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FIGURES

TABLE

ACRONYM LIST

CFR	Code of Federal Regulations
CWC	Central Waste Complex
DAF	dilution attenuation factor
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DRAS	delisting risk assessment software (delisting model)
Ecology	Washington State Department of Ecology
EE/O	Electrical Energy per Order
EPA	U.S. Environmental Protection Agency
ETF	200 Area Effluent Treatment Facility
HBL	health-based level
HWMA	*State of Washington Hazardous Waste Management Act of 1976*
IX	ion exchange
LAW	low-activity waste
LDR	land disposal restrictions
LERF	Liquid Effluent Retention Facility
LLBG	Low-Level Burial Grounds
PUREX	Plutonium-Uranium Extraction (Facility)
RCRA	*Resource Conservation and Recovery Act of 1976*
RO	reverse osmosis
SALDS	State-Approved Land Disposal Site
ST 4500	State Waste Discharge Permit Number ST 4500 (Ecology 2000)
UV/OX	ultraviolet oxidation
WAC	Washington Administrative Code
WTP	Waste Treatment Plant

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	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
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

06/2001

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

1.0 PROPOSED DELISTING ACTION

This delisting modification requests that the treated effluent from the 200 Area Effluent Treatment Facility (ETF) be delisted for an expanded constituents list. An increase in the annual ETF treated effluent volume limit, from 72 million liters to 210 million liters per year, also is requested. Delisting for 1.2 million liters per year of ETF concentrated waste (i.e., powders and evaporator brine) resulting from processing existing and projected wastewaters also is requested.

The initial ETF Delisting Petition (DOE/RL-92-72), submitted in August 1993, requested delisting for 72 million liters per year of ETF treated effluent. This volume was based on a projected rate of waste treatment. The constituents to be delisted in the treated effluent were based on the projected content of 242-A Evaporator process condensate and two Plutonium-Uranium Extraction (PUREX) Facility wastewater streams. On June 13, 1995, in response to this initial ETF Delisting Petition, the U.S. Environmental Protection Agency (EPA) published the final rule (Final Delisting) that excluded 72 million liters per year of ETF treated effluent from "being listed as hazardous wastes" (EPA 1995).

The following sections provide administrative information, a description of the proposed delisting action, and a statement of need/justification for this requested delisting action.

1.1 NAME OF PETITIONER

U.S. Department of Energy, Richland Operations Office (DOE-RL)
Hanford Site
Richland, Washington

1.2 CONTACTS

For additional information, contact:

Name	Title	Telephone Number
J. B. Hebdon	Director Regulatory Compliance & Analysis Division	(509) 372-2400

Mailing address for contact:

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

1.3 FACILITY NAME AND LOCATION

Liquid Effluent Retention Facility/200 Area Effluent Treatment Facility (LERF/ETF)
200 East Area
Hanford Site
Richland, Washington.

The single identification number issued to the Hanford Facility by the EPA and the Washington State Department of Ecology (Ecology) is EPA/State Identification Number WA7890008967.

1.4 DESCRIPTION OF PROPOSED DELISTING ACTION

This delisting action requests delisting of ETF treated effluent for an expanded constituents list. The proposed action also includes increasing the annual ETF treated effluent volume limit to 210 million liters per year. This volume limit is based on the ETF design capacity of 570 liters per minute and a total operating efficiency of 70 percent (accounting for planned maintenance outages and other down time). In addition, the delisting action requests delisting for 1.2 million liters per year of ETF concentrated waste (i.e., powders and evaporator brine) resulting from processing existing and projected wastewaters. (The LERF/ETF processes and resulting treated effluent and concentrated waste are discussed further in Section 2.0.)

The scope of the treated effluent delisting modification includes all constituents associated with wastewaters projected for treatment in LERF/ETF. Projected wastewaters include multi-source leachate, Waste Treatment Plant (WTP) effluents, and other hazardous wastewaters. Multi-source leachate is generated during operation of hazardous waste landfills. The WTP effluents will be generated from evaporator, melter, and decontamination operations within the WTP pretreatment and vitrification processes. Other hazardous wastewaters will be generated from analytical laboratory operations, research and development studies, waste management activities, environmental remediation projects (e.g., groundwater pump-and-treat operations, soil washing, etc.), and deactivation projects. Most of these projected wastewaters will be generated on the Hanford Site; however, it is possible that similar wastewaters will be received from offsite. These projected wastewaters are discussed further in Section 3.0.

This delisting modification demonstrates that the ETF adequately will treat these new wastewaters (Section 4.0) and describes the proposed verification sampling strategy to confirm that the waste is no longer listed (Section 5.0). The resulting ETF delisted treated effluent and delisted concentrated waste (i.e., powders and evaporator brine) will no longer require management under the *Resource Conservation and Recovery Act* (RCRA) *of 1976* Subtitle C or the *State of Washington Hazardous Waste Management Act* (HWMA) *of 1976*.

As described in Section 4.0, the treated effluent delisting methodology is similar to that used in the initial ETF Delisting Petition (DOE/RL-92-72). Potential wastewater constituents are placed into treatability groups based on similar chemical properties. Treatment efficiencies by treatability group are derived from knowledge of ETF operations, from surrogate testing performed in support of the original delisting effort (DOE/RL-92-72), and from information available from manufacturers of equipment used in the ETF. Given this strategy, no additional benchscale, surrogate, or other testing is proposed.

In the case of concentrated waste, delisting will be obtained through application of the delisting risk assessment software (DRAS) delisting model. The DRAS delisting model is used to calculate concentration-specific delisting criteria based on the most conservative of possible exposure scenarios. Only concentrated waste meeting these delisting criteria will be managed as non-hazardous waste (refer to Section 4.2 for further discussion of the concentrated waste delisting methodology).

Based on knowledge of waste accepted at ETF for treatment and of the treatment process, it is not expected that all concentrated waste will meet delisting criteria. Based on influent properties and the waste processing and disposal strategy, ETF personnel will determine whether a concentrated waste will be subject to Final Delisting and verification sampling. Where there is a high degree of certainty that delisting criteria will be met, the concentrated waste will be managed under the revised Final Delisting and the associated verification sampling scheme. Where it is indicated that delisting criteria will not be met, the concentrated waste will be managed as hazardous, and no verification sampling will be conducted other than sampling needed for waste designation under WAC-173-303-070 and land disposal restriction requirements of WAC 173-303-140. For example, if a characteristically hazardous influent is treated through ETF, the resulting concentrated waste most likely cannot be delisted because constituents contributing to the characteristic in the influent will be at even higher concentrations in the concentrated waste given the nature of the ETF process. In such instances, no delisting verification sampling will be performed for the concentrated waste, and the concentrated waste will continue to be managed under RCRA and HWMA.

1.5 STATEMENT OF NEED/JUSTIFICATION

To support the current Hanford Site mission, it is essential to provide treatment and disposal capacity for the mixed waste generated from cleanup activities. The existing Final Delisting (EPA 1995) allows ETF to delist the effluent resulting from processing wastewaters bearing the "F001 through F005," and/or "F039 derived from F001 through F005" waste designation. Multi-source leachate, WTP effluents, and other hazardous wastewaters intended for ETF treatment are expected to contain a broader spectrum of constituents than is accommodated by the existing Final Delisting. This treatment in ETF will result in an effluent that is considered a hazardous and dangerous waste under the derived-from rule and must be delisted and meet the requirements of State Waste Discharge Permit Number ST 4500 (ST 4500) (Ecology 2000) before discharge.

