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WASTE ANALYSIS PLAN FOR THE 200 AREA ETF & LERF

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OCT 02 1995

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Page 1 of 1

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WASTE ANALYSIS PLAN FOR THE 200 AREA EFFLUENT TREATMENT FACILITY AND LIQUID EFFLUENT RETENTION FACILITY

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7. Abstract

This waste analysis plan (WAP) has been prepared for startup of the 200 Area Effluent Treatment Facility (ETF) and operation of the Liquid Effluent Retention Facility (LERF), which are located on the Hanford Facility, Richland, Washington. This WAP documents the methods used to obtain and analyze representative samples of dangerous waste managed in these units, and of the nondangerous treated effluent that is discharged to the State-Approved Land Disposal System (SALDS). Groundwater monitoring at the SALDS will be addressed in a separate plan.

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ACRONYMS

1		
2		
3		
4	ASTM	American Society of Testing and Materials
5		
6	BAT/AKART	best available technology and all known, available and
7		reasonable methods of prevention, control and treatment
8		
9	CFR	Code of Federal Regulations
10	CWC	Central Waste Complex
11		
12	DOE	U.S. Department of Energy
13	DOE-RL	U.S. Department of Energy, Richland Operations Office
14	DQO	data quality objective
15	DST	double-shell tank
16		
17	Ecology	Washington State Department of Ecology
18	ETF	200 Area Effluent Treatment Facility
19	EPA	U.S. Environmental Protection Agency
20		
21	HEPA	high-efficiency particulate air
22		
23	IX	ion exchange
24		
25	LDR	land disposal restrictions
26	LERF	Liquid Effluent Retention Facility
27		
28	MSDS	material safety data sheet
29		
30	PC	process condensate
31	PCB	polychlorinated biphenyl
32	ppb	parts per billion
33	PQL	practical quantification limit
34		
35	QA	quality assurance
36	QC	quality control
37		
38	RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
39	RO	reverse osmosis
40		
41	SALDS	State-Approved Land Disposal Site
42	SVOC	semivolatile organic compound
43		
44	TC	toxicity characteristic
45	TCLP	toxicity characteristics leaching procedure
46	TIC	tentatively identified compound
47	TDS	total dissolved solids
48	TSD	treatment, storage, and/or disposal
49	TSS	total suspended solids
50		

ACRONYMS (cont)

1		
2		
3		
4	UHW	Uniform Hazardous Waste Manifest
5	UTS	universal treatment standards
6	UV/OX	ultraviolet oxidation
7		
8	VOC	volatile organic compound
9		
10	WAC	Washington Administrative Code
11	WAP	waste analysis plan
12		

METRIC CONVERSION CHART

The following conversion chart is provided to the reader as a tool to aid in conversion.

Into metric units

Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			Length		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			Area		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
square miles	259	hectares	hectares	0.00391	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			Mass (weight)		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			Volume		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76	cubic meters	cubic meters	1.308	cubic yards
Temperature			Temperature		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

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1.0 INTRODUCTION

This waste analysis plan (WAP) has been prepared for startup of the 200 Area Effluent Treatment Facility (ETF) and operation of the Liquid Effluent Retention Facility (LERF), which are located on the Hanford Facility, Richland, Washington. This WAP documents the methods used to obtain and analyze representative samples of dangerous waste managed in these units, and of the nondangerous treated effluent that is discharged to the State-Approved Land Disposal System (SALDS). Groundwater monitoring at the SALDS will be addressed in a separate plan.

1.1 PURPOSE AND SCOPE

The purpose of this WAP is to establish the sampling and analytical methods and rationale for the management of dangerous waste in the LERF and the ETF, and for the discharge of treated effluent to the SALDS. This plan is designed to meet the specific requirements of the following:

- *Hanford Facility Dangerous Waste Permit Application, Liquid Effluent Retention Facility* (DOE/RL-90-43, Rev. 0, June 1991); under Title 40 Code of Federal Regulations (CFR) 270 and 265, and Washington Administrative Code (WAC) 173-303
- *Hanford Facility Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility* (DOE/RL-93-03, Rev. 0, August 1993); under 40 CFR 270 and 265, and WAC 173-303
- Final Approval for Delisting, 200 Area Effluent Treatment Facility, Vol. 60, Federal Register 31115, June 13, 1995; under 40 CFR 260.22 and 40 CFR 261
- Washington State Waste Discharge Permit No. 4500 (Discharge Permit), 200 Area Effluent Treatment Facility, Hanford Facility, Washington State Department of Ecology, June 26, 1995; under RCW 90.48 and WAC 173-216 (Ecology 1995a).
- *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste at the Hanford Facility*, Permit WA7890008967, Washington State Department of Ecology, September 28, 1994.

The requirements specified in the regulatory documents listed previously that are addressed in this WAP include the following:

- Sampling and analysis in the LERF of process condensate (PC) from the 242-A Evaporator to verify that the PC meets the LERF liner compatibility requirements

- 1 ◦ Sampling and analysis of PC to examine the presence and variability of
- 2 a few selected constituents before treatment in the ETF (variability
- 3 study)
- 4
- 5 ◦ Sampling and analysis before discharge of treated effluent from the
- 6 ETF to ensure compliance with the Approval for Delisting, Discharge
- 7 Permit limits, and early warning values
- 8
- 9 ◦ Sampling and analysis to designate and characterize the powder waste
- 10 produced by the secondary treatment train in the ETF
- 11
- 12 ◦ Characterization of other waste (such as maintenance waste) associated
- 13 with the operation of the ETF.
- 14

15 This WAP does not address sampling conducted for the purposes of process
 16 control, sampling required under regulatory authority other than the *Resource*
 17 *Conservation and Recovery Act (RCRA) of 1976* regulations and WAC 173-303 and
 18 173-216.

19
 20 As operating history is accumulated, this WAP could be revised to reflect
 21 reduced sampling and analysis activity, which is consistent with the terms and
 22 conditions of the Discharge Permit, and the Final Approval for Delisting.

23 24 25 1.2 FACILITY DESCRIPTION

26
 27 The LERF (storage) and ETF (treatment) are two units of a mixed waste
 28 treatment system located in the 200 East Area (Figure 1-1). Mixed waste
 29 stored in the Double-Shell Tank (DST) System is transferred to the
 30 242-A Evaporator, where the waste is concentrated through an evaporation
 31 process. The concentrated slurry waste is returned to the DST System, and the
 32 evaporated constituents are recondensed and collected and transferred to the
 33 LERF. This PC is stored in the lined LERF basins until transferred to the ETF
 34 for additional treatment. Treated effluent meets the delisting requirements
 35 and is discharged as nondangerous waste at the SALDS in the 600 Area, north of
 36 the 200 West Area (Figure 1).

37
 38 The LERF consists of three lined surface impoundments with a nominal
 39 capacity of 24.6 million liters each. The PC from LERF is pumped to the ETF
 40 surge tank through a double-walled fiberglass pipeline. The pipeline is
 41 equipped with leak detection located in the annulus between the inner and
 42 outer pipes. Detailed information on the construction and operation of the
 43 LERF is provided in the *Hanford Facility Dangerous Waste Permit Application,*
 44 *Liquid Effluent Retention Facility* (DOE/RL-90-43, Rev. 0, June 1991). Each
 45 basin is equipped with seven sample risers constructed of 6-inch perforated
 46 pipe. An eighth riser in each basin contains liquid level instrumentation.
 47 Each riser extends along the sides of each basin from the top to the bottom of
 48 the basin.

49
 50 The ETF consists of a primary and a secondary treatment train
 51 (Figure 1-2). The primary treatment train removes or destroys dangerous and
 52 mixed waste components from the waste water. The secondary treatment train

processes the waste by-products removed by the primary treatment train. The secondary waste is dried to a powder, containerized, and transferred to a mixed waste treatment, storage, and/or disposal (TSD) unit. Process flow for ETF waste treatment is depicted in Figure 1-3.

Each treatment train consists of a series of treatment operations. The primary treatment train includes the following:

- Surge tank
- Rough filter
- Ultraviolet oxidation (UV/OX)
- pH adjustment
- Hydrogen peroxide decomposer
- Fine filter
- Degasification
- Reverse osmosis (RO)
- Polisher [ion exchange (IX) column]
- Final pH adjustment and verification.

The secondary treatment train uses the following systems:

- Secondary waste receiving tanks
- ETF evaporator (forced circulation evaporator)
- Concentrate tank
- Thin film dryer
- Container handling
- Supporting systems.

Detailed information concerning each treatment operation is provided in the *Hanford Facility Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility* (DOE/RL-93-03, Rev. 0, August 1993).

The treated effluent is contained in the verification tanks where the effluent is sampled and held until the analytical results confirm that the effluent meets the delisting criteria and discharge limits. The effluent is discharged through a pipeline to the SALDS, a 35-meter by 61-meter infiltration gallery, where the treated effluent is released to the soil.

The treated waste water contains tritium, a radioactive isotope of hydrogen. There is no viable treatment technology available to remove tritium. This WAP discusses the dangerous and mixed waste removed from the waste water; however, these discussions do not apply to tritium. The tritium levels are not reduced in the ETF and the water discharged at the SALDS contains tritium. Although the treatment and storage of radioactive waste (i.e., source, special nuclear, and by-product materials as defined by the *Atomic Energy Act of 1954*) are not within the scope of RCRA or WAC 173-303, information is provided for general knowledge where appropriate.

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Figure 1-1. Location of the Liquid Effluent Retention Facility, the 200 Area Effluent Treatment Facility, and the State-Approved Land Disposal Site.

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Figure 1-2. 200 Area Effluent Treatment Facility Floor Plan.

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Figure 1-3. 200 Area Effluent Treatment Facility Process Flow Diagram.

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2.0 SAMPLING AND ANALYSIS OF PROCESS CONDENSATE

The sole waste stream accepted as influent to the ETF is PC from the 242-A Evaporator. The 242-A Evaporator processes waste in campaigns (batches). The feed to the 242-A Evaporator for each campaign is characterized for organic species, ammonia, total organic carbon, transuranic content, and other 242-A Evaporator process parameters. The PC contains small amounts of volatile and semivolatile organic constituents, inorganic constituents, and radionuclides. Some control of PC composition is achieved through careful blending of 242-A Evaporator feed stock, to meet the LERF liner compatibility requirements. The PC currently is stored in a LERF basin before treatment in the ETF. Sampling and analysis of the waste contained in LERF, and the rationale behind these activities, are described in the following sections.

