 by Chemical Separation/Liquid Scintillation Counting	adjust pH<2 with HCl	6 months		Lower priority
ALPHA-RA	Total Radioactive Radium Alpha by Chemical Separation/Gas Proportional Counting	adjust pH<2 with HNO ₃	6 months		Lower priority
U	Total Uranium by Kinetic Phosphorescence Analysis	adjust pH<2 with HNO ₃	6 months		Lower priority
GA/GB	Gross Alpha & Gross Beta by Gas Proportional Counting	adjust pH<2 with HNO ₃	6 months		Lower priority

- ^a Method 8070A laboratory capability is currently unavailable. Method 8270C will be substituted.
- ^b PAHs may be analyzed by either 8270C or 8310 provided that practical quantification limits in Table 5 are met.
- ^c No analytical service provider has been identified.
- ^d This method is being replaced by Standard Method 2540C.
- ^e This method is being replaced by Standard Method 2540B.
- ^f This method is being replaced by Standard Method 2310B.
- ^g This method is being replaced by Standard Method 4500-NH₃G.

- GA = gross alpha
- GB = gross beta
- GC = gas chromatography
- GEA = gamma energy analysis
- HPLC = high performance liquid chromatography
- ISE = ion-selective electrode
- MS = mass spectrometry
- PAH = polycyclic aromatic hydrocarbon
- PCB = polychlorinated biphenyl
- UV = ultraviolet

1.4.3 Sample Documentation

All information pertinent to field sampling and analysis will be recorded in bound logbooks in accordance with ENV-1-2.5, "Field Logbooks." Entries made in the logbook will be dated and signed by the individual who makes the entry.

1.4.4 Sample Identification and Labeling

The Hanford Site Sample Data Tracking database will be used to track sample and laboratory results. Sample numbers will be issued to the sampling organization in accordance with ENV-1-2.10, "Sample Event Coordination."

Each sample will be identified and labeled with a unique sample number. The sample location, date, and time of collection along with the corresponding number will be recorded on the chain-of-custody form and in the field sampling logbook by or at the direction of the analytical lead.

Each sample container will be labeled by or at the direction of the analytical lead with the following information using a waterproof marker on firmly affixed, water-resistant labels:

- Sample number
- Sample collection date/time
- Name/initials of sampler
- Analysis required
- Preservation method, if applicable.

1.4.5 Chain-of-Custody Procedures

All samples will be controlled from the point of origin to the analytical laboratory in accordance with ENV-1-2.13, "Chain of Custody." A chain-of-custody record will be initiated in the field at the time of collection and will accompany each set of samples. Chain-of-custody procedures will be followed throughout the sample collection, transfer, analysis, and disposal to ensure that the integrity of the sample is maintained.

A custody seal (evidence tape) will be affixed to the lid of each sample container. The custody seal will be initialed and dated by the sampler at the time the container is sealed.

1.4.6 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with ENV-1-2.14, "Sample Packaging and Shipping," under the direction of a U.S. Department of Transportation-qualified shipper. After the samples are properly labeled, they will be placed in a transportation package along with the chain-of-custody and SAF. Samples will be placed in sufficient ice to maintain the temperature at $4^{\circ} \pm 2^{\circ}\text{C}$ throughout the shipment.

Sample shipment must comply with applicable U.S. Department of Transportation Hazardous Materials Regulations (49 Code of Federal Regulations 171-177) and International Air Transport Association air shipment requirements, as applicable.

1.5 SAMPLING QUALITY ASSURANCE AND QUALITY CONTROL

QA requirements for sampling are established in ENV-1-2.36, "River Corridor Quality Assurance Program Plans." All sampling personnel will be trained to ensure the acquisition of complete and high-quality data.

1.5.1 Equipment Operation and Calibration

All sampling and field measurement equipment used to support this project will be calibrated, if applicable, to operate within the specifications provided by the manufacturer and in accordance with applicable WCH procedures. Calibrations will be performed as stipulated by the manufacturer's calibration procedure, the project-specific calibration requirements, or as specified within the requirements defined by the analytical method.

1.5.2 Preventive Maintenance

All measurement and testing equipment that directly affects the quality of analytical data is subject to preventive maintenance measures that ensure minimization of downtime.