Under current operations, RCRA concentrated waste from the secondary treatment train is transferred to a RCRA-permitted disposal trench or to the Central Waste Complex (CWC) to await additional treatment before disposal in a RCRA-permitted disposal trench. Selective delisting of certain ETF concentrated waste substantially would reduce the volume of hazardous waste being generated and in turn eliminate much of the interim storage and secondary treatment costs, as well as disposal costs for such waste.

1.6 CERTIFICATION STATEMENT

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

________________________________	____________________
Owner/Operator Keith A. Klein, Manager U.S. Department of Energy, Richland Operations Office	Date
________________________________	____________________
Co-operator E. Keith Thomson President and Chief Executive Officer Fluor Hanford	Date

2.0 CURRENT OPERATIONS

The LERF/ETF are RCRA-permitted multi-waste treatment and storage units located in the 200 East Area of the Hanford Site (Figure 2-1). The ETF began waste treatment operations in 1995, and the LERF began operation in the previous year to treat wastewaters in advance of ETF treatment. Since this time, the LERF/ETF successfully have treated in excess of 428 million liters of hazardous listed waste.

The following sections provide an overview of the LERF/ETF and the treatment processes (Section 2.1), the ETF waste acceptance process (Section 2.2), and waste processing strategies (Section 2.3). The current ETF treated effluent verification sampling and discharge requirements also are discussed (Section 2.4 and Section 2.5 respectively).

In support of this delisting modification, a revised verification sampling strategy is proposed in Section 5.0. The LERF/ETF and treatment processes, waste acceptance process, and waste processing strategy described in Sections 2.1, 2.2, and 2.3 should remain unchanged under the revised verification sampling strategy presented in Section 5.0.

2.1 FACILITY AND PROCESS DESCRIPTION

The LERF consists of three composite, double-lined basins, each with a leachate collection system located between the primary and secondary composite liner system. Any leachate is collected in a sump and pumped into the basin. Each basin has an operating capacity of 29.5 million liters. The LERF can receive wastewaters through four inlets: via pipeline from 200 West Area, via pipeline from the 242-A Evaporator, via pipeline from the Load-In Station at ETF, and also directly through a series of sample ports located at each basin.

The ETF generally receives influent directly from any of the three LERF basins, but also can receive influent directly from tanker trucks via the Load-In Station. It also is possible to add containerized wastewaters directly to the ETF process. Wastewaters currently treated by LERF/ETF include 242-A Evaporator process condensate, groundwater derived from pump-and-treat operations, multi-source leachate (bearing the "F039 derived from F001 through F005" waste designation), and a variety of other wastewaters generated from onsite waste management and cleanup activities.

The ETF is a robust multi-waste treatment unit capable of treating influents with a broad range of metal and organic constituents. The ETF was designed with an influent flow rate of approximately 570 liters per minute and consists of a primary and a secondary treatment train (Figure 2-2). The primary treatment train provides for the removal or destruction of contaminants and consists of the following treatment units:

- Surge tank - inlet and surge capacity
- Filtration - removal of suspended solids generated within the treatment process
- Ultraviolet oxidation (UV/OX) - organic destruction
- pH adjustment - waste neutralization
- Hydrogen peroxide decomposer - removal of excess hydrogen peroxide
- Degasification - removal of carbon dioxide
- Reverse osmosis (RO) - removal of dissolved solids and radionuclides
- Ion exchange (IX) column (i.e., polisher) - removal of dissolved solids and radionuclides
- Verification tanks - holding treated effluent during verification sampling.

The UV/OX, RO, and IX units are the major treatment units and are the only treatment units considered when defining ETF treatment efficiencies for constituents of concern. Organic destruction is accomplished in two UV/OX units operating in parallel. The waste passes through reaction chambers where hydrogen peroxide is added. The UV/OX system uses the photochemical reaction of UV light on hydrogen peroxide to form hydroxyl radicals and other reactive species that oxidize the organic compounds. The final products of the complete reaction are carbon dioxide, water, and inorganic ions.

The RO system uses pressure to force clean water molecules through semi-permeable membranes while retaining the larger contaminants (e.g., dissolved solids, radionuclides, and high molecular weight organic materials) in the membrane. The RO process produces both a clean permeate stream and a concentrate (or retentate) stream. The contaminants are concentrated to the greatest extent possible to minimize the amount of concentrated waste produced.

Because the RO process removes most of the dissolved solids in the waste, the IX process acts as finishing step for dissolved solids removal. The IX system includes three columns containing beds of cation and/or anion resins. Typically, the two columns in operation are arranged in a primary/secondary (lead/lag) configuration, and the third (regenerated) column is maintained in standby.

The secondary treatment train typically processes the waste by-products from the primary treatment train (e.g., concentrate from the RO, filter backwash, regeneration waste from the IX system, etc.). Contaminants are concentrated in an evaporator and the evaporator brine is transferred to the concentrate tanks before being fed to the thin film dryer where the contaminants are dried to a powder. The evaporator brine chemically is representative of the powder. The powders are containerized and stored in the container storage area or in collection areas. The secondary treatment train consists of the following treatment units:

- Secondary waste receiving tanks - waste receiving
- Evaporator - concentrating secondary waste streams
- Concentrate tanks - receiving concentrate from the evaporator (i.e., brine) and adjusting pH
- Thin film dryer - dewatering of concentrate tank waste
- Container handling - packaging of dewatered concentrated waste.

After ETF treatment, the treated effluent is transferred to the verification tanks where the effluent is sampled to verify that the effluent meets the discharge levels of the Final Delisting (EPA 1995) and the discharge limits of ST 4500 (Ecology 2000) before the treated effluent is discharged to the State-Approved Land Disposal Site (SALDS) (Figure 2-1). If a treated effluent does not meet discharge requirements, the effluent is returned to LERF or to the ETF primary treatment train for additional treatment. (Refer to Section 2.5 for additional discussion of the current ETF treated effluent discharge requirements.) In the future, the delisted treated effluent from ETF could be used as make-up water at onsite facilities that have a demand for large quantities of demineralized water. Delisted effluent contains appreciable amounts of tritium and must be used in closed systems to minimize personnel exposure to the radioactive liquid. The processes used for makeup with this tritiated water would be used up in the treatment process or would be returned to the LERF/ETF for treatment.

The concentrated waste from the secondary treatment train currently is being transferred to a RCRA-permitted disposal trench or to CWC to await additional treatment before disposal.

Additional information on the construction and operation of the LERF/ETF is provided in the *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste at the Hanford Facility* (Ecology 2001, Attachment 34, Chapter 4.0).

2.2 WASTE ACCEPTANCE PROCESS

The LERF/ETF operations are regulated under permits and approvals issued by Ecology, EPA, and the Washington State Department of Health. The LERF/ETF operations also are authorized by the U.S. Department of Energy (DOE), and therefore are subject to the requirements contained in DOE Orders/Federal Regulations. These various regulatory drivers limit the influent content that can be accepted for ETF treatment. The combination of regulatory and operational limits imposed on the ETF influent defines the ETF treatability envelope. A subset of the ETF treatability envelope is the delisting treatability envelope. The delisting treatability envelope accounts for ETF treatment efficiency, LERF liner compatibility (Ecology 2001, Attachment 3A of Attachment 34), constituent solubility, and is defined as the limiting influent concentration by constituent associated with these three factors. Section 4.0 presents the development of the delisting treatability envelope in support of this delisting modification.