2.1 RATIONALE FOR PROCESS CONDENSATE ANALYSIS PARAMETER SELECTION

Table 2-1 provides the parameters selected for analysis and the rationale associated with each. These rationales are explained in the following sections.

2.1.1 Waste Designation

Process knowledge and analytical data are used to designate and characterize the PC in LERF before transfer from LERF to ETF.

Between August 1985 and March 1989, 34 samples of PC were collected from the 242-A Evaporator to provide detailed composition information. The results are summarized in Table 2-2 of the Delisting Petition (DOE/RL-92-72). These results define the maximum contaminant concentrations expected in the PC and the 90% confidence interval of expected concentrations. These analytical results and knowledge of historic chemical use on the Hanford Facility were used to designate the waste as follows:

- F001 (1,1,1-trichloroethane)
- F002 (methylene chloride)
- F003 (acetone and methyl isobutyl ketone)
- F004 (cresylic acid)
- F005 (methyl ethyl ketone)
- F039 (leachate derived from F001, F002, F003, F004, or F005 waste)
- WT02 (state-only toxic dangerous waste based on ammonia concentration).

1 The F-list dangerous waste numbers are included because the PC is derived
2 from DST System waste, which contains spent solvents. Although some of the
3 organic species might not be present in detectable concentrations, the
4 F-listing applies until the waste has undergone treatment and the treated
5 waste water meets the delisting criteria specified in the Approval for
6 Delisting (60 FR 31115, June 13, 1995). Ammonia concentrations are variable
7 in DST System waste and thus in the PC. The designation of WT02 would apply
8 to PC containing 110 milligrams per liter ammonia or more. Refer to
9 Appendix C for toxicity calculation to determine if a waste meets the toxicity
10 criteria of WAC 173-303-100(5). In addition, pH is monitored to verify that
11 the PC is not a corrosive dangerous waste (D002; $\text{pH} < 2.0$ or $\text{pH} > 12.5$).
12
13

14 2.1.2 Conditions for Newly Identified Waste Codes

15

16 In a March 7, 1995 letter from Ecology to DOE-RL, subject "Listed Waste
17 from Hanford Laboratories", Ecology exercised its enforcement discretion with
18 respect to the designation of newly identified waste that might have been
19 discharged to units upstream of the LERF and the ETF. Ecology will exercise
20 that discretion so long as several conditions are met and as long as these
21 conditions are met; the waste numbers will not be included in Part A of the
22 dangerous waste permit applications for the LERF or the ETF. The applicable
23 constituents associated with the newly identified waste numbers will be
24 analyzed in each LERF basin as part of the program to meet these conditions.
25
26

27 2.1.3 Liquid Effluent Retention Facility Liner Compatibility

28

29 The high-density polyethylene liners in the LERF basins potentially are
30 vulnerable to the presence of some constituents in the PC. Based on vendor
31 data and results of compatibility testing (DOE/RL-90-43), several constituents
32 were identified as potentially harmful (at high concentrations) to the
33 integrity of the liners. From these data and the application of safety
34 factors, concentration limits (Table 2-2) for these compounds in the PC were
35 established (WHC 1995).
36

37 Sampling of the PC in each LERF basin will include analysis for these
38 constituents to ensure that none of the liner compatibility threshold
39 concentrations are exceeded.
40
41

42 2.1.4 Characterization and Variability Study

43

44 The PC stored in a LERF basin will be characterized before processing
45 through the ETF. The Discharge Permit (Ecology 1995, Section S5) requires
46 sampling in the LERF basins until sufficient data are collected to adequately
47 assess the variability of ammonia and total Kjeldahl nitrogen (TKN),
48 strontium-90, and iodine-129. These parameters will be analyzed to assess the
49 range of concentrations present in the PC. In addition, the 10 highest
50 concentrations of tentatively identified compounds (TICs) will be reported
51 from each PC (LERF) sampling event. Tentatively identified compounds are
52 non-targeted organic compounds or fragments of compounds with unique

chromatographic spectra that are qualitatively identified by comparing them to standard databases of spectra. Because these compounds are identified qualitatively, their concentration only can be estimated.

A report will be submitted to Ecology after each LERF sampling event. The report will include the results of ammonia and TKN analysis, detections of strontium-90 and iodine-129, all other parameters analyzed as described in this section, and the 10 highest TICs.

2.1.5 Confirmation of Best Available Treatment and All Known, Available, and Reasonable Treatment Levels

The ETF is designed to treat all of the anticipated contaminants in the PC within a 'treatment envelope' of specified constituent concentrations, as described in the Delisting Petition (DOE/RL-92-72). Some of the Waste Discharge Permit limits were established based on best available treatment and all known, available, and reasonable treatment (BAT/AKART) levels determined in pilot scale tests using surrogate influent solutions. The Discharge Permit (Section S4, Ecology 1995) provides for the review and revision of BAT/AKART effluent concentrations based on actual full-scale operating data, should Ecology submit a written request to ETF (giving 90 days notice), or voluntarily at any time by the ETF organization.

To collect data for possible future review and revision of BAT/AKART concentrations, all parameters for which effluent delisting criteria, discharge limits, and/or early warning values were established in the Approval for Delisting or the Discharge Permit will be sampled voluntarily in the PC (in LERF), as noted in Table 2-1. The established limits for discharge of treated effluent are tabulated in Appendix A.

2.1.6 Operational or Process Design Limitations

Each system within the ETF has specific process design limits for safe and efficient operation. Process control parameters, such as pH, temperature, flow rate, pressure, and others, can be manipulated during the treatment process to avoid exceeding operational design limits of the system. These parameters will be measured in situ or by routine process control samples that are beyond the scope of this WAP.

2.1.7 Waste Analysis for Land Disposal Restrictions

Because storage of the PC in LERF and subsequent treatment of the PC in the ETF are both intermediate steps in the overall waste treatment process (from the DST System to disposal), analysis of the PC in LERF specifically for land disposal restrictions is not required. It is anticipated that the LERF basins will not accumulate solids, as long as the method of treatment for land disposal restriction (LDR) aqueous waste (flow and pH equalization) remains unchanged. Therefore, solid removal is not anticipated. Very few solids are anticipated in the PC in LERF for the following reasons (Teynor 1995):

- PC contains low levels of solids from the evaporative process. Solids entrained into the vapor phase during boiling in the 242-A Evaporator are impinged by deentrainer pads and washed back into the slurry by water sprays.
- PC samples taken for process control at the 242-A Evaporator do not show any evidence of solids precipitating out of solution.
- The LERF basins are covered and all incoming air first goes through a breather filter. Therefore, solids cannot accumulate from airborne dust.
- Co-precipitating or flocculating chemicals are not used in flow and pH equalization.

To monitor for residual solids buildup in the LERF, PC samples collected from the discharge at the 242-A Evaporator will be collected routinely and analyzed for total suspended solids (TSS) during a 242-A Evaporator campaign for process control purposes. A trending analysis will be used to quantify the amount of solids discharged to the LERF during a campaign. Operators visually will monitor process control samples for indications of solids. If monitoring suggests that a problematic quantity of solids could be deposited in the LERF, a procedure will be developed (with EPA concurrence) to inspect for and remove the solids if necessary.

Discharged treated effluent from the ETF will meet the requirements for delisting and therefore will no longer be subject to LDR. The dry powder waste produced by the secondary treatment train will be analyzed as described in Section 4.1. These data will be transmitted to the receiving TSD unit that will provide any necessary LDR notification and final documentation. To anticipate the need for further treatment of the dry powder waste, in the event that the waste does not meet the universal treatment standards (UTS), analysis will be conducted. Anticipated constituents are chromium and mercury.

2.2 SAMPLING STRATEGY: PROCEDURES, LOCATIONS, ANALYSES, AND FREQUENCY

Waste acceptance procedures, sampling procedures, sampling location, frequency of sampling, and the analytical methods used are discussed in the following sections.

2.2.1 Waste Acceptance Procedures

The ETF operating contractor is responsible for transferring waste (by pumping) from the LERF to the ETF, and from the ETF to the SALDS. Data sheets are used to track these waste transfers. Section 2.8 of the *Hanford Facility Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility* (DOE/RL-93-03) contains detailed information regarding documentation for receiving waste at the ETF.

2.2.2 Sampling Procedures

At each LERF sampling location, sections of stainless steel tubing with quick-connects will be inserted into the sample riser to the appropriate depth. Using a portable peristaltic pump, the sample line will be flushed with PC from the sample location and the sample collected. Samples will be obtained in a manner consistent with SW-846 procedures (EPA 1986). The sample containers will be filled for volatile organic compounds first, then semivolatile organic compounds, and then the remainder of the bottles in any order. For sampling a single location at multiple depths, samples typically will be collected from top to bottom. Additional sections of tubing will be connected for the subsequent sampling depths.

2.2.3 Sampling Locations

Samples representative of the contents of a LERF basin will be collected through seven sample risers located in each LERF basin (Drawing H-2-79591 in Appendix 4B of the *Liquid Effluent Retention Facility Dangerous Waste Permit Application*, DOE/RL-90-43). Though eight sample risers are identified in this document, one sample riser at each basin is dedicated to liquid level instrumentation.

The *Liquid Effluent Retention Facility Dangerous Waste Permit Application* (DOE/RL-90-43) initially indicated that sampling at three depths was required because of the potential existence of three separable phases in the LERF basins. However, data from the sampling of the PC in the LERF conducted in September 1994 and a preliminary statistical evaluation of the analytical data (SAIC 1995) confirmed only an aqueous phase in the LERF basins. Furthermore, discharge of a separable phase from the 242-A Evaporator is prevented by specific operating controls in the 242-A Evaporator (WHC 1995a). Therefore, a separate nonaqueous phase is not anticipated in any LERF basin and there is no requirement for either visual determination or sampling of the top surface or bottom of the basin.

However, there is sufficient variability in waste composition between sample risers and between depths to require multiple samples from each available sample riser. For a confidence level of 90% and to obtain precision sufficient for the characterization of PC as described in earlier sections, two samples will be obtained from each of the seven risers, from two different depths selected at random for each riser. With each sampling event, another statistical evaluation could be performed to further refine the number of samples needed to obtain the desired precision and confidence levels.