Analytical Field Services will be responsible for maintenance of the sampling equipment, if applicable, in accordance with manufacturers' recommendations.

1.5.3 Field Quality Control Requirements

QC samples are introduced into the collection system to monitor the adequacy of the sampling system and the integrity of the samples from their field collection point through laboratory analysis. QC requirements for the sample collection process are defined as follows:

- One field duplicate sample of the leachate will be collected for each sampling event. Field duplicates are composed of two samples produced from the same matrix and collected at the same location. The field duplicates provide information concerning the homogeneity of the matrix, as well as an evaluation of the precision of the sampling and analysis process.

When the sampling event cycle is completed and aliquots are prepared for the individual sample analyses, equal aliquots will be assigned to field duplicate samples.

- One volatile organic analysis trip blank will be collected for every volatile organic analysis sampling event. Trip blanks are samples prepared by adding clean, analyte-free water to sample containers for analysis of volatile organic compounds. Preservatives are added to the blank, and the containers are sealed before the sampling trip. Trip blanks are usually prepared in the laboratory and are transported with empty sample containers to the site of work and remain sealed until analyzed with the collected samples at the laboratory. Trip blanks permit evaluation of contamination generated from sample containers or occurring during the shipping and laboratory storage process.

1.6 LABORATORY ANALYSIS

1.6.1 Analytical Methods

Analytical methods will be as defined in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 1997), except for ammonia, total suspended solids, total dissolved solids, and formic acid. Alkalinity, ammonia, total suspended solids, and total dissolved solids analytical methods are defined in *Chemical Analysis of Water and Wastes* (EPA 1995) or replacements as defined by EPA. Formic acid analysis will be performed using a modification of EPA Method 300.0 (EPA 1995). Table 3 identifies all constituents and their associated method references and quantification limits. Analyses will be performed on unfiltered samples. Analyses are expected to be performed on and reported as undiluted samples except for quantification of constituents exceeding the upper calibration limit of the associated analytical method. Analytical methods will be updated as required by EPA.

1.6.2 Detection Limits

Practical quantification limits (PQLs) will be used to assess method sensitivity. The PQL is equivalent to the estimated quantification limit as defined in Chapter 1 of SW-846 (EPA 1997). PQL/estimated quantification limit values reflect analytical accuracies/precisions that are considered nominal for the method and can be routinely achieved in a variety of sample matrices.

In Table 3, selected constituents have been highlighted to identify where analytical PQLs exceed one-tenth of the delisting levels (gray shaded) and where analytical PQLs exceed the delisting levels (gray shaded-italicized). The analytical methodologies will report detected constituents below the PQL. Laboratories flag numerical values below the PQL to indicate that analytical accuracies/precisions are potentially worse than values reported at or above the PQL. For the gray shaded constituents, detections greater than one-tenth of the delisting levels should be identified by the analysis.

For the gray shaded-italicized constituents Acrylonitrile, 1,2-Diphenylhydrazine, and 2-Naphthylamine, the available analytical methodologies should report detection at levels below delisting levels, but not down to one-tenth of the delisting levels. For the remaining gray shaded-italicized constituents, commercially available methods are not available to report detection at levels at or near the delisting levels. Evaluation of alternative analytical techniques showed them to be nonroutine, requiring special analytical equipment, extensive/specialized sample preparation, highly specialized training/expertise, or a combination of all of these. These techniques are normally limited to highly specialized laboratories unlikely to possess suitable licenses allowing the receipt of potentially radioactive samples. None of these constituents have had a documented use at the Hanford Site; therefore, it is unlikely that they will be present in the leachate. Analyses by the identified EPA-prescribed methods are the best available choice at this time. These methods should be capable of detection at concentrations below 5 µg/L (i.e., ppb).

Advances in commercially available technology will be monitored periodically for revisions to PQLs/implementation of alternate methods with lower PQLs.

The full spectrum analysis performed on the leachate includes a search for tentatively identified compounds (TICs). Detection of TICs may be due to the presence of secondary chemical breakdown products. Assessment of analytical results will include examination of TICs reported

as part of the routine broad-spectrum volatile and semivolatile organic analyses (gas chromatograph – mass spectrum). The mass spectrum libraries, used to search for compound identification of “unknown” analysis peaks, typically exceed 60,000 individual compounds. Examination of reported TICs from confirmatory sampling will be the primary mechanism for inclusion of unexpected constituents in future sampling lists, regardless of the source of the constituent. Potential sources could include residues from undocumented use or disposal of chemicals, or decomposition of known materials used/disposed of at the Hanford Site.