The LERF/ETF can accept dangerous, low-level, and mixed wastewaters for treatment. Before acceptance, any wastewaters proposed for ETF treatment must be characterized. The first step in the waste acceptance process is for the wastewater generating unit to complete and certify a waste profile sheet with supporting analytical data and documentation attached. Each generating unit is responsible for designating and characterizing their wastewater. Accordingly, each generating unit samples and analyzes the wastewater using the target list of parameters defined in the ETF/LERF waste analysis plan (Ecology 2001, Attachment 3A of Attachment 34). The target list of parameters was established to ensure the ETF influent, to which the wastewaters contribute, will meet the ETF treatability envelope. The target list of parameters might expand as the ETF treatability envelope is expanded to include additional constituents per this Delisting Modification, to account for process reconfiguration for multi-pass through the treatment train, to account for removal/destruction efficiency changes based on actual operating data, etc. The rationale for the target list of parameters to be sampled includes the need for the following:

- Set operating conditions in LERF/ETF (e.g., to determine operating configuration as discussed in Section 2.3)

- Identify concentrations of constituents that might interfere with or foul the ETF treatment process (e.g., interference with UV/OX destruction, fouling of the RO membranes as discussed in Section 2.3)

- Evaluate compatibility with LERF/ETF materials of construction and other wastewaters stored in LERF (e.g., the evaluation of LERF compatibility confirms specific constituents of concern are below concentration levels determined to be detrimental to the integrity of the LERF composite liner)

- Determine treatability to evaluate if constituents in the treated effluent will meet ST 4500 limits and Delisting levels

- Estimate concentrations of constituents in the waste generated in the secondary treatment train.

During the waste acceptability evaluation, LERF/ETF personnel evaluate the wastewater characterization data provided by the generating unit against the established ETF waste acceptance criteria. The waste acceptability review also concludes whether an incoming wastewater will be placed in a particular LERF basin with other waste or whether the wastewater will be transferred directly into the ETF process. Because most wastewaters are blended with other wastewaters in one of the three LERF basins before being fed as an influent to the ETF, any impact to the aggregate basin content also must be considered during the waste acceptance process. The resulting ETF influent must continue to fall within the ETF treatability envelope. Such considerations are addressed when developing the waste processing strategy

(Section 2.3). Both the waste acceptability evaluation and the decision as to whether to accept the wastewater for LERF/ETF processing are documented as part of the ETF Operating Record.

As required by the LERF/ETF waste analysis plan (Ecology 2001, Attachment 3A of Attachment 34), periodic re-evaluation of a routine wastewater is performed when LERF/ETF personnel have reason to believe that the process generating the wastewater has changed or note an increase or decrease in the concentration of a constituent in the wastewater beyond the range of concentrations described in the waste profile sheet. For those wastewaters that are a constant-flow source (i.e., not batch feeds), the wastewater is sampled periodically as part of the re-evaluation. The generating unit might be required to submit an updated waste profile sheet if it is determined that the wastewater is outside the currently approved concentration range. As long as a change in a wastewater characterization has no impact on the associated ETF influent, no operational rebaselining is required. These concepts are discussed further in Section 2.3.

2.3 WASTE PROCESSING STRATEGY

A waste processing strategy must be defined to support treatment of any ETF influent, whether a multi-source wastewater being received from one of the LERF basins or a single wastewater transferred directly into the ETF process. The waste processing strategy identifies any adjustments to the ETF treatment process and/or changes to the configuration of the ETF treatment units necessary to accommodate an influent and to ensure effective waste treatment. If a proposed wastewater could result in an ETF influent that is outside of the established operational baseline (as defined later in this section), the waste processing strategy is developed before acceptance of a wastewater into either LERF or ETF to ensure the resulting ETF influent will be within the treatability envelope.

The ETF is a flexible unit that can be modified to effectively treat specific influents. Examples of possible ETF process changes include the following.

- Typically, a waste is processed through the UV/OX unit and the RO unit of the primary treatment train. The ETF also can be reconfigured to process the waste in the RO unit before the UV/OX unit. This approach might be applied in cases where the waste has high concentrations of nitrates that might interfere with the performance of the UV/OX unit. In addition, the RO unit reject rate can be modified to accommodate the concentration of soluble salts in the wastewater feed and prevent premature fouling or scaling of the RO unit.

- The flexibility of the ETF also allows for some influents to be processed first in the secondary treatment train. For example, waste with high concentrations of certain anions and metals can be processed first in the secondary treatment train. This approach prevents premature fouling or scaling of the RO unit. The liquid portion (i.e., untreated overheads from the ETF evaporator and the thin film dryer) is sent to the primary treatment train for additional processing before discharge.

- In unique circumstances, it also is possible to solidify evaporator brine to contend with mobile radionuclide concentrations exceeding the mobile radionuclide reporting limit.

The operational baseline consists of the following three elements. When developing the waste processing strategy, the influent data are evaluated to determine if there is a change to the established operational baseline.

- Influent Characterization Data - influent concentrations for comparison to the influent baseline. The influent baseline is defined as the influent constituent concentration levels previously processed through the ETF. A one order of magnitude increase in either the total organic carbon concentration or the total dissolved solids concentration indicates that the influent baseline has changed. A change to the influent baseline might require modification to the primary operating parameters (discussed in the following).

- Primary Operating Parameters - include use of all major treatment units (i.e., UV/OX, RO, and IX), the sequence of major treatment units, and the RO reject rate. Proper control of the primary operating parameters ensures that the waste is processed through all the major treatment units, that ETF equipment is protected, and that acceptable contaminant treatment efficiencies are achieved.

- Flowrate - the rate at which the influent is processed through ETF. Monitoring the flowrate ensures that the ETF design rate is maintained and that the capacity of the treatment systems is not exceeded. Flowrate monitoring also provides an indication that the necessary residence time in the UV/OX unit and the contact time in the polishers (IX column) are maintained. The established conditions for these treatment units are met if the flowrate through the ETF is maintained between 150 and 570 liters per minute.

2.4 TREATED EFFLUENT VERIFICATION SAMPLING

When the ETF first began operations in 1995, Condition 1A, Initial Verification Testing (EPA 1995), required that verification samples be pulled from the first three filled verification tanks. Once EPA evaluated the operational and analytical test data resulting from initial ETF operations, the EPA provided notification that Condition 1B, Subsequent Verification Testing, could be used for subsequent verification sampling. Condition 1B requires that a verification sample be collected from every 10^{th} filled verification tank. The verification samples typically are a grab sample collected from a sample port on the verification tank recirculation line. Each verification sample is analyzed for all constituents listed in Condition 3, Delisting Levels. If sample analysis results indicate that not all delisting levels have been achieved, the effluent is reprocessed through the ETF; Condition 1B requires that the next two verification tanks also be sampled. When delisting levels are achieved, sampling at a rate of 1 in 10 tanks will recommence.
Verification sampling also is performed in the following situations:

- When the influent total dissolved solids or total organic carbon concentration increases by an order of magnitude above that of the influent baseline (operational baseline element)

- When any primary operating parameters (i.e., use of all major treatment units, the sequence of the major treatment units, and the RO reject rate) are changed (operational baseline element)

- When there is a change in flowrate outside the operational baseline range of 150 to 570 liters per minute (operational baseline element)

- When a significant (e.g., factor of 10) increase in treated effluent conductivity is identified (operational indicator) (Conductivity provides a numerical indication of the total concentration of dissolved ionic constituents and serves as a good indicator of the ETF treatment efficiency. Conductivity of the treated effluent being transferred to the verification tanks is monitored continuously.).

During the ETF operational history, there has not been an instance where verification sample results exceeded delisting levels. For this reason, a reduced verification rate, which better coincides with the ETF operational cycles, is being proposed in Section 5.0.