2.2.4 Frequency of Sampling

Sampling will be conducted to characterize the PC in a LERF basin after the conclusion of each 242-A Evaporator campaign and before transfer of the PC to ETF. No additional PC will be admitted into the LERF basin after characterization samples have been obtained, unless the basin is resampled before ETF treatment. Characterization of the PC in a LERF basin defines a

1 treatment batch for the ETF, and the characterization will be completed before
2 the effluent is transferred to the ETF for treatment.

5 2.2.5 Analytical Parameters and Methods

7 The analytical methods that will be used for each of the parameters are
8 listed in Table 2-3. All methods are EPA approved except those used for the
9 analysis of radionuclides, which are laboratory specific. Both the methods
10 and the practical quantitation limits (PQLs) have been specified in the Waste
11 Discharge Permit for the analytes mentioned in the discharge permit.

12
13 The sample containers, preservation materials, and holding times for each
14 method are listed in Appendix B.

Table 2-1. Rationale for Parameters to Be Monitored in Process Condensate. (sheet 1 of 3)

Parameter	Designation ^a	Conditions for new waste numbers ^b	Liner compatibility ^c	Characterization/variability ^d	Approval for delisting ^{e*}	Discharge permit limit ^{e*}	Early warning value ^{e*}
VOLATILE ORGANIC COMPOUNDS							
Acetone	X		X		X		
Benzene					X		X
1-Butyl alcohol (1-Butanol)			X		X		
Carbon tetrachloride					X	X	
Chlorobenzene					X		
Chloroform					X		X
1,2-Dichloroethane					X		
1,1-Dichloroethylene					X		
2-Hexanone			X				
Methylene chloride	X						
Methyl ethyl ketone (2-Butanone)	X		X		X		
Methyl isobutyl ketone (Hexone)	X		X		X		
2-Pentanone			X				
Tetrachloroethylene					X	X	
Tetrahydrofuran			X				X
Toluene					X		
1,1,1-Trichloroethane	X				X		
1,1,2-Trichloroethane					X		X
Trichloroethylene					X		
Vinyl chloride					X		
SEMIVOLATILE ORGANIC COMPOUNDS							
Acetophenone							X
Benzyl alcohol					X		
2-Butoxyethanol			X				
Cresol (o, p, or m)	X				X		
1,4-Dichlorobenzene					X		

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Table 2-1. Rationale for Parameters to Be Monitored in Process Condensate. (sheet 2 of 3)

Parameter	Designation ^a	Conditions for new waste ^b numbers ^b	Liner compatibility ^c	Characterization/variability ^d	Approval for delisting ^{e*}	Discharge permit limit ^{e*}	Early warning value ^{e*}
1	Dimethylnitrosamine					X	
2	Di-n-octyl phthalate				X		
3	Hexachloroethane				X		
4	Naphthalene				X		
5	Tributyl phosphate			X		X	
6	TOTAL METALS						
7	Antimony				X		
8	Arsenic				X		X
9	Barium				X		
10	Beryllium				X		X
11	Cadmium				X		X
12	Chromium (L)				X	X	
13	Copper						X
14	Lead				X		X
15	Mercury (L)				X		X
16	Nickel				X		
17	Selenium				X		
18	Silver				X		
19	Vanadium		X		X		
20	Zinc				X		
21	ANIONS						
22	Fluoride				X		
23	Formate		X				
24	Nitrate					X	
25	Nitrite						X
26	Sulfate						X
27	OTHER ANALYSES						
28	Ammonia ^f	X		X	X		X
29	Total Kjeldahl nitrogen			X			X

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Table 2-1. Rationale for Parameters to Be Monitored in Process Condensate. (sheet 3 of 3)

Parameter	Designation ^a	Conditions for new waste numbers ^b	Liner compatibility ^c	Characterization/variability ^d	Approval for delisting ^{e*}	Discharge permit limit ^{e*}	Early warning value ^{e*}
Cyanide		X			X		
Iodine-129				X			
Strontium-90				X			M
Tritium							M
Gross alpha							M
Gross beta							M
pH	X		X				
Total dissolved solids							X
Total organic carbon							X
Total suspended solids							X
Specific conductivity						M	

^a Refer to Section 2.1.1.

^b Refer to Section 2.1.2.

^c Refer to Section 2.1.3.

^d Refer to Section 2.1.4.

^e Refer to Section 2.1.5.

^f Although the Approval for Delisting lists "ammonium" (NH_4^+), the standard analytical methods measure ammonia (NH_3). Ammonia is assumed to be the contaminant of concern.

* = required monitoring in effluent; to be mirrored by voluntary monitoring in LERF.

X = rationale for measuring this parameter in LERF.

M = monitor only (in effluent); no limit defined.

L = also for LDR documentation.

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Table 2-2. Process Condensate Limits for Liner Compatibility.

Target parameters	Chemical family	Limit (mg/L) ^{a,d}
1-Butanol	Alcohol/glycol	500,000
Sum of: acetone, 2-butanone, 2-hexanone, methyl isobutyl ketone, and 2-pentanone	Alkanone ^b	2,000
(None targeted)	Alkenone ^c	2,000
Tetrahydrofuran	Aromatic/cyclic hydrocarbon	2,000
(None targeted)	Halogenated hydrocarbon	2,000
(None targeted)	Aliphatic hydrocarbon	2,000
2-Butoxyethanol	Ether	2,000
Tributyl phosphate	Other hydrocarbon	2,000
(None targeted)	Oxidizer	1,000
Ammonia	Acid, base, salt	100,000
pH	N/A	pH>0.5; pH<13.0

mg/L = milligrams per liter.

N/A = not available.

^a The limits are applied using the sum of the fraction technique:

$$\sum_{n=1}^i \left(\frac{\text{Conc}_n}{\text{LIMIT}_n} \right) \leq 1$$

where i is the number of organic constituents detected in analysis of the process condensate.

^b Ketone containing saturated alkyl group(s).

^c Ketone containing unsaturated alkyl group(s).

^d If a chemical fits in more than one chemical family, the more restrictive limit applies.

(Source: WHC 1994)

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Table 2-3. Parameters, Methods, and Practical Quantitation Limits for the
Analysis of Process Condensate and Treated Effluent. (sheet 1 of 3)

Parameter	Analytical method ^a	Practical quantitation limit (ppb) ^b
VOLATILE ORGANIC COMPOUNDS		
Acetone	8260A	40
Benzene	8260A	5
1-Butyl alcohol (1-Butanol)	8260A	500
Carbon tetrachloride	8260A	5
Chlorobenzene	8260A	5
Chloroform	8260A	5
1,2-Dichloroethane	8260A	5
1,1-Dichloroethylene	8260A	5
Methyl n-butyl ketone (2-Hexanone)	8260A	50
Methylene chloride	8260A	5
Methyl ethyl ketone (2-Butanone)	8260A	100
Methyl isobutyl ketone (Hexone)	8260A	50
2-Pentanone	8260A	10
Tetrachloroethylene	8260A	5
Tetrahydrofuran	8260A	100
Toluene	8260A	5
1,1,1-Trichloroethane	8260A	5
1,1,2-Trichloroethane	8260A	5
Trichloroethylene	8260A	5
Vinyl chloride	8260A	10
SEMIVOLATILE ORGANIC COMPOUNDS		
Acetophenone	8270B	10
Benzyl alcohol	8270B	20
2-Butoxyethanol	8270B	1000

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Table 2-3. Parameters, Methods, and Practical Quantitation Limits for the Analysis of Process Condensate and Treated Effluent. (sheet 2 of 3)

	Parameter	Analytical method ^a	Practical quantitation limit (ppb) ^b
1	Cresol (o, p, or m)	8270B	10
2	1,4-Dichlorobenzene	8270B	10
3	Dimethylnitrosamine	8270B	20
4	Di-n-octyl phthalate	8270B	5
5	Hexachloroethane	8270B	10
6	Naphthalene	8270B	10
7	Tributyl phosphate	8270B	100
8	TOTAL METALS		
9	Antimony	6010/EPA 200.7	300
10	Arsenic	7060/EPA 200.8	15
11	Barium	6010/EPA 200.7	20
12	Beryllium	6010/EPA 200.8	40
13	Cadmium	7131A/EPA 200.8	5
14	Chromium	7191/EPA 200.8	20
15	Copper	6010/EPA 200.7/200.8	70
16	Lead	7421/EPA 200.8	10
17	Mercury	7470/7471/EPA 245.1	2
18	Nickel	6010/EPA 200.7	75
19	Selenium	7740	20
20	Silver	6010/EPA 200.7	70
21	Vanadium	6010/EPA 200.7	80
22	Zinc	6010/EPA 200.7	20
23	ANIONS		
24	Fluoride	9056/EPA 300.0	500
25	Formate		
26	Nitrate	9056/EPA 300.0	100
27	Nitrite	9056/EPA 300.0	100

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Table 2-3. Parameters, Methods, and Practical Quantitation Limits for the Analysis of Process Condensate and Treated Effluent. (sheet 3 of 3)

Parameter	Analytical method ^a	Practical quantitation limit (ppb) ^b
Sulfate	9056/EPA 300.0	10,000
OTHER ANALYSES		
Ammonia ^c	EPA 350.3/350.1	40
Total Kjeldahl nitrogen	TKN/EPA 351.1/351.2	600
Cyanide	9012/ EPA 335.1/335.2/335.3	100
Iodine-129	Laboratory specific	5 pCi/L
Strontium-90	Laboratory specific	5 pCi/L (72-hr)
Tritium	Laboratory specific	460 pCi/L
Gross alpha	Laboratory specific	3 pCi/L
Gross beta	Laboratory specific	4 pCi/L
pH	EPA 150.1 (in laboratory)/ 9040A	RL +/- 0.1 unit
Total dissolved solids	EPA 160.1	RL 10,000
Total organic carbon	9060A	RL 1,000
Total suspended solids	EPA 160.2	RL 4,000
Specific conductivity	EPA 120.1 (in laboratory)/ 9050	RL 10 umho/cm

^a SW-846 methods unless otherwise noted. Analytical methods can be substituted if the practical quantitation limit is less than or equal to that stated.

^b parts per billion unless otherwise noted.

^c Although the Approval for Delisting lists "ammonium" (NH_4^+), the standard analytical methods measure ammonia (NH_3). Ammonia is assumed to be the contaminant of concern.