Should future special analyses not typically performed under existing contracts be required, the designated laboratory will be required to demonstrate its ability to satisfactorily perform these analyses prior to receipt of the Hanford Site samples.

1.6.3 Bendiocarb Analysis

All analytical techniques identified for bendiocarb may be considered to be nonroutine, requiring special analysis equipment, extensive/specialized sample preparation, highly specialized training/expertise, or a combination of all of these. These techniques are normally limited to highly specialized laboratories unlikely to possess suitable licenses allowing the receipt of potentially radioactive samples. Implementation of any technique at the existing contracted laboratories would be cost prohibitive.

Analytical capability will continue to be monitored for bendiocarb. If adequate and economical technology becomes available in the future, an appropriate analytical method will be specified.

1.6.4 Laboratory Quality Assurance and Control

All samples will be analyzed to the requirements of the *Hanford Analytical Services Quality Assurance Requirements* (HASQARD) (DOE-RL 1998). At a minimum, the following QC shall be performed:

- One method blank for every 20 samples, analytical batch, or sample delivery group (whichever is most frequent) will be used to monitor contamination resulting from the sample preparation process for each analytical method.
- One laboratory control sample or blank spike will be performed for every 20 samples, analytical batch, or sample delivery group (whichever is most frequent) of samples for each analytical method criteria to monitor the effectiveness of the sample preparation process. The results from the analysis are used to assess laboratory performance.
- As appropriate to the method, a combination of either (1) a matrix spike and matrix spike duplicate, or (2) a matrix spike and duplicate sample will be prepared and analyzed for each 20 samples, analytical batch, or delivery group (whichever is most frequent). This QC step will be performed on an ERDF leachate sample. The matrix spike results are a measure of detection accuracy for the analytes of interest that are measured in the sample matrix. Laboratory duplicates or matrix spike duplicates are used to assess precision and will be analyzed at the same frequency as the matrix spikes.

1.6.5 Laboratory Quality Control Acceptance Criteria

The definitions of laboratory required QC samples found in the HASQARD (DOE-RL 1998) are used for this project. Percent recoveries as defined in the HASQARD will be used to assess accuracy. Relative percent difference and relative standard deviation as defined in the HASQARD will be used to assess precision. The accuracy and precision limits that are listed in the HASQARD will be applied to the results from the leachate for each sampling round. Analytes without accuracy and precision limits in the HASQARD will be assessed based on statistical evaluation of laboratory control sample results using the same formulas presented for the compounds with limits. Because the leachate will be aqueous with low probability of interferences, this is a reasonable approach.

1.7 DATA MANAGEMENT

1.7.1 Data Reporting

The laboratory will prepare a report summarizing the results of analysis, including associated laboratory QC. Data summaries shall include, at a minimum, sample identity, sampling and analysis dates, reduced data results, analytical detection limits for nondetect results, and a detailed case narrative for the following investigative and QC samples (as appropriate to the method):

- ERDF samples
- All associated laboratory method blanks
- Associated batch matrix spike/surrogate/tracer/carrier recoveries
- Associated batch duplicate/matrix spike duplicate relative percent differences
- Associated batch laboratory control sample recoveries.

1.7.2 Data Validation

Level C data validation has been selected for leachate data per ENV-1-2.12, "Data Package Validation." This approach includes the review of all QC data, transcription error verification, and holding time review. Level C is the middle validation level and does not require review of raw data and recalculation of data. The basic elements of this validation level include evaluation of the following parameters (as appropriate to the method):

- Required analysis hold times
- Associated batch method blank results
- Associated batch matrix spike/surrogate recoveries
- Associated batch duplicate/matrix spike duplicate relative percent differences
- Associated batch laboratory control sample recoveries
- Reported analytical detection limits for nondetect results.

Should problems arise from the level C review, the project may perform recalculation and review of raw data. Level C validation will be performed by qualified Sample/Data Management personnel or by a qualified subcontractor. Subcontract validation requirements will be defined in procurement documentation or work orders, as appropriate.