2.5 DISCHARGE REQUIREMENTS

Treated effluent discharges are subject to the conditions of the existing Final Delisting (EPA 1995), ST 4500 (Ecology 2000), and DOE Orders. The existing Final Delisting requires that the treated effluent meet certain discharge levels before disposal in the SALDS and consequently restricts the LERF/ETF influents to those bearing the "F001 through F005," and/or "F039 derived from F001 through F005" waste designations. Currently it is unlikely that the treated effluent stream would be managed at units other than SALDS because of the tritium content of the delisted waste stream. Therefore, the limiting exposure pathway was found to be the groundwater exposure pathway and so this pathway was used for risk assessment. However, as discussed in Section 2.1, future delisted treated effluent could be used as make-up water at onsite facilities that have a demand for large quantities of demineralized water.

ST 4500 (Ecology 2000) was written to comply with the requirements of WAC 173-200, *Water Quality Standards for Ground Waters of the State of Washington*, which is premised on the fact that all contaminants should be regulated to protect all existing and future beneficial uses of the groundwater. Use as drinking water is the most restrictive and protective use of groundwater; therefore, ST 4500 establishes enforcement limits (maximum allowable concentration levels) for nonradioactive contaminants in the effluent and/or groundwater that essentially are drinking water standards. Hence, the ETF treated effluents essentially meet drinking water standards for nonradioactive contaminants before discharge to the SALDS.

ST 4500 specifies monitoring, recording, and reporting to verify that the ETF process is functioning correctly, that groundwater criteria are not violated, and that effluent limitations are being achieved. Monitoring is performed for the treated effluent at the verification tanks and for the groundwater at three monitoring wells near SALADS. The groundwater is sampled quarterly at these three wells and is monitored for various parameters as defined in ST 4500 (Ecology 2000). ST 4500 imposes treated effluent daily maximum enforcement limits, average monthly enforcement limits, and average monthly early warning values, as well as groundwater limits. Because the groundwater never has exceeded the WAC 173-200 regulations for the purposes of this delisting modification, historical groundwater data were not used.

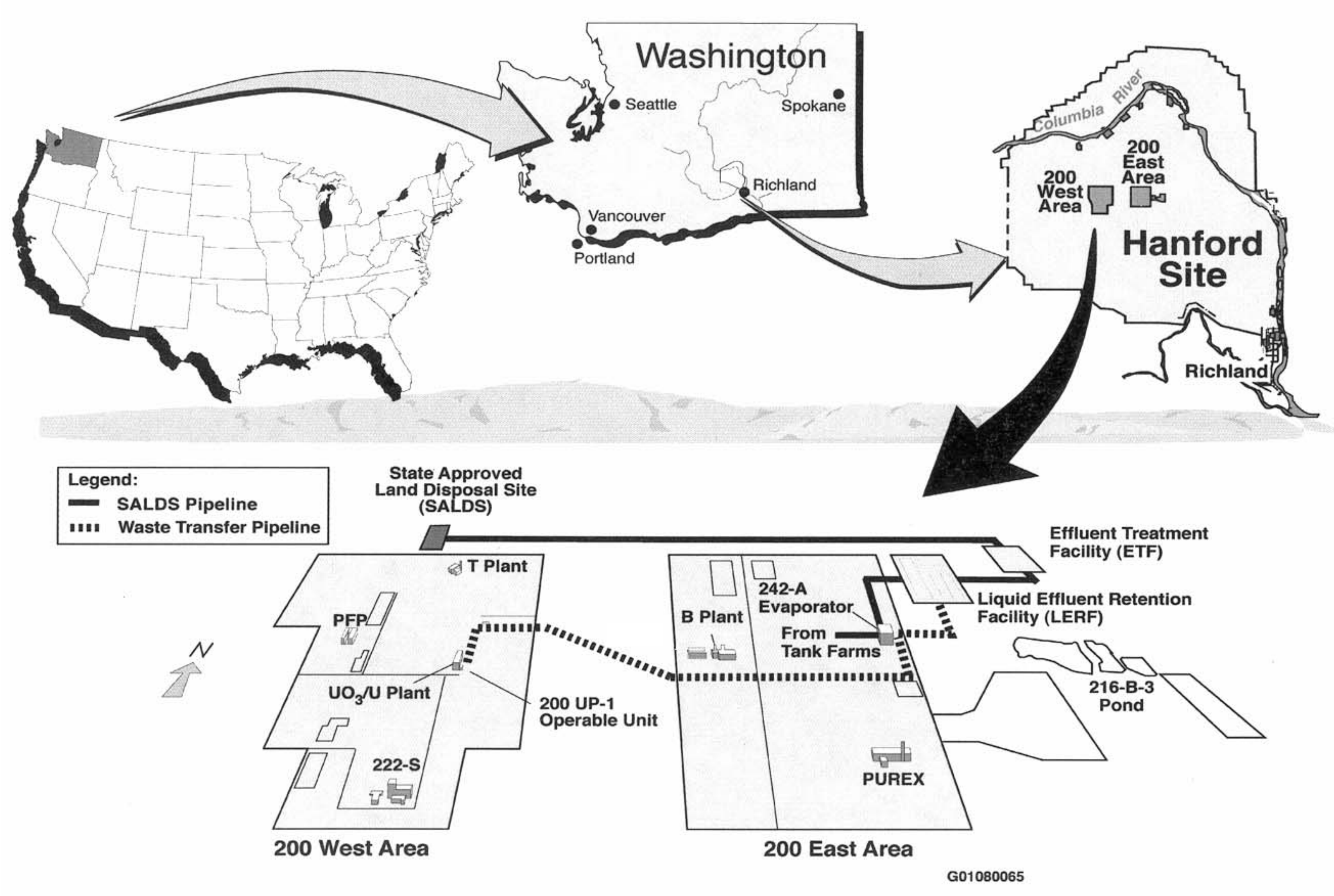

Figure 2-1. Locations of the 200 Area Effluent Treatment Facility and the Liquid Effluent Retention Facility on the Hanford Site.