RL = reporting limit.

pCi/L = picocuries per liter.

ppb = parts per billion.

umho/cm = micromhos per centimeter.

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3.0 SAMPLING AND ANALYSIS OF 200 AREA EFFLUENT TREATMENT FACILITY EFFLUENT

The treated waste water is collected in three 2,540,000-liter verification tanks before discharge to the SALDS. To determine whether the ETF effluent meets discharge limits, the treated effluent routinely will be sampled before the effluent enters the verification tanks. The sampling and analyses to be performed are described in the following sections.

3.1 RATIONALE FOR EFFLUENT ANALYSIS PARAMETER SELECTION

The parameters that will be measured in the effluent at the verification tanks are those specified in the ETF regulatory documents as follows:

- Delisting criteria from the Approval for Delisting
- Effluent limits from the Waste Discharge Permit
- Early warning values from the Waste Discharge Permit.

These parameters and their associated limitations are listed in Appendix A. If the concentration of any analyte is found to meet or exceed a delisting criterion or a discharge limit, the contents of the verification tank and the waste water will be reprocessed and reanalyzed.

If the concentration of any analyte meets or exceeds the early warning value, an early warning report will be prepared and submitted to Ecology.

Pesticides, herbicides, and polychlorinated biphenyls (PCBs) will not be analyzed as these compounds are not in DST System waste and therefore are not present in PC or in treated effluent. The effluent will not be ignitable, reactive, or corrosive; therefore, these parameters also will not be analyzed.

3.2 EFFLUENT SAMPLING STRATEGY: METHODS, LOCATION, ANALYSES, AND FREQUENCY

Effluent sampling method and location, the analyses performed, and frequency of sampling are discussed in the following sections.

3.2.1 Effluent Sampling Method and Location

Treated waste water samples will be collected after final pH adjustment and before entry into the verification tanks. Two types of sampling devices will be used. The first is a flow proportional sampler. This sampler will be used to collect samples for all analyses except volatile organic compounds. A zero-headspace flow proportional sampler capable of collecting a sample over a multiple-day period will be used in parallel with the other flow proportional sampler. The minimum sample collection period typically will be 72 hours, representing the amount of time to fill one verification tank at the design flow rate of 562 liters per minute.

1 If for any reason one or both of the composite samplers fail and cannot
2 be repaired quickly, a representative sample will be collected manually from a
3 sampling port on the verification tank recirculation line. For grab samples,
4 volatile organic compound sample containers will be filled first, followed by
5 semivolatile organic compounds and the remainder of the parameters. The
6 sample containers, preservation materials, and holding times for each analysis
7 are listed in Appendix B.

10 3.2.2 Analyses of Effluent

11 The parameters that will be analyzed in the samples obtained from the
12 verification tank sampling station and their associated rationales are listed
13 in Table 3-1. The analytical methods and PQLs associated with each parameter
14 are the same as those used in PC analysis, and are listed in Table 2-3.

15 With the exception of formic acid (as formate), analyses for the
16 constituents associated with the newly listed waste numbers (Section 2.1.2)
17 are already required analyses in the effluent and are not addressed
18 independently. An analysis for formate will not be required unless this
19 constituent is detected in the PC stored in a LERF basin.

24 3.2.3 Frequency of Sampling

25 The Approval for Delisting (60 FR 31115) specifies an initial
26 verification testing period and a subsequent verification program that can be
27 activated if certain conditions are met in the initial verification testing
28 period. The initial verification testing will consist of the collection and
29 analysis of composite samples from each of the first three verification tanks
30 filled with treated effluent. A full suite of analyses (Table 3-1) will be
31 conducted on these samples. A report on the results of these analyses and
32 associated quality control (QC) information will be submitted to EPA within
33 90 days after the first verification tank is filled with treated effluent
34 (refer to Section 6.6).

35 If EPA determines that the constituents of concern are consistently below
36 delisting levels, and notifies the DOE-RL in writing with authorization for a
37 reduced sampling program, subsequent verification testing will be required for
38 every 10th verification tank filled with treated effluent. If one or more of
39 the constituents exceeds the delisting level, samples from the following two
40 verification tanks are required to be analyzed before effluent discharge.
41 Treated waste water that does not meet the delisting levels will not be
42 discharged to the SALDS and will be recycled for further treatment.

43 For the purposes of interim status startup, every verification tank
44 filled with treated effluent will be tested for the parameters listed in
45 Table 3-1. Analytical results will be received from the laboratory and
46 reviewed before the treated effluent is discharged. (Treated effluent that
47 does not meet the discharge limitations will not be discharged). This WAP
48 will be revised at such time that sufficient operational history has been
49 accumulated to support a reduced sampling program.

Table 3-1. Rationale for Parameters to Be Monitored in Treated Effluent.
(sheet 1 of 3)

Parameter	Approval for delisting	Discharge limit	Early warning value
VOLATILE ORGANIC COMPOUNDS			
Acetone	X		
Benzene	X		X
1-Butyl alcohol	X		
Carbon tetrachloride	X	X	
Chlorobenzene	X		
Chloroform	X		X
1,2-Dichloroethane	X		
1,1-Dichloroethylene	X		
Methyl ethyl ketone	X		
Methyl isobutyl ketone	X		
Tetrachloroethylene	X	X	
Tetrahydrofuran			X
Toluene	X		
1,1,1-Trichloroethane	X		
1,1,2-Trichloroethane	X		X
Trichloroethylene	X		
Vinyl chloride	X		
SEMIVOLATILE ORGANIC COMPOUNDS			
Acetophenone			X
Benzyl alcohol	X		
Cresol	X		
1,4-Dichlorobenzene	X		
Dimethylnitrosamine		X	
Di-n-octyl phthalate	X		
Hexachloroethane	X		
Naphthalene	X		

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Table 3-1. Rationale for Parameters to Be Monitored in Treated Effluent.
(sheet 2 of 3)

	Parameter	Approval for delisting	Discharge limit	Early warning value
1	Tributyl phosphate	X		
2	TOTAL METALS			
3	Antimony	X		
4	Arsenic	X	X	
5	Barium	X		
6	Beryllium	X		X
7	Cadmium	X		X
8	Chromium	X	X	
9	Copper			X
10	Lead	X		X
11	Mercury	X		X
12	Nickel	X		
13	Selenium	X		
14	Silver	X		
15	Vanadium	X		
16	Zinc	X		
17	ANIONS			
18	Fluoride	X		
19	Nitrate		X	
20	Nitrite			X
21	Sulfate			X
22	OTHER ANALYSES			
23	Ammonia*	X		X
24	Total Kjeldahl nitrogen			X
25	Cyanide	X		
26	Tritium			M
27	Strontium-90			M

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Table 3-1. Rationale for Parameters to Be Monitored in Treated Effluent.
(sheet 3 of 3)

Parameter	Approval for delisting	Discharge limit	Early warning value
Gross alpha			M
Gross beta			M
Total dissolved solids			X
Total organic carbon			X
Total suspended solids			X
Specific conductivity		M	

X = rationale for measuring this parameter in treated effluent.

M = monitor only; no limit defined.

* Although the Approval for Delisting lists "ammonium" (NH_4^+), the standard analytical methods measure ammonia (NH_3). Ammonia is assumed to be the contaminant of concern.

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4.0 CHARACTERIZATION OF WASTE GENERATED AT 200 AREA EFFLUENT TREATMENT FACILITY

This section describes the characterization of the following waste streams generated within the ETF:

- Powdered dry waste from the secondary treatment train
- Waste generated by operations and maintenance activities
- Other miscellaneous waste generated within the ETF.

For each waste stream, the waste is described, a characterization methodology and rationale are provided, and sampling requirements are addressed. Further detail regarding the characterization and handling of these waste streams will be provided in the solid waste management plan for the ETF.

4.1 SECONDARY WASTE (THIN FILM DRYER POWDER)

The secondary waste treatment system receives and processes the following treatment by-products generated during primary treatment:

- Concentrate from the first RO stage
- Backwash from the rough and fine filters
- Regeneration waste from the ion exchange system (polisher)
- Spillage or overflow collected in the process sumps.

This waste is processed by pH adjustment in the secondary waste receiving tanks, evaporation in the ETF evaporator, pH adjustment in the concentrate tanks (if necessary), and drying in the thin film dryer. A more complete description of these processes can be found in Section 1.1.3 and in the *Hanford Facility Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility* (DOE/RL-93-03).

4.1.1 Rationale for Selection of Parameters for Analysis

The primary rationales for selection of parameters for analysis in the secondary dry powder waste are waste designation and LDR, to ensure that the waste is managed properly after the waste is transferred from the ETF to another TSD unit.

The dry powder waste is the concentrate generated in the secondary treatment train from the treatment of the 242-A Evaporator PC. Process knowledge and analytical data, from the initial characterization of the PC before treatment in the ETF, may be used to designate the dry waste powder. This waste will also be sampled at the concentration tanks while in the slurry form and before the waste enters the thin film dryer for characterization and verification of treatment system efficiency.

1 The dry powder waste is anticipated to consist primarily of ammonium
2 sulfate or other salts, radionuclides, and minor amounts of metals. Volatile
3 and semivolatile organic compounds are not expected. The waste is neither
4 water nor air reactive. Though the waste is not expected to contain
5 releasable cyanide or sulfide in concentrations that would result in
6 designation as a reactive waste, the waste will be analyzed for cyanides.

7
8 Volatile and semivolatile organic analyses, as well as cyanide analyses,
9 will be included in the initial characterization program. However, if these
10 compounds are not detected during the initial characterization period
11 (estimated as the first 12 months of operation), analysis for these compounds
12 will be eliminated in subsequent samples. Furthermore, analytical data and
13 process knowledge of the composition of the DST waste from which the PC was
14 generated might be used to eliminate some constituents from the list of
15 parameters to be analyzed, as determined on a campaign-by-campaign basis.

16
17 As described in Section 2.1.1, the F-listed dangerous waste constituents
18 apply to the secondary dry powder waste because the PC is derived from an
19 F-listed waste source, i.e., DSTs containing spent solvents. The designation
20 of WT02 might apply if the dry powder waste contains more than 110 milligrams
21 per liter ammonia. The pH of the powder is expected to be between 4 and 5;
22 however, this waste will be monitored and sampled to verify that the PC is not
23 a corrosive dangerous waste (D002; $\text{pH} < 2.0$ or $\text{pH} > 12.5$).