1.7.3 Data Management

Data generated as a result of laboratory analysis will be managed by the Sample/Data Management organization until its formal transfer to Document Control, as outlined in ENV-1-2.11, "Sample Documentation Processing."

All validated reports and supporting analytical data packages shall be subject to final technical review by qualified reviewers before their final submittal to regulatory agencies or inclusion in reports or technical memoranda. Electronic data access, when appropriate, is through computerized databases (such as ENRE). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989).

1.8 AUDITING AND ASSESSMENT

The WCH QA department may conduct random surveillances and assessments to verify compliance with the requirements outlined in this SAP in accordance with QA-1, *Quality Assurance*, QA-1-1.7, "WCH Surveillances – Internal, Subcontractor and Other Hanford Contractors," and QA-1-1.11, "Independent Assessment." Collectively, the surveillance and assessments will address quality-affecting activities that include, but are not limited to, measurement system accuracy; field activities; data collection, processing, validation, and management; and QA programs.

Random surveillance and assessments will be structured to meet system and performance audit classifications. System audits consist of the evaluation of the measurement system components to determine their proper selection and use. Performance audits ensure the accuracy of the total system and its individual parts.

1.9 DATA QUALITY

Once the analytical data have been verified and validated, the assigned chemist will also assess the data for trends and provide written input to the EPL. The chemist will coordinate with the EPL to ensure that analytes are added to and removed from the sampling program as appropriate.

Recommendations about the status of each monitored analyte will be made on the same schedule that data are being collected to ensure that the monitoring status of each analyte remains up-to-date. Recommendations should be made in the context of the historical data and trending and with respect to the waste management processes being performed at the site. The addition of new or different waste streams will be considered each time that data are assessed.

1.10 CORRECTIVE ACTIONS

If, at any time after the delisting of the identified waste, other data relevant to the delisted waste indicate that any constituent is at a level higher than the delisting level established in Table 1 for that constituent, then such data will be reported informally immediately to DOE, and reported in writing via memorandum to DOE and EPA within 10 days of first possessing or being made aware of such data.

Based on the information described in the above paragraph and any other information received from any other source, EPA will make a preliminary determination as to whether the reported information requires agency action to protect human health or the environment. Further action may require suspending or revoking the delisting or other appropriate response necessary to protect human health and the environment.

If EPA determines that the reported information does require agency action, DOE will be notified in writing of the actions the agency believes are necessary to protect human health and the environment. The notice shall include a statement of the proposed action and a statement providing the facility with an opportunity to present information as to why the proposed agency action is not necessary or to suggest an alternative action. The DOE shall have 10 days from the date of EPA's notice to present such information.

2.0 REFERENCES

49 CFR 171-177, "Department of Transportation Hazardous Materials Requirements," *Code of Federal Regulations*, as amended.

BHI, 2005a, *Description of Work for Routine Groundwater Sampling at the Environmental Restoration Disposal Facility*, BHI-00873, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.

BHI, 2005b, *Environmental Restoration Disposal Facility Biennial Waste Stream Evaluation and Confirmatory Leachate Sampling*, CCN 119278, Letter from J. M. Atwood to O. C. Robertson, Bechtel Hanford, Inc., Richland, Washington, February 22, 2005.

DOE-RL 1998, *Hanford Analytical Services Quality Assurance Requirements, Volume IV Laboratory Technical Requirements*, DOE/RL-96-68, Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE-RL, 1999, *Environmental Restoration Disposal Facility Leachate Delisting Petition*, DOE/RL-98-47, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

ENV-1, *Environmental Monitoring & Management*, Washington Closure Hanford, Richland, Washington.

EPA, 1995, *Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1997, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd Edition, as amended by Updates I (July 1992), IIA (August 1993), IIB (January 1995), and III, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1999, *U.S. Department of Energy Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

FH, 2005, *Hanford Site Liquid Waste Acceptance Criteria*, HNF-3172, Rev. 3, Fluor Hanford, Inc., Richland, Washington.

FH, 2007, *Groundwater Protection Plan for the Environmental Restoration Disposal Facility*, R SGW-33772, Rev. 0 Fluor Hanford, Inc., Richland, Washington.

QA-1, *Quality Assurance*, Washington Closure Hanford, Richland, Washington.