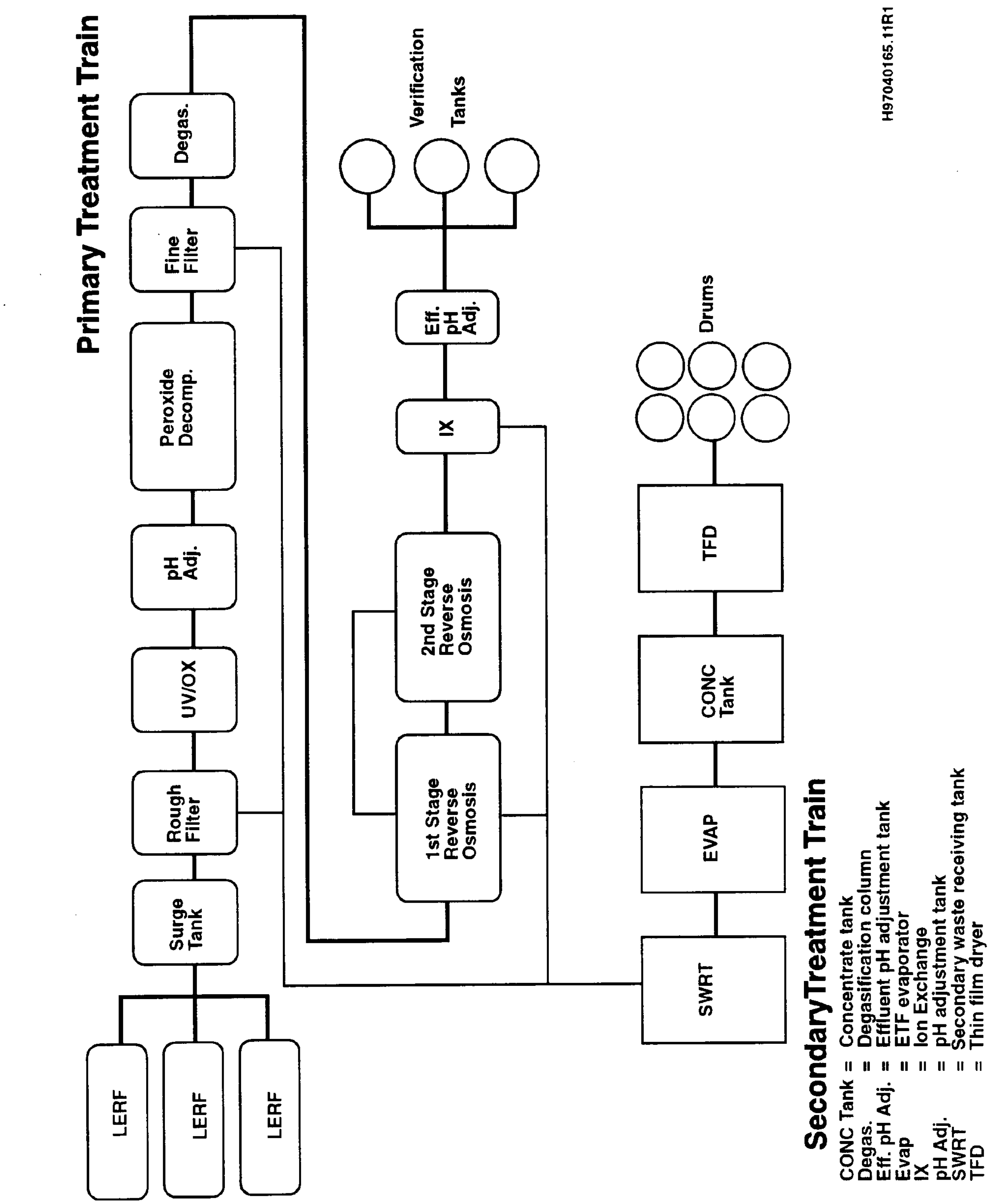

Figure 2-2. 200 Area Effluent Treatment Facility Primary and Secondary Treatment Trains.

3.0 WASTEWATERS PROJECTED FOR TREATMENT IN THE 200 AREA EFFLUENT TREATMENT FACILITY

This delisting action requests that the existing Final Delisting (EPA 1995) be modified to allow delisting of both the ETF treated effluent and concentrated waste (i.e., powders and evaporator brine) for an expanded list of constituents (as defined in Section 4.0). The expanded list of constituents is associated with several wastewaters projected for treatment in ETF. This section provides an overview of wastewaters projected for ETF treatment including the following:

- Multi-source leachate to be generated from operation of hazardous waste landfills

- WTP effluents to be generated from pretreatment and vitrification processes

- Other hazardous wastewaters to be generated from analytical laboratory operations, research and development studies, waste treatment, environmental remediation and deactivation projects, and other waste management activities.

3.1 MULTI-SOURCE LEACHATE

Multi-source leachate is defined as leachate (liquids that have percolated through land disposed waste) resulting from the disposal of more than one regulated waste classified as hazardous (RCRA Subpart D) and/or dangerous (WAC 173-303). Multi-source leachate is designated with the F039 waste number per WAC 173-303-082 (40 Code of Federal Regulations [CFR] 261.31). By regulation, only the F039 listed waste number is applied to the newly generated multi-source leachate. Waste numbers associated with the waste from which the leachate is generated do not carry forward to the leachate unless the leachate exhibits a hazardous characteristic that specifically is not addressed by the F039 listed waste number (i.e., ignitable, corrosive, reactive, or toxic). The F039 land disposal restrictions (LDR) treatment standard consists of approximately 200 hazardous constituents. The regulations do not require that all hazardous constituents specified on the list be monitored. Instead, the generating unit is required to identify only those F039 hazardous constituents that reasonably are expected to be present in the leachate at the point of generation above the Universal Treatment Standards identified in 40 CFR 268.40.

As of this submittal, only multi-source leachate bearing the "F039 derived from F001 through F005" waste designation has been generated on the Hanford Site. Future sources of multi-source leachate include, but are not limited to, leachate generated from land disposal units managing RCRA-regulated or hazardous waste (e.g., the immobilized low-activity waste trench, mixed waste burial ground trenches, etc.) and waste generated from application of the derived-from rule and/or mixture rule (e.g., T Plant Complex decontamination wastewaters, analytical laboratory aqueous solutions resulting from work performed on F039 designated samples, catch basin spills, etc.) both on and off the Hanford Site.

Infiltration of precipitation (e.g., rain, snowmelt, etc.) through land disposed waste is, and will be, the primary contributor to multi-source leachate generation on the Hanford Site. The quantity of leachate generated from a given disposal trench will vary over the life of the trench depending on the exposed surface area, amount of waste disposed, evaporation rates, yearly precipitation amounts, and run-on rates. The leachate flow will be greatest at inception of disposal operations and progressively will decrease as filling occurs until the burial ground is capped and closed, at which time the leachate production rate would become fairly constant.

Precipitation will enter the disposal areas through the exposed surface area, slowly migrate downward through the waste to the primary lining, and flow along the sloped lining to one or more leachate collection sumps designed into the low points of each disposal trench. At a set operational level, these sumps will pump leachate into an accumulation tank. When enough leachate has accumulated, the leachate will be transported by tanker truck to LERF/ETF.

This multi-source leachate will be designated with waste number F039. The leachate generating unit also will make a determination of all F039 hazardous waste constituents reasonably expected to be present in the leachate at the point of generation. Where the generating unit bases waste analysis on a sampling and analysis plan, such information could be used. Further characterization of the leachate could be required by LERF/ETF to meet waste acceptance requirements specified in the LERF/ETF waste analysis plan (Ecology 2001, Attachment 3A of Attachment 34).

The following section describes multi-source leachate generation at onsite Low-Level Burial Grounds (LLBG). In the near term, this source represents the majority of the multi-source leachate to be received for processing at ETF.

Low-Level Burial Grounds Multi-Source Leachate Generation

Trenches 31 and 34 of the 218-W-5 LLBG currently are being incorporated into the Hanford Facility RCRA permit. The trenches meet minimum technological requirements for landfills. Trench construction was completed in 1995, and each trench can hold between 22,800 to 52,760 cubic meters of LDR-compliant mixed waste on a containerized and bulk basis respectively. On an as-needed basis, additional disposal trenches will be constructed on the Hanford Site to accommodate mixed waste disposal volumes.

Waste disposal in Trench 34 was initiated in 1999. Because of a limited disposal pathway for leachate generated in the trench, disposal has been limited to characteristic waste, F001 through F005 listed waste (non-specific source waste), and/or waste subject to state-only requirements (WAC 173-303). All waste accepted by the Hanford Site Solid Waste Program must meet the solid waste acceptance criteria. At a minimum, constituents that account for more than 1 percent of the total waste are identified. Before placement in a LLBG trench, it is confirmed that the waste meets LDR treatment standards.