24
25 Pesticides, herbicides, and polychlorinated biphenyls (PCBs) will not be
26 analyzed because these compounds are not present in the PC. Additionally, the
27 powdered material is neither ignitable nor reactive; thus these parameters
28 will not be measured.

29
30 Each sample will undergo a percent water analysis. This value will be
31 used to report the concentrations of the parameters on a dry weight basis.
32 The dry weight concentration will represent more closely the concentration of
33 the powder after the thin film dryer. For each analyte that might result in
34 characteristic designation (toxicity characteristic constituents), the total
35 concentration will be divided by 20 and compared to the promulgated toxicity
36 characteristic (TC) limit. This represents the worst-case scenario if the
37 analysis was performed by TCLP (i.e., the total concentration is entirely
38 leachable), because the TCLP method specifies an extraction "with an amount of
39 extraction fluid equal to 20 times the weight of any solid phase" (SW-846,
40 "Toxicity Characteristic Leaching Procedure"). Thus, the result of a 'total'
41 analysis, divided by 20, represents the maximum possible concentration in the
42 TCLP extract (refer to the following example calculation). If any analyte
43 meets or exceeds the TC limit, the waste will be designated accordingly.

44
45 Example dry weight concentration calculation:

- 46
47 • Slurry analyses indicated 0.006 mg/L Mercury (Hg) and 60% water (60 g
48 of water in a 100 g slurry sample).
49

- $(0.006 \text{ mg/L slurry})(1 \text{ L slurry}/1,210 \text{ g slurry})(100 \text{ g slurry}/40 \text{ g solid}) = 1.24 \text{ E-05 mg/g Hg in the solid}$
 $(1.24 \text{ E-05 mg/g})(1,000 \text{ g/l L}) = 0.0124 \text{ mg/L Hg in solid}$
 $- 1,210 \text{ g slurry/L} = \text{slurry density}$
 $- 100 \text{ g}/40 \text{ g} = \text{percent solids}$
 To determine if TC: $(0.0124 \text{ mg/L})/20 = 6.2 \text{ E-04 mg/L Hg.}$

The maximum concentration of Hg for TC = 0.2 mg/L, and in this case, the waste would not be a dangerous waste with a D009 designation.

The parameters for analysis of the dry powder waste and the rationale for selection are provided in Table 4-1. All methods are EPA approved for the analysis of dangerous waste. The QC procedures and limits established in the published methods will be met, unless a laboratory quality assurance (QA) project plan with more stringent QC procedures is approved before submittal of samples.

4.1.2 Sampling Methods

The thin film dryer produces a mixed waste that will be transferred to another TSD unit for long-term storage or disposal. Because health and safety considerations preclude sampling the dry powder waste directly, slurry samples will be collected upstream of the thin film dryer. The concentrate tanks each have recirculation lines to mix tank contents during pH adjustment and to prevent caking. A sample port in the recirculation line will be opened to collect samples directly into sample containers.

The sample port line will be flushed with a minimum of three line volumes before collecting a grab sample. The volatile organic compounds (VOC) sampling will be performed first. Each VOC sample container will be filled such that cavitation at the sample valve is minimized and the container has no head space. The semivolatile organic compound (SVOC) sample containers will be filled next followed by the remainder of the analytes. The sample container requirements, sample preservation requirements, and maximum holding times for each of the parameters to be analyzed are listed in Appendix B. The QC samples will be collected as described in Section 5.0.

4.1.3 Sampling Frequency

At the design flow rate, a concentrate tank will receive waste at 3 liters per minute while the other concentrate tank feeds the waste to the dryer at the same rate. Each tank of concentrate waste will generate approximately 40 containers of dry powder waste at a rate of up to 9 or 10 containers per day at design conditions. The slurry concentrate is recirculated in the tank and therefore will be homogeneous. One sample from each tank (i.e., every 18,900 liters of concentrate) is sufficient to adequately represent tank contents. One slurry sample will be collected for each 18,750 liters of slurry concentrate generated and analyzed for the parameters in Table 4-1.

If VOCs and SVOCs are not detected in the first 18,900 liters of concentrate produced during treatment of a batch of PC, these parameters will be eliminated from further analysis of slurry concentrate during treatment of that basin of PC. However, on startup of treatment for a new PC batch (i.e., a new LERF basin), all the parameters in Table 4-1 will be analyzed in the sample representing the first 18,900 liters of concentrate to verify the treatment process is producing secondary waste containing no volatile or semivolatile organic compounds. Thus, the first slurry concentrate sample from each new batch of PC will receive a full suite of analyses. If no VOCs or SVOCs are present, all subsequent concentrate samples for that PC batch will be analyzed only for inorganic constituents.

If VOCs and SVOCs are consistently not detected, these analyses may be eliminated from future sampling of the dry powder waste. Similarly, if individual parameters (organic or inorganic) are consistently not detected, these parameters might be eliminated from the list of parameters to be analyzed in future dry powder waste sampling.

4.1.4 Waste Analysis Requirements Pertaining to Land Disposal Restrictions

Containers of the dry powder waste will be transferred for further treatment or long-term storage to the Central Waste Complex (CWC). The ETF personnel will provide the analytical characterization data and necessary process knowledge for the waste to be tracked by CWC staff, and for appropriate LDR treatment and documentation.

The following information on the dry powder waste will be included on the LDR notification that is provided to the receiving TSD unit:

- Dangerous waste numbers
- The corresponding treatment standards set forth in 40 CFR 268, Subpart D, and all applicable prohibitions set forth in 40 CFR §268.32 for each applicable constituent listed in 40 CFR §268.48 that is reasonably expected to be in the waste.
- The waste tracking information associated with the transfer of waste
- Waste analysis results.

Comprehensive LDR characterization (based on process knowledge and broad parameter analysis) is required to be performed once only. Any parameters found not to meet the UTS must be analyzed in subsequent sampling events. Other parameters can be eliminated from future LDR characterization sampling.

4.2 OPERATIONS AND MAINTENANCE WASTE GENERATED AT THE 200 AREA EFFLUENT TREATMENT FACILITY

Operation and maintenance of process and ancillary equipment will generate additional routine waste. These waste materials will be segregated

to ensure proper handling and disposition, and to minimize the commingling of potentially dangerous waste with nondangerous waste. The following waste streams (that might or might not be dangerous waste, depending on the nature of the material and its exposure to PC) are anticipated to be generated during routine operation and maintenance of the ETF:

- Spent lubricating oils and paint waste from pumps, the dryer rotor, compressors, blowers, and general maintenance activities
- Spent filter media from coarse and fine filters (anticipated changeout of media is less than once per year)
- Spent ion exchange resin (anticipated changeout is less than once per year)
- HEPA filters
- UV light tubes
- RO membranes
- Equipment that cannot be returned to service
- Other miscellaneous waste that might contact a dangerous waste (e.g., plastic sheeting, glass, rags, paper, waste solvent or aerosol cans).

These waste streams will be stored at the ETF before being transferred to a TSD unit. This waste will be characterized and designated using process knowledge, based on the influent (PC) composition that will have been previously determined; analytical data; and material safety data sheets (MSDS) of the chemical products present in the waste or used (these data sheets are kept at the ETF). Sampling of these waste streams is not anticipated; however, if an unidentified or unlabeled waste is discovered, that waste will be sampled. This 'unknown' waste will be sampled and analyzed for the parameters in Table 4-1 as appropriate.

4.3 OTHER WASTE GENERATED AT THE 200 AREA EFFLUENT TREATMENT FACILITY

There are two other potential sources of waste at the ETF: spills and/or overflows and discarded chemical products. Spilled material that potentially might be dangerous waste will either enter the sumps and be routed to the surge tank for treatment or be containerized and transferred to another TSD unit. In most cases, process knowledge and the use of MSDS will be sufficient to designate the waste material. If the source of the spilled material is unknown, and the material cannot be routed to the surge tank, a sample of the waste will be collected and analyzed according to Table 4-1, as necessary, for appropriate characterization of the waste.

Chemical products could be generated if chemical feed solutions, cleaning agents, or maintenance products become contaminated or are otherwise rendered unusable. In all cases, these materials will be appropriately containerized

1 and designated based on MSDS information. Sampling of these materials might
2 be necessary. Sampling will be performed, as appropriate, to determine the
3 radioactivity of a waste, or if required for designation of waste.

Table 4-1. 200 Area Effluent Treatment Facility Secondary, Maintenance, and Unknown Waste Characterization Sampling.

Parameter ¹	Method ²	Rationale
Percent water ³	ASTM D2216	<ul style="list-style-type: none"> Calculate dry weight concentrations for TCLP comparisons
Volatile organic compounds (combined target compound lists)	8240 or 8260A	<ul style="list-style-type: none"> Waste designation LDR - verify UTS Eliminate if all SVOCs are undetected during initial verification testing period
Semivolatile organic compounds (target compound list plus tributyl phosphate)	8270B	<ul style="list-style-type: none"> Waste designation LDR - verify UTS Eliminate if all VOCs are undetected during initial verification testing period
Metals (antimony, barium, beryllium, cadmium, chromium, nickel, silver, thallium, vanadium, and zinc)	6010A	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Mercury	7470A EPA 245.1	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Arsenic	7060	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Lead	7421	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Selenium	7740	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Fluoride	EPA 300.0	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Sulfate	EPA 300.0	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Ammonia	EPA 350.3	<ul style="list-style-type: none"> Waste designation - toxicity
Cyanide	9013 ⁵ EPA 335.2/335.3	<ul style="list-style-type: none"> Waste designation LDR - verify UTS
Specific gravity ⁴	Laboratory specific	<ul style="list-style-type: none"> Calculate dry weight concentration for TCLP comparisons
pH	WAC 173-303-110(3)(a)(ii) ⁶ EPA 150.1	<ul style="list-style-type: none"> Waste designation - corrosivity

¹ The total sample (solid plus liquid) will be analyzed. Each dry weight result will be divided by 20 and compared to the TCLP constituent limits. (This assumes, conservatively, that all of the constituent is leachable.) If the TCLP limit is exceeded, the waste will be designated accordingly. All measured parameters will be compared against the corresponding UTS.

² Methods are SW-846 unless otherwise noted.

³ Percent water will not be determined for unknown waste samples and will only be analyzed in maintenance waste samples as appropriate (e.g., percent water is not required for such routine maintenance waste as aerosol cans, fluorescent tubes, waste oils, batteries, etc.).