DISTRIBUTION

U.S. Department of Energy
Richland Operations Office

S. L. Charboneau	A5-11
O. C. Robertson	A3-04
A. K. Wright	L1-02

Washington Closure Hanford

J. F. Armatrout	T2-03
M. A. Casbon	T2-03
B. C. Covert	T2-03
D. A. Duranceau	T2-05
K. R. Fecht	H4-21
K. A. Hadley	T2-03
R. W. Ovink	H4-21
D. A. St. John	H4-21
G. B. Snow	T2-03
J. E. Rugg	T2-04
B. L. Vedder	H4-21
R. L. Weiss	H4-21
ERDF Project Files	T2-05

Document Control	H4-11
DOE-RL Public Reading Room	H2-53
Hanford Technical Library	P8-55

**ERDF LEACHATE SAMPLING AND ANALYSIS PLAN
LIST OF CHANGES**

The following substantive changes have been made to the 1999 Leachate SAP.

- Changed overall text to reflect current timeframe (e.g. delisting of the leachate has already been completed).
- Deleted existing Table 1 because it was redundant with Table 5. Re-numbered other tables.
- Updated new Table 1 to reflect results from sampling event of December, 2006.
- Added Formic Acid and Chrome-6 to the analyte tables.
- Revised Section 1.2 to incorporate verbiage concerning use of the Delisting Risk Assessment Software (DRAS), and changed the new Table 2 heading to match content of the ROD amendment (compounds are now referred to as “Contaminants of Concern”).
- Revised Section 1.2 to reflect current status of the characterization sampling program including completion of the initial quarterly analysis regimen.
- Revised Section 1.2 to state that DOE will evaluate analytical results and may elect to add constituents to the list of analytes.
- In Section 1.2.1 Beryllium has been added to the list. The list has now been made all-inclusive for those COCs and characteristics required by the routine sampling program.
- In Section 1.2.2, deleted the following wording: “Should leachate volume approach the maximum on an annual basis, appropriate actions will be evaluated in coordination with EPA.” The “maximum” is not well defined in the document, nor is its operational or environmental significance apparent.
- Updated Section 1.2.2 to include recent precipitation and leachate data.
- Because problems have not been encountered in obtaining required sample volumes for full suites of analyses, verbiage in Section 1.2.2 regarding use of grab samples in dry months has been deleted.
- In Sections 1.2 and 1.2.3, clarified the interval for waste stream evaluation as every two years, in keeping with previously agreed-to interpretation of the ROD terminology.
- In Section 1.3, updated group and personnel titles to reflect current WCH structure.

- In Section 1.3.1, revised Environmental Project Lead and other responsibilities.
- In Section 1.3.2, Support responsibilities have been revised and “HEIS” has been changed to “ENRE”.
- In Section 1.4.2, specific sample volume quantities have been removed and replaced by references to the SAFs.
- Procedure references have been revised to reflect current WCH documents throughout the SAP.
- In Section 1.4.4, responsibilities for sampling identification and labeling have been clarified.
- Because all sampling will be performed using new certified pre-cleaned bottles, verbiage related to rinsate blanks has been eliminated from Section 1.5.3.
- In Section 1.6.2, consolidated the wording previously contained in Sections 1.6.3 through 1.6.6, resulting in deletion of Sections 1.6.3 through 1.6.6. Revised discussion of detection limits to make it much more straightforward than it was previously, per follow-on discussions with the WCH Sampling group.
- In the new Table 3, changed Method Detection Limit (MDL) values to Practical Quantification Limit (PQL) values to more realistically reflect standard practices and accuracies. Added shading for those analytes for which the PQL is greater than 10% of the delisting level. Also revised table to reflect DRAS information contained in the February 2005 Bechtel letter.
- In the new Table 4, details on sample volumes and containers have been deleted. The SAFs have been referenced for details on sampling. Analytical methods have been updated.
- In Section 1.6.4 (formerly Section 1.6.8) the governing quality document has been changed to the Hanford Analytical Services Quality Assurance Requirements Document (HASQARD).
- In Section 1.9, wording concerning data quality has been revised; although trends in sampling data are evaluated, there is no formal DQA process in place. Also, two paragraphs pertaining to formal statistical analysis have been deleted.
- In Section 1.10, added the ROD requirement for immediate reporting to DOE of any constituents found to be above delisting levels.