The leachate currently generated in Trench 34 is collected in a sump. When a specific level is reached in the sump, the leachate is pumped up to a 10,000-gallon accumulation tank beginning the 90-day regulatory clock. The accumulation tank is operated under the generating unit provisions of RCRA. The leachate is transferred to ETF for treatment under the existing Final Delisting (EPA 1995).

The multi-source leachate generated from future LLBG operations also is slated for treatment at the ETF, providing this delisting modification is approved. In fiscal year 2002, Trenches 31 and 34 disposal operations are to be expanded to allow emplacement of solid mixed waste that meets LDR treatment standards for other listed constituents (i.e., other F, P, and U designated waste). Approximately 8,600 cubic meters of such waste now reside in storage at CWC (DOE/RL-98-09) with federal waste numbers F001 through F005, P029, P030, P098, P106, P120, U123, D001, D007, D008, and state-only waste numbers WT02, WP02, and WT01 being the most predominant on a waste volume basis. These waste types are summarized as follows:

- 3,100 cubic meters of debris (e.g., pipes, pumps, sheet metal, concrete, brick, roofing material, wood, plastic, paper, asphalt, etc.) packaged in 208-liter containers or various sized boxes

- 3,500 cubic meters of solar evaporation basin solids consisting of solidified basin liquids, crystalline solids, sludges, and particulates (sandblast grit) from 183-H Solar Evaporation Basins closure activities

- Miscellaneous waste (e.g., labpacks, soil, wastewater treatment secondary solids, elemental lead, etc.).

This delisting modification specifically requests delisting for all constituents (waste numbers) associated with the waste types stored in CWC and intended for disposal in LLBG. Section 4.1 provides further discussion of the process used to identify all constituents considered in the ETF treatability assessment.

3.2 WASTE TREATMENT PLANT EFFLUENTS

The WTP is being designed to immobilize mixed waste using a vitrification process and will generate effluent intended for treatment at LERF/ETF. Like the 242-A Evaporator process condensate, this effluent will be derived from the treatment of Hanford Site tank farm waste. The WTP effluent will be generated within the WTP process from evaporation of low-activity waste (LAW) fractions, treatment of the melter offgas streams, and decontamination of immobilized LAW containers and miscellaneous equipment. The WTP effluents are not characterized fully at this time. To process this wastewater in ETF, it might be necessary to reconfigure the treatment process and establish a revised operational baseline. As with all waste streams, the WTP effluent must meet the LERF/ETF treatability envelope before being accepted into LERF and ETF. It is anticipated that the concentrated waste generated from ETF processing of WTP effluent could contain mobile radionuclides with concentrations exceeding the mobile radionuclide reporting limit. To support disposal, such waste must be solidified. The current proposal is to delist the ETF evaporator brine before addition of a solidification media, as opposed to routing the waste through the thin film dryer to produce a powder. Similar stabilization also could be required for other future ETF influents.

3.3 OTHER HAZARDOUS WASTEWATERS

Wastewaters generated from a variety of other remediation and waste management activities also have been projected for treatment at LERF/ETF, including the following. All waste streams must meet the LERF/ETF treatability envelope before acceptance into LERF and ETF.

- Purgewater obtained during well drilling, well remediation, well sampling, well maintenance, and aquifer testing activities

- Wastewater resulting from soil washing, pump-and-treat, and other remediation activities

- Wastewater generated from decontamination activities

- Unused wastewater samples

- Analytical wastewater resulting from sample analysis

- Laboratory reagents and standards

- Wastewater from chemicals synthesized or created during research activities

- Wastewater from research and development activities and treatability studies

- Wastewater resulting from spill/release events and cleanup activities

- Maintenance/construction project wastewater.

4.0 DELISTING OF WASTE RESULTING FROM PROJECTED WASTEWATER TREATMENT IN THE 200 AREA EFFLUENT TREATMENT FACILITY

The basis for requesting this delisting action (Section 1.4) is the demonstration that ETF effectively will treat all potential influent constituents such that:

- The treated effluent concentration is at or below 6 times the health-based level (HBL)

- The concentrated waste concentration is at or below acceptable risk limits established by the DRAS delisting model.

Determination of acceptable treated effluent concentration is based on a groundwater exposure pathway and the dilution attenuation factor (DAF) defined using EPA's composite model for landfills (56 Federal Register 32993, July 18, 1991). Use of the groundwater exposure pathway and the method for calculating the DAF are consistent with the approach used in the initial ETF Delisting Petition (DOE/RL-92-72). Because of the increased discharge volume, the DAF has changed from 10 (used in the initial delisting petition) to 6. The product of the DAF and the HBL defines the acceptable treated effluent constituent concentration.

For the treated effluent, a treatability assessment was performed using available ETF treatment efficiency data to demonstrate that treatment of all potential influent constituents in the ETF results in effluents that meets delisting levels. This treatability assessment is described in Section 4.1. Section 4.2 presents the characterization data available for the ETF concentrated waste. These data will serve as input to the DRAS delisting model effort. This DRAS delisting model will define acceptable delisting levels for the concentrated waste.

4.1 TREATED EFFLUENT

The ETF was designed to treat the contaminants anticipated in the 242-A Evaporator process condensate and other Hanford Site wastewaters. In support of the initial ETF Delisting Petition (DOE/RL-92-72), the capabilities of the ETF were demonstrated through pilot plant testing of the UV/OX, RO, and IX treatment units. The testing used surrogates containing anticipated constituents of concern and provided sufficient information to support an up-front delisting in advance of ETF influent treatment.

The pilot plant testing evaluated many organic and inorganic constituents, a number of which have yet to be seen in the ETF influent. In addition, most constituents were tested at higher concentrations than seen to date in the ETF influent. The ETF treatment efficiencies have been measured since the ETF began operation in 1995. For those constituents that ETF has treated, there is good agreement between the ETF and the pilot plant treatment efficiencies as demonstrated in Table A-1 of Appendix A. Given that the pilot plant treatment efficiencies are predictive of ETF treatment efficiencies, there is a high degree of confidence that the ETF will perform as well as the pilot plant when treating additional constituents or treating influents with higher constituent concentrations.

4.1.1 Treatability Groups

To initiate the ETF treatability assessment, it first was necessary to identify the constituents that potentially could exist in the multi-source leachate, WTP effluents, and other projected hazardous wastewaters described in Section 3.0. Appendix B contains a discussion of the constituent identification process and the resulting consolidated constituents list.

The constituents defined in Appendix B were placed into treatability groups (Table 4-1) based on similar chemical characteristics. When actual operating or test data were not available for given constituents in a treatability group, one or more other constituents of the treatability group were selected to represent those constituents. The methodology of using a representative constituent is consistent with that used in the initial ETF Delisting Petition (DOE/RL-92-72).

4.1.2 Treatment Efficiency

The ETF treatment efficiencies can be determined based on previous laboratory and pilot plant testing, ETF waste processing experience, and equipment vendor information. The constituent treatment efficiency is used to determine an ETF influent concentration envelope. This envelope represents the highest constituent concentrations that can be treated to meet delisting levels assuming single-pass operation through the ETF. The existing delisting levels (EPA 1995, Condition 3, Delisting Levels) are based on both the HBL, as set forth by the EPA in the *Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions* (EPA 1994), and a DAF of 10. Development of an influent concentration envelope is consistent with the approach taken in the initial ETF Delisting Petition (DOE/RL-92-72). Because of the request to increase the waste treatment volume, the DAF will be changed from 10 to 6. The influent concentration envelope includes this change in DAF.