⁴ Specific gravity will not be determined for unknown waste samples and will only be analyzed in maintenance waste samples as appropriate.

⁵ For solid or oily waste.

⁶ For solid waste.

ASTM = American Society of Testing and Materials.

LDR = land disposal restrictions.

TCLP = toxicity characteristic leaching procedure.

UTS = universal treatment standards.

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5.0 QUALITY ASSURANCE AND QUALITY CONTROL

The following discussion presents the objectives of the QA/QC program that support the sampling and analysis of waste. This information will be superseded by the issuance of the *200 Area Liquid Effluent Facilities Quality Assurance Project Plan* (LEF QAPjP) (WHC 1995b).

5.1 QUALITY ASSURANCE AND QUALITY CONTROL OBJECTIVES

The purpose of waste testing objectives are to ensure that the waste is characterized in compliance with WAC 173-303 and the LDRs (40 CFR 268.48); to ensure the safe management of waste being generated, treated, stored, or transferred; and to ensure proper disposition of residuals from incidents that might occur. To accomplish these objectives, the QA/QC program must ensure that chemical and physical analysis of representative samples of the waste that is treated or stored meet data quality requirements of the LEF QAPjP.

The objectives of the QA/QC program are two-fold. The first objective is to control and characterize any errors associated with the data. The QA activities, such as the review of data sheets before waste transfer and use of standard procedures for collecting samples, are intended to limit the introduction of error. The QC activities, such as the collection of duplicate samples and the inclusion of blanks in sample sets, are intended to provide the information required to characterize errors in the data. Other QC activities ensure that the specified analytical methods are followed and that the QA information needed for characterization is obtained.

The second QA/QC objective is to illustrate that waste testing has been performed according to specifications in this WAP. The QA/QC activities will include:

- **Field inspections** - performed by an ETF operator or a member of a compliance group, depending on the activity. The inspections are visual examinations, with the purpose of verifying that sampling is being performed properly (i.e., according to the specific guideline, specification, or procedure for the activity) and is successfully completed. Field inspections will be conducted periodically based on the operating schedule of the ETF.
- **Field sampling** - performed by trained sampling personnel with oversight by an operations supervisor according to specified procedures. Field sampling involves collecting waste samples and associated quality control samples.
- **Laboratory QC** - performed by onsite laboratories on waste samples. The purpose of the laboratory QC is to demonstrate acceptable precision and accuracy of the data.
- **Instrument calibration** - maintain records of calibration of all instruments used to perform surveying, field-testing, and

laboratory analyses to demonstrate that instruments are within appropriate operating ranges to ensure data quality.

5.2 SAMPLING, DATA COLLECTION, AND ANALYTICAL OBJECTIVES

The sampling objectives and data collection and analytical objectives are described in this section.

5.2.1 Sampling Objectives

The data quality objectives (DQOs) for waste sampling and data analyses are as follows:

- Determine if waste received in the LERF meets the liner compatibility limits
- Verify waste designation in the LERF
- Characterize the process condensate for the purpose of developing additional data for BAT/AKART level refinement/confirmation
- Determine if the treated effluent meets Waste Discharge Permit and Approval for Delisting limits
- Characterize the secondary dry powder waste for waste designation and proper subsequent handling
- Determine whether the secondary dry powder waste meets the UTS and provide documentation for LDR requirements.

5.2.2 Data Collection and Analytical Objectives

The acquired data need to be scientifically sound, of known quality, and thoroughly documented. The DQOs for the data collection and analysis will be consistent with the DQOs specified in the *Hanford Analytical Services Quality Assurance Plan* (DOE/RL-94-55) and the LEF QAPjP (WHC 1995b) as follows.

- **Precision** represents a quantitative measure of the degree of reproducibility of measurements under prescribed similar conditions. Precision is calculated on the basis of matrix spike and matrix spike duplicate samples or field duplicate samples. The goal for precision is ± 20 percent.
- **Accuracy** represents the degree to which a measurement agrees with an accepted reference or true value. Sample accuracy is a quantitative measurement expressed as the average percent recoveries of spiked samples. The percent recovery limits are those stated in SW-846 Methods as percent recovery or if not stated in SW-846 Methods, the limit is ± 20 percent.

- 1 ~ **Representativeness** is the degree to which data accurately and
2 precisely represent a characteristic of a population, parameter
3 variation at a sampling point, or a process condition.
4 Representativeness is a qualitative measure and will be addressed
5 for the following points.
6
7 - Based on the homogeneity/nonhomogeneity of the waste in the
8 LERF basins, an adequate number of sampling locations are
9 selected.
10
11 - The representativeness of flow-proportional composite samples is
12 appropriate.
13
14 - The representativeness of selected media has been accurately
15 defined.
16
17 - The sampling and analytical methodologies are appropriate.
18
19 - The environmental conditions at the time of sampling are
20 documented.
21
22 ~ **Completeness** is a quantitative measure of the amount of valid
23 data obtained from the measurement system. The target
24 completeness objectives are that 95 percent of the data is
25 useable for decisions, meaning the data is not rejected due to
26 QA/QC concerns, and that 100 percent of the requested analytical
27 sample data is received.
28
29 ~ **Comparability** is the confidence with which one data set can be
30 compared to another. For each analyte, comparable precision and
31 accuracy depend on the method and sample matrix. For data to be
32 comparable, similar precision, accuracy, and detection limits will be
33 achieved on samples with similar matrices using similar sampling and
34 analytical methods. Comparability of PC and treated effluent data are
35 ensured through the use of the same analytical methods, PQLs, and
36 precision and accuracy limits as set forth in this WAP and the QAPjP.

39 **5.3 FIELD QUALITY ASSURANCE AND QUALITY CONTROL**

41 Field QA/QC checks will be established by both qualitative documentation
42 of sampling events and by submitting QA/QC samples to the analytical
43 laboratory. Documentation of field sampling activities will include the
44 following:

- 46 ~ Chain of custody
- 47 ~ Sample preservation
- 48 ~ Sampling equipment decontamination
- 49 ~ Field logs.

51 Field sampling QC involves taking various QC samples and sending these
52 samples to an analytical laboratory. Field QC samples typically consist of

field duplicates, trip blanks, and equipment blanks, as described in the following paragraphs. Each of these types of QC samples are typically collected at a ratio of 1 QC sample per 20 field samples (5 percent) in each matrix. Table 5-1 indicates the number of field and laboratory QC samples that will be obtained for each type of sampling described in this WAP.

- **Trip blanks**--sample containers are prepared with deionized water and carried into and out of the field but are not opened at any time during the sampling event. Trip blanks are analyzed for VOCs only. If the trip blank is found to be contaminated, the source of the contamination is assumed to be the container itself, the environment in which the trip blank was prepared, or cross-contamination of VOCs during shipping or storage.
- **Equipment blanks**--prepared after decontamination and before sampling by running ASTM Type II water over and/or through the sampling equipment and collecting the water in a clean sample container. Equipment blanks are analyzed for the same parameters as corresponding environmental samples. If the equipment blank is found to be contaminated, the source of contamination is assumed to be from the equipment used during the sampling event and might represent similar adverse impacts to environmental samples.
- **Field duplicates**--independent samples that are taken from the same location at the same time and are used to measure the representativeness of the sampling event. This is a measure that describes both the variability of the waste composition and the variability of the sampling technique.

5.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

The quality of analytical data generated in the analytical laboratories will be controlled by compliance with the *Hanford Analytical Services Quality Assurance Plan* (DOE/RL-94-55) and the LEF QAPjP (WHC 1995b).

Before commencement of the analytical work, the laboratory will submit its QA program plan prepared in accordance with the *Hanford Analytical Services Quality Assurance Plan* (DOE/RL-94-55). The plan will document how the analytical laboratory will meet onsite requirements (DOE-RL-94-55) for the analytes requested by ETF and should, at a minimum, address the following:

- ~ Personnel training and qualifications
- ~ Sample custody and management practices
- ~ Analytical methods
- ~ Sample preparation and analytical procedures
- ~ Instrument maintenance and calibration procedures
- ~ Internal QA/QC measures.

Laboratory QC samples that require the collection of additional sample material are indicated in Table 5-1 for each type of sampling described in

1 this WAP. Laboratory internal quality control check samples are described in
2 the following paragraphs.

- 3
- 4 • **Method blanks**--usually consist of laboratory reagent grade water
5 treated in the same manner as the sample (i.e., digested,
6 extracted, distilled, etc.), which is analyzed and reported as a
7 field sample would be.
- 8
- 9 • **Matrix spike**--an aliquot of an investigative sample that is
10 fortified (spiked) with a known quantity of the analytes of
11 interest and is analyzed with an associated sample batch to
12 monitor the effects of the investigative sample matrix (matrix
13 effects) on the analytical method. One matrix spike (MS) and one
14 matrix spike duplicate (MSD) per 20 samples (5 percent) or one
15 MSD set per batch of samples is typical.
- 16
- 17 • **Laboratory duplicate samples**--obtained by splitting a field
18 sample into two separate aliquots and performing two separate
19 analyses on the aliquots. The analysis of laboratory duplicates
20 monitors the precision of the analytical method for the sample
21 matrix. However, the analysis might be affected by
22 nonhomogeneity of the sample, particularly in the case of
23 nonaqueous samples. Duplicates are performed only in association
24 with selected protocols. Laboratory duplicates are performed on
25 5 percent of the samples (1 in 20) or one per batch of samples,
26 whichever represents the higher percentage. If the precision
27 value exceeds the control limit, the higher of the two
28 concentrations is reported. If the precision value is within the
29 control limit, the two values are averaged and the average is
30 reported.
- 31
- 32 • **PQL check standard**--a separate check standard at a concentration equal
33 to the PQL will be analyzed alongside all compliance monitoring
34 samples. The PQL check standards will be treated as an method
35 detection limit sample and brought through the entire method. Check
36 standards will be produced independently of calibration standards and
37 will be maintained as a part of compliance records.
- 38
- 39

40 5.5 DATA REVIEW AND VALIDATION

41

42 Data from process condensate, effluent verification, and secondary waste
43 sample analysis, all considered compliance samples, will be validated
44 according to Appendix D. The validation will be performed onsite or by an
45 independent validator.

46

47 At the design flow rate, analytical results for treated effluent
48 verification samples must be received and interpreted within 72 hours after
49 sampling to ensure that treated waste water meets the Discharge Permit and
50 Approval for Delisting limits before the waste water is discharged to the
51 SALDS. Because of this time constraint, monitoring samples collected from the
52 verification tanks will not be validated routinely by an independent

1 validation group. The data validation process is designed to qualify or
2 eliminate questionable data, as described in Appendix D.

3
4 Sampling associated with waste characterization in LERF and the dry
5 powder waste likewise will not be validated routinely by an independent
6 validation group. Data quality will be monitored internally. All data
7 reports will be sent to the ETF and maintained as part of the operating record
8 as discussed in Section 6.0.
9

Table 5-1. Quality Control Samples Collected in the Field.

Material sampled/sample location	Field quality control samples			Laboratory quality control samples
	Field duplicate	Trip blank	Equipment blank	Matrix spike/matrix spike duplicate
Process condensate/ LERF	1 per treatment batch*, at least 1 per 20 samples	1 per day of sampling per cooler of VOC samples, at least 1 per 20 samples	1 per treatment batch, at least 1 per 20 samples	1 per treatment batch, at least 1 per 20 samples
Treated effluent/ verification tanks	1 per treatment batch, at least 1 per 20 samples	1 per day of sampling per cooler of VOC samples, at least 1 per 20 samples	None required except for VOA composite sampler at 1 per treatment batch, at least 1 per 20 samples	1 set per treatment batch, at least 1 per 20 samples
Dry powder/ before thin film dryer	1 per treatment batch, at least 1 per 20 samples	None required	None required	1 set per treatment batch, at least 1 per 20 samples

* A treatment batch is one LERF basin.

VOA = volatile organic analysis.

VOC = volatile organic compounds.

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6.0 RECORDKEEPING AND REPORTING

All reports or information submitted to Ecology in compliance with the Discharge Permit, and any permit modification requests will be certified in accordance with the provisions of Section G18 of the Discharge Permit (Ecology 1995). This includes, but is not limited to, the following documents:

- Discharge monitoring reports (DMRs)
- Initial verification testing report
- Effluent variability or BAT/AKART study report
- Early warning report
- Noncompliance notification report
- Engineering reports, plans, and specifications related to construction or modification of any waste water control facility
- State waste discharge permit application modification.

6.1 MAINTENANCE OF RECORDS

All sampling and analytical records, operations logs, upset reports, DMRs, reports, and plans required by the permit (including this WAP), and other information generated in the operation of the ETF will be retained onsite by the organization responsible for ETF operation. All records will be retained onsite for at least 3 years; for a longer period in the event of an unresolved dispute regarding the discharge of pollutants at the SALDS or as requested by Ecology.

6.2 DISCHARGE MONITORING REPORTS

The results of effluent monitoring will be summarized and reported on a DMR form (EPA 3320-1) and submitted to Ecology according to the following schedule:

<u>Due date</u>	<u>Period covered</u>
May 30	January through March
August 29	April through June
November 29	July through September
March 1	October through December

The Discharge Permit (Section G17) requires that all effluent monitoring conducted during ETF operations using test procedures specified in the permit be reported in the DMRs. Thus, results of voluntary sampling conducted above and beyond the required sampling as specified in the Discharge Permit and

1 Approval for Delisting will be reported, as will the results of required
2 routine effluent monitoring.

3
4 The results from each PC (LERF) sampling event will be reported. Results
5 of analyses will be reported as mean concentration for each analyte.
6 Constituents sampled for liner compatibility concerns will be compared with
7 the limits stated in Table 2-2. Any excursions over liner compatibility
8 limits will be reported to Ecology.

9
10 Results of effluent analysis (from the ETF) will be reported on DMRs and
11 compared to the regulated constituent limits. The 'daily maximum' is
12 understood to be the discharge limit for a constituent analyzed in a single
13 composite sample from a verification tank, regardless of the period over which
14 the composite sample was obtained. If a measured constituent is below the
15 PQL, the constituent will be reported as "NQ" for nonquantifiable. The
16 'monthly average' is understood to be the average measurements of a
17 constituent from all of the composite samples obtained within a calendar
18 month. Averages will be calculated using the method detection limit (not
19 zero) for measurements that are "NQ". During each quarterly reporting period,
20 one monthly average will be reported for each of the 3 months.

21 22 23 6.3 EARLY WARNING REPORT

24
25 If the analytical results indicate that one or more analytes is at or
26 above the early warning value, a written report will be submitted to Ecology.
27 The report will be submitted by the ETF operating contractor within
28 10 calendar days of the receipt of analytical results from the laboratory.
29 The report will include the following information, at a minimum:

- 30
31 • Date, location, and type of sample
- 32
33 • Identification and concentration of analyte(s) at or above the early
34 warning value(s)
- 35
36 • Concentrations of other parameters analyzed
- 37
38 • Concentrations of contaminants from previous sampling events.

39 40 41 6.4 NONCOMPLIANCE NOTIFICATION

42
43 The Discharge Permit requires the ETF operating contractor to notify
44 Ecology immediately (by telephone) on discovery of noncompliance with any of
45 the permit terms and conditions. In addition, actions will be taken to stop,
46 contain, and clean up any unauthorized discharges and to take such actions
47 necessary to correct the problem and prevent a repeat violation. Within
48 30 days, a detailed written report will be submitted to Ecology that describes
49 the noncompliant situation, corrective actions taken and planned, planned
50 actions to prevent a recurrence, and any other information relevant to the
51 violation.

6.5 PROCESS CONDENSATE VARIABILITY STUDY

A report documenting the measured composition of PC in LERF, including the variability of ammonia and TKN in PC from LERF samples, the presence of iodine-129 and strontium-90, and the 10 TICs of highest concentrations will be submitted to Ecology after three completed 242-A Evaporator campaigns. At the discretion of the ETF operating contractor, should the data from three campaigns be insufficient to provide a demonstration of ammonia concentration variability in the PC, the report could be submitted at a later date.

6.6 INITIAL VERIFICATION TESTING REPORT

Under the conditions of the Approval for Delisting (60 FR 31115), the first three verification tanks filled with treated effluent must be sampled and analyzed. Results of these analyses will be reported to EPA no later than 90 days after the first tank is filled with treated effluent. If EPA determines that the data from this initial verification period indicate that constituent concentrations are consistently below delisting levels, EPA is to notify the ETF that a reduced sampling program can be implemented, as described in Section 3.2.3.

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7.0 REFERENCES

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18

APPENDICES

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APPENDIX A

200 AREA EFFLUENT TREATMENT FACILITY
EFFLUENT LIMITS

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Table A-1. Effluent Limits at the 200 Area Effluent Treatment Facility.
(sheet 1 of 3)

Parameter	Approval for delisting level, ppb	Effluent discharge limit, ppb (avg. monthly/ daily max.)	Early warning value, ppb (monthly average)
VOLATILE ORGANIC COMPOUNDS			
Acetone	40,000	--	--
Benzene	50	--	5
1-Butyl alcohol (1-Butanol)	40,000	--	--
Carbon tetrachloride	50	5/10	--
Chlorobenzene	1,000	--	--
Chloroform	100	--	5
1,2-Dichloroethane	50	--	--
1,1-Dichloroethylene	70	--	--
Methyl ethyl ketone (2-Butanone)	200,000	--	--
Methyl isobutyl ketone (Hexone)	30,000	--	--
Tetrachloroethylene	50	5/10	--
Tetrahydrofuran	--	--	100
Toluene	10,000	--	--
1,1,1-Trichloroethane	2,000	--	--
1,1,2-Trichloroethane	50	--	5
Trichloroethylene	50	--	--
Vinyl chloride	20	--	--
SEMIVOLATILE ORGANIC COMPOUNDS			
Acetophenone	--	--	10
Benzyl alcohol	100,000	--	--
Cresol	20,000	--	--
1,4-Dichlorobenzene	750	--	--
Dimethylnitrosamine	--	20/--	--

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Table A-1. Effluent Limits at the 200 Area Effluent Treatment Facility.
(sheet 2 of 3)

	Parameter	Approval for delisting level, ppb	Effluent discharge limit, ppb (avg. monthly/daily max.)	Early warning value, ppb (monthly average)
1	Di-n-octyl phthalate	7,000	--	--
2	Hexachloroethane	60	--	--
3	Naphthalene	10,000	--	--
4	Tributyl phosphate	200	--	--
5	TOTAL METALS			
6	Antimony	60	--	--
7	Arsenic	500	15/30	--
8	Barium	20,000	--	--
9	Beryllium	40	--	40
10	Cadmium	50	--	7.5
11	Chromium	1,000	20/--	--
12	Copper	--	--	70
13	Lead	150	--	38
14	Mercury	20	--	2
15	Nickel	1,000	--	--
16	Selenium	500	--	--
17	Silver	2,000	--	--
18	Vanadium	2,000	--	--
19	Zinc	100,000	--	--
20	ANIONS			
21	Fluoride	40,000	--	--
22	Nitrate	--	100/--	--
23	Nitrite	--	--	100
24	Sulfate	--	--	10,000

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Table A-1. Effluent Limits at the 200 Area Effluent Treatment Facility.
(sheet 3 of 3)

Parameter	Approval for delisting level, ppb	Effluent discharge limit, ppb (avg. monthly/daily max.)	Early warning value, ppb (monthly average)
OTHER ANALYSES			
Ammonia	10,000	--	830
Total Kjeldahl nitrogen	--	--	600
Cyanide	2,000	--	--
Tritium	--	--	M
Strontium-90	--	--	M
Gross alpha	--	--	M
Gross beta	--	--	M
Total dissolved solids	--	--	380,000
Total organic carbon	--	--	1,100
Total suspended solids	--	--	4,000
Specific conductivity	--	M/--	--

ppb = parts per billion.
 -- = no regulated limit.
 M = monitor only.