The treatment efficiency and treated effluent delisting levels (6 times the HBL) can be used to calculate a concentration envelope by constituent. When an influent falls within the concentration envelope, ETF treatment will produce a treated effluent that is likely to meet the revised Final Delisting levels. The ability for ETF to recycle treated effluent for multiple-pass processing adds flexibility with regard to the concentration envelope while ensuring that the treated waste will be at or below the delisting levels. The updated concentration envelope derived from this delisting modification will be incorporated into the LERF/ETF waste acceptance process described in Section 2.2. Any new wastewater meeting LERF/ETF waste acceptance criteria should be accepted for ETF treatment under the revised Final Delisting.

4.1.2.1 Inorganic Constituent Treatment Efficiency

The inorganic constituents addressed by this delisting modification are sulfide, thallium, osmium, cobalt, and tin. These constituents augment the inorganic constituents previously addressed in the initial ETF Delisting Petition (DOE/RL-92-72).

The inorganics are removed primarily by the ETF RO and IX treatment units. The concentration envelope for the inorganic constituents is based on the treatability testing performed for the initial ETF Delisting Petition. Thallium is the only one of these inorganic constituents that has a specific established HBL. To calculate an example influent concentration envelope, a HBL of 1 milligram per liter was assumed for sulfide, osmium, cobalt, and tin. The influent concentration envelope can be calculated using 6 times the HBL and the treatment efficiency by constituent.

Sulfide was not considered in laboratory or treatability testing. However, sulfide readily is converted to the sulfate ion under strong oxidizing conditions resulting from the presence of hydrogen peroxide. Hydrogen peroxide is used primarily in the UV/OX system and also is used in the surge tank for biological control. The sulfate is removed in the RO unit. Based on this known chemistry, the sulfide removal efficiency is expected to be greater than 99.9 percent. Using the assumed HBL of 1 milligram per liter, the influent concentration envelope for sulfide, to meet a treatment target of 6 times the HBL, is 6,000 milligrams per liter.

Thallium, osmium, cobalt, and tin also were not considered in laboratory or treatability testing. However, based on pilot testing of other metals with similar valance states, the removal efficiencies by the RO unit for thallium, osmium, cobalt, and tin are expected to be greater than 93.4 percent, 97.5 percent, 98.1 percent, and 97.5 percent respectively. When accounting for the IX treatment removal efficiency of 99 percent, the overall ETF treatment efficiency for these metals is greater than 99.9 percent. Given the HBL for thallium of 0.002 milligram per liter, the influent concentration envelope for thallium to meet 6 times the HBL is 12 milligrams per liter. Using the assumed HBL of 1 milligram per liter for osmium, cobalt, and tin, the influent concentration envelope to meet 6 times the HBL is 6,000 milligrams per liter.

4.1.2.2 Organic Constituent Treatment Efficiency

Of the 428 million liters of hazardous listed waste treated at ETF to date, the major organic constituents treated include acetone, 1-butanol, 2-butanone (methyl ethyl ketone), 2-butoxyethanol, carbon tetrachloride, tetrahydrofuran, and tributyl phosphate.

This evaluation considers over 400 potential organic constituents not addressed previously by the initial ETF Delisting Petition (DOE/RL-92-72). (A total of 41 organic constituents were delisted via the initial ETF Delisting effort.) The concentration envelope determination is based primarily on pilot plant testing and vendor information. Selected organic constituents were used to represent the treatment efficiency for each treatability group. Organic constituents are destroyed primarily through UV/OX treatment; however, to some degree, the RO treatment step can remove organics that have a molecular weight greater than 100. For this assessment, only the UV/OX treatment efficiencies were considered.

A slight terminology difference is used here to express the treatment efficiency from that used in the initial ETF Delisting Petition (DOE/RL-92-72). In the initial ETF Delisting Petition, the oxidation rate constant was calculated from observed test results. The observed decrease in the organic constituent concentration over time followed first order reaction kinetics. These test results were scaled up to the ETF UV/OX system. The scale-up parameters included the total ultraviolet energy, the hydrogen peroxide concentration, and ultraviolet energy per UV/OX reactor volume. New information provided from the vendor directly incorporates these scale-up parameters into a factor referred to as the Electrical Energy per Order (EE/O). The EE/O is different for each organic constituent; however, groups of constituents will tend to have similar EE/Os.

The EE/O is defined as the UV light energy, in terms of kilowatt-hours of electricity, required to reduce the concentration of a constituent in 1,000 gallons of influent by 1 order of magnitude (or 90 percent). The unit for EE/O is kilowatt-hour per 1,000 gallons/order. The EE/O is determined through laboratory testing in the same way that the pilot plant oxidation rate constant was determined. The lower the EE/O is, the greater the treatment efficiency.

The formula for EE/O is as follows:

$$\text{EE/O} = \text{UV Dose}/\log(C_{(i)}/C_{(f)}) \qquad (1)$$

Where: The UV dose is kWh/1,000 gallons of influent
$C_{(f)}$ is the final constituent concentration after treatment assumed to be the HBL x 6, where 6 is the dilution attenuation factor.
$C_{(i)}$ is the initial constituent concentration before treatment.

For example, if it takes 10 kilowatt-hours of electricity to reduce the concentration of a target constituent in 1,000 gallons of influent by 1 order of magnitude, or 90 percent (e.g., from 10 parts per million to 1 part per million), the EE/O is 10 kilowatt-hours per 1,000 gallons per order for that constituent. It would take another 10 kilowatt hours to reduce the constituent concentration from 1 part per million to 0.1 part per million.

The UV/OX vendor has supplied the EE/O for the organic constituents. The treatability group concept also was used by the vendor when determining EE/O values for constituents not included in their extensive database.

The design constraints of the ETF UV/OX system are 720 kilowatt electric (662.4 kilowatt UV energy, using a 92 percent conversion factor), 172 gallons per minute flow rate through the UV/OX equipment, and 2.08 minute residence time in the UV/OX unit. The design UV dose for the ETF UV/OX unit is 64.19 kilowatt hour per 1,000 gallons. The influent organic constituent concentration that can be treated in one pass through the UV/OX unit and reach 6 times the HBL is calculated as follows:

$$C_{(i)} = 10^{(\text{UV Dose/EE/O})} * C_{(f)} . \qquad (2)$$

The influent organic constituent concentration that can be treated at the ETF ($C_{(i)}$) is calculated according to equation (2). Where no EPA-established HBL was available in the *Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions* (EPA 1994), a HBL of 1 milligram per liter was assumed to complete the calculation. Once the $C_{(i)}$ value was calculated, the value was compared to the LERF liner compatibility limit (Ecology 2001, Attachment 3A of Attachment 34) and the organic constituent solubility limit. The lowest of the three values defines the treatability envelope. Table C-2 presents the treatability envelope for the organic constituents.

4.1.3 Treatability Conclusions

This treatability analysis confirms the conclusions from the initial ETF Delisting Petition (DOE/RL-92-72). The treatability groups that are most difficult to treat include halogenated organics, such as the volatile halogenated alkanes, and halogenated aliphatic hydrocarbons. Constituents having an EE/O above 40 are considered difficult to treat.

Of the 400+ constituents evaluated in this treatability assessment, only 30 constituents are considered difficult to treat in the ETF UV/OX unit. The majority of these 30 constituents fall within the volatile halogenated alkanes treatability group (group 13). Several of the constituents currently being analyzed to verify delisting levels, as imposed by the existing Final Delisting Condition 3, Delisting Levels (EPA 1995), also fall within treatability group 13 and are being effectively treated by the ETF.