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APPENDIX B

SAMPLE CONTAINERS, PRESERVATIVE METHODS, AND HOLDING TIMES

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Table B-1. Sample Criteria for Process Condensate and Treated Effluent Sampling.
(sheet 1 of 4)

Parameter	Analytical method ^a	PQL (ppb) ^b	Sample container ^c	Preservative ^c	Holding time ^d
VOLATILE ORGANIC COMPOUNDS					
Acetone	8260A	40	2 x 40-mL amber glass with Teflon* septum or collection syringe (for verification tank samples)	1:1 HCl to pH<2; 4°C no preservative required for collection syringe	7 days
Benzene		5			
1-Butyl alcohol (1- Butanol)		500			
Carbon tetrachloride		5			
Chlorobenzene		5			
Chloroform		5			
1,2-Dichloroethane		5			
1,1-Dichloroethylene		50			
2-Hexanone		5			
Methylene chloride ^f		100			
Methyl ethyl ketone (2-Butanone)		50			
Methyl isobutyl ketone (Hexone)		10			
2-Pentanone		5			
Tetrachloroethylene		5			
Tetrahydrofuran		5			
Toluene		5			
1,1,1-Trichloroethane		10			
1,1,2-Trichloroethane					
Trichloroethylene					
Vinyl chloride					

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Table B-1. Sample Criteria for Process Condensate and Treated Effluent Sampling.
(sheet 2 of 4)

	Parameter	Analytical method ^a	PQL (ppb) ^b	Sample container ^c	Preservative ^c	Holding time ^d
1	SEMIVOLATILE ORGANIC COMPOUNDS					
2	Acetophenone	8270B	10	4 x 1-liter amber glass	4°C	7 days for extraction; 40 days for analysis after extraction
3	Benzyl alcohol		20			
4	2-Butoxyethanol		1000			
5	Cresol (o, p, or m)		10			
6	1,4-Dichlorobenzene		10			
7	Dimethylnitrosamine		10			
8	Di-n-octyl phthalate		5			
9	Hexachloroethane		10			
10	Naphthalene		10			
11	Tributyl phosphate		100			
12	TOTAL METALS					
13	Antimony	6010A/EPA 200.7	300	1 x 0.5-liter glass	1:1 HNO ₃ to pH<2	180 days; mercury 28 days
14	Arsenic	7060/EPA 200.8	15			
15	Barium	6010A/EPA 200.7	20			
16	Beryllium	6010A/EPA 200.7	40			
17	Cadmium	7131A/EPA 200.8	5			
18	Chromium	7191/EPA 200.8	20			
19	Copper	6010A/EPA	70			
20	Lead	7421/EPA 200.8	10			
21	Mercury	7470A/7471/EPA 245.1	2			
22	Nickel	6010A/EPA 200.7	75			
23	Selenium	7740	20			
24	Silver	6010A/EPA 200.7	70			
25	Vanadium	6010A/EPA 200.7	80			
26	Zinc	6010A/EPA 200.7	20			

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Table B-1. Sample Criteria for Process Condensate and Treated Effluent Sampling.
(sheet 3 of 4)

Parameter	Analytical method ^a	PQL (ppb) ^b	Sample container ^c	Preservative ^e	Holding time ^d
ANIONS					
Fluoride	9056/EPA 300.0	500	1 x 1-liter glass	4°C	28 days
Formate	"	1,250			
Nitrate	"	100			
Nitrite	"	100			
Sulfate	"	10,000			
pH	EPA 150.1 (in lab)/ 9040A	RL +/- 0.1			
OTHER ANALYSES					
Ammonia ^e	EPA 350.3/350.1	40	250 mL glass	H ₂ SO ₄ to pH<2; 4°C	28 days
Total Kjeldahl nitrogen	TKN/EPA 351.1/351.2	600			
Cyanide	9012/EPA 335.1/335.2	100	250 mL polyethylene	6 M NaOH to pH>12 4°C	14 days
Iodine-129 Tritium	Laboratory specific	5 pCi/L 460 pCi/L	1 x 2 L glass	None	None
Strontium-90	Laboratory specific	5 pCi/L (72 hr)	1 L glass	2 mL/L HNO ₃	None
Gross alpha Gross beta	Laboratory specific	3 pCi/L 4 pCi/L	2 x 1-liter glass	1:1 HNO ₃ to pH<2	180 days
Total dissolved solids Total suspended solids Specific conductivity	EPA 160.1 EPA 160.2 EPA 120.1 (in lab)/ 9050	RL 10,000 RL 4,000 RL 10 umho/cm	1 L glass	None	7 days
Total organic carbon	9060A	RL 1,000	250 mL glass	HCl or H ₂ SO ₄ to pH<2; 4°C	28 days

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^a SW-846 methods unless otherwise noted. Other methods might be substituted if the applicable PQL can be met.

^b Parts per billion unless otherwise noted.

^c Sample volumes and preservatives may be adjusted per laboratory directions.

^d Holding time = maximum time between sampling and analysis.

^e Although the Approval for Delisting lists "ammonium" (NH_4^+), the standard analytical methods measure ammonia (NH_3). Ammonia is assumed to be the contaminant of concern.

^f Methylene chloride will not be analyzed for treated effluent sampling.

mL = milliliter.

RL = reporting limit.

pCi/L = picocuries per liter.

ppb = parts per billion.

umho/cm = micromhos per centimeter.

* Teflon is a trademark of E.I. DuPont de Nemours & Company.

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Table B-2. Sample Containers, Preservative Methods, and Holding Times for Solid, Sludge, and Slurry Samples.

Parameter	Analytical method ^a	Container ^b	Preservative ^c	Holding time ^d
Percent water	ASTM D2216	1-liter glass	None	180 days
Specific gravity	Lab specific			
Fluoride	EPA 300.0			
Sulfate	EPA 300.0			
Ammonia	EPA 350.3/350.1			
pH	WAC 173-303-110 (3)(a)(ii) ^f / EPA 150.1/9040A	1-liter glass	None	28 days 48 hours
Cyanide	9013 ^e / EPA 335.2/335.3	250 mL poly	None	14 days
Volatile organic compounds	8240 or 8260A	2-40 mL amber glass w/septum	None	14 days
Semivolatile organic compounds	8270B	4-1,000 mL amber glass	None	Extract within 7 days; analyze extract within 40 days
Total metals	6010A or 7000 Series	1-liter glass	None	Mercury 28 days; 6 months all others

^a SW 846 methods unless otherwise indicated.

^b Container size and type could be changed by negotiation with the laboratory.

^c No preservatives are added to containers due to the anticipated high concentrations of ammonium sulfate.

^d Holding time = maximum time between sampling and analysis.

^e For solid or oily waste.

^f For solid waste.

mL = milliliter.

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APPENDIX C

TOXICITY CALCULATION FOR AMMONIA

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TOXICITY CALCULATION FOR AMMONIA

Toxicity Calculation: Toxicity data obtained from the National Institute of Occupational Safety and Health (NIOSH) publication Registry of Toxic Effects of Chemical Substances (RTECS). Of the four test methods accepted by Washington state, the "inhalation rat" category was the only test category available in the RTECS. To determine the Toxic Category:

- For ammonia: "inhalation rat LC₅₀" = 200 ppm/4 hours.
- Convert "inhalation rat LC₅₀" from ppm to mg/L and account for the density of air and the molecular weights of ammonia and air:
(2000 ppm)(0.001220 mg/L air density)(17/28.9) = 1.4 mg/L.
- Compare 1.4 mg/L to WAC 173-303-9906 Toxicity Category Chart.
- Determined that ammonia meets the Toxic Category "B".

Consider the dry powder that is generated as ETF secondary waste to determine the upper limit of ammonia concentration that would result in a WT02 designation.

- Assume:
 - ammonia concentration of 110 mg/l from secondary waste analysis,
 - 55 gallon (208 L) drum containing 500 pounds (227 Kg) of waste
- $(110 \text{ mg/L})(208 \text{ L})(10^{-6} \text{ Kg/1.0 mg}) = 0.228 \text{ Kg ammonia}$
- $(.228 \text{ Kg}/227 \text{ Kg}) = 0.001 = 0.1\% \text{ of the } 227 \text{ Kg of drummed waste is ammonia}$
- Equivalent Concentration % (EC%) = $(0.1\%)/100 = 0.001$

Compare the EC value and the weight of the waste to the WAC 173-303-9906 Toxic Dangerous Waste Mixtures to determine if waste is non-regulated (only non-regulated if EC < 0.001), WT01, or WT02. The waste in this example falls into the WT02 designation range.

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APPENDIX D

LIQUID EFFLUENT FACILITIES DATA VALIDATION

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LIQUID EFFLUENT FACILITIES DATA VALIDATION

I. LEVEL A

This level of data validation will include the verification of required deliverables, requested versus reported analyses, and evaluation and qualification of results based on analytical holding times. Completion of this level of validation except for checking of sample number is not required to release the treated effluent from the verification tanks. Level A validation will be performed on all ETF compliance samples and includes the following:

- Chain of custody--Verify that the correct samples were collected by comparing the chain of custody to the corresponding sample authorization form. Check "Special Instruction" block of chain of custody for comments entered by samplers. The project scientist must determine if samples may have been affected by the conditions noted by the sampler on the chain of custody, and to ensure that the data are flagged appropriately.
- Compare requested data to reported data--Review the data to determine if requested samples were collected and whether all requested analyses were performed.
- Holding times--Review the data to determine if the sample analysis was performed within the requested holding time (the time between sample collection and date and time of analysis).

II. LEVEL B

This level of data validation will include Level A validation and evaluation and qualification of results based on analysis of blanks. Level B validation will be conducted on a minimum of 1 in every 20 ETF compliance samples. Completion of this level of validation is not required to release the treated effluent from the verification tanks. Level B validation includes the following:

- Blank evaluation--Results of field blanks will be examined to evaluate potential contamination during transfer of the samples, laboratory handling, or sampling.
- QAPjP requirements--Verify that sampling procedures met the field QC requirements specified in the WAP.

III. LEVEL C

This level of data validation will include Levels A and B in addition to the evaluation and qualification of sample results based on matrix spikes, laboratory control samples, laboratory duplicates, and chemical and tracer

1 recoveries. Level C validation will be conducted, at a minimum, once per
2 quarter on a randomly selected dataset. Completion of this level of
3 validation is not required to release the treated effluent from the
4 verification tanks. Level C validation includes the following:
5

- 6 • Duplicates--Evaluate results of field (if performed) and laboratory
7 duplicates, matrix spikes, and laboratory control sample analyses and
8 compare with laboratory and LEF QAPjP requirements. Flag data that
9 are affected by QC analyses outside the required ranges.
10
- 11 • PQL check standard--Determines if the recovery calculated from
12 analysis of a check standard, at the concentration of the PQL, meets
13 the accuracy goal of ± 20 percent. The PQL check standard applies
14 only to the process condensate and the treated effluent samples.
15