The influent concentration envelope (Appendix C) defines the influent concentration that can be effectively treated in a single pass through ETF. The ETF design includes the capability to recycle the treated effluent back through the process if the effluent does not meet discharge requirements. The ability to recycle the contents of a verification tank for further treatment before disposal allows for a flexible influent concentration envelope. This flexibility provides ETF with the ability to treat a wide variety of wastewaters containing a broad spectrum of hazardous constituents while still meeting the discharge requirements before disposal at SALDS.

4.2 CONCENTRATED WASTE

Supplemental constituent delisting for the ETF treated effluents follows the methodology applied in the initial ETF Delisting Petition (DOE/RL-92-72). Unlike the ETF treated effluent, no previous delisting has been obtained for the ETF concentrated waste (i.e., powders and evaporator brine). For this reason, the newly adopted EPA delisting methodology will be applied. The EPA will use the DRAS delisting model to calculate concentration-specific delisting criteria based on the most conservative range of possible exposure scenarios.

The waste processing strategy is used to minimize the amount of concentrated waste that does not meet the delisting levels. As part of the waste processing strategy for a given ETF influent, the characterization of the concentrated waste is projected. The concentration of an inorganic constituent in the concentrated waste can be projected using a mass balance approach given the concentration of the constituent in the influent and the amount of water to be removed in the process. When the projected concentrated waste characterization prohibits management of the waste pursuant to the revised Final Delisting, that waste will be managed as listed waste. When the projected concentrated waste characterization predicts the waste will be below the delisting levels, the verification sampling program (Section 5.0) will confirm the concentrated waste meets the delisting levels.

Powder characterization data are presented in Appendix D. Table D-1 is the powder characterization for powder that is proposed for delisting. These data are being supplied to the EPA for their use in applying the DRAS delisting model. Table D-2 is an example of a powder characterization where the waste processing strategy indicates the concentrated waste would be designated as hazardous. Such concentrated waste would not be managed pursuant to the revised Final Delisting, and the waste would continue to be managed as listed waste.

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Table 4-1. Treatability Groups. (2 Sheets)

Group Name	Group No.[1]
Phenols	1
Substituted phenols	2
Low molecular weight aromatics	3; also 15, 15a
High molecular weight polycyclic aromatic hydrocarbons	4
Halogenated aromatic hydrocarbons	5; also 16
Halogenated benzenes	5a; also 16
Halogenated aliphatic hydrocarbons	6
Halogenated alkanes	6a; also 13
Halogenated alkenes	6b; also 14
Halogenated ethers	7
Halogenated alkyl ethers	7a
Halogenated aryl ethers	7b
Phthalates	8
Miscellaneous oxygenated compounds	9
Alcohol	9a
Organonitrogen compounds	10
Amines	10a
Anilines	10b
Nitriles	10c
Nitroaromatics	10d
Nitrosoamines	10e
Pyridines	10f
Pesticides	11
Polychlorinated biphenyls	12
Volatile halogenated alkanes	13; also 6a
Volatile halogenated alkenes	14; also 6b
Volatile aromatic hydrocarbons	15; also 3
Low molecular weight polycyclic aromatic hydrocarbons	15a; also 3
Volatile halogenated aromatic hydrocarbons	16; also 5, 5a
Volatile unsaturated carbonyl compounds	17
Aldehyde compounds	17a
Volatile ethers	18
Cyclic ethers	18a
Volatile ketones	19
Miscellaneous volatile compounds	20
Inductively coupled plasma metals	21; also 22
Non-inductively coupled plasma cations	22; also 21
Anions	23
Halides	23a
Single analyte methods[2]	24

Table 4-1. Treatability Groups. (2 Sheets)

Group Name	Group No.[1]
Miscellaneous semivolatile compounds	25
Alkly phosphates	25a
Long chain alkanes	25b
Radionuclides	26

[1] Treatability Groups based on *A Project Manager's Guide to Requesting and Evaluating Chemical Analysis* (EPA 1991). Because several groups have similar chemical and treatability characteristics, a constituent could be assigned multiple groups. However, for the purposes of this delisting modification, a constituent is assigned to only one treatability group.

[2] Group not intended to have one representative chemical compound but to signify a compound requiring a specific analytical method and not fitting in any other group.

5.0 PROPOSED VERIFICATION SAMPLING STRATEGY

This section presents a proposed verification sampling strategy in support of a revised Final Delisting. This proposed sampling strategy is intended to apply to the delisting of ETF treated effluent and concentrated waste (i.e., powders and evaporator brine) generated from processing both existing and projected wastewaters. This proposed strategy deviates from the approach described in Section 2.4 as this strategy proposes a different sampling frequency and specifically addresses the concentrated waste sampling. However, the LERF/ETF and treatment processes, waste acceptance process, and waste processing strategy described in Sections 2.1, 2.2, and 2.3 should remain unchanged under the revised verification sampling strategy presented here. Figure 5-1 summarizes the proposed verification sampling strategy.

As discussed in Section 2.3, when preparing to treat an ETF influent, a waste processing strategy is developed to determine the most effective and efficient approach to treating the influent. Normally, an ETF influent consists of wastewaters from several different sources stored in a given LERF basin. The strategy defines the operational parameters necessary to comply with the regulatory permits and safety requirements while maintaining the integrity of facility equipment. As part of the strategy development, contaminant concentrations are predicted for both the treated effluent and concentrated waste resulting from influent treatment.

In the case of treated effluent, if no change in the operational baseline is required to effectively process an influent (as discussed in Section 2.3), it is proposed that, at a minimum, every 15th verification tank be sampled. This reduction in the verification sampling rate (1 in 15 as compared to the current rate of 1 in 10) is consistent with the ETF operational cycles and is supported by demonstration that ETF has successfully treated all wastewaters processed to date.

It also is proposed that if a change to the operational baseline is required, or the total organic carbon or total dissolved solids influent baseline increases by an order of magnitude, at a minimum, the first verification tank will be sampled to establish the new baseline. Once the new baseline is established, at a minimum, every 15th verification tank will be sampled.

Sample collection will be conducted according to the LERF/ETF waste analysis plan (Ecology 2001, Attachment 3A of Attachment 34). The verification tank samples typically will be grab samples collected from a sample port on the verification tank recirculation line. The verification tank contains an aggregate of treated effluent collected over time. The treated effluent that is sent to the verification tank has little variability. Because the verification tank contents are blended further by the recirculation system on the verification tank, the grab samples taken from the recirculation line are representative of the verification tank contents.

Sample analysis will be conducted according to the LERF/ETF waste analysis plan (Ecology 2001, Attachment 3A of Attachment 34) and consistent with SW-846 methodologies. Other EPA-approved analytical methods might be substituted if the minimum detection level is the same or lower. The sampled verification tank will be discharged once discharge requirements have been met and confirmed. If the treated effluent fails to meet delisting levels, the verification tank contents will be reprocessed and the next verification tank will be sampled. For the revised Final Delisting, preserving the existing effluent verification sampling parameters is recommended. This might be revised based on results of an ongoing EPA review of toxicological information.

In the case of concentrated waste, a determination as to whether to manage the waste pursuant to the revised Final Delisting will be based primarily on the characteristic metal concentrations in the ETF influent and on the final disposal path for the concentrated waste. For example, if an influent is a characteristically hazardous waste before ETF treatment, and the resulting concentrated waste also is predicted to be characteristically hazardous, such waste would not be managed pursuant to the revised Final Delisting.

When a decision is made to manage powders pursuant to the revised Final Delisting, the contents of the first concentrate tank (i.e., evaporator brine) and first powder batch generated from ETF treatment of the influent will be sampled according to SW-846 methodologies or equivalent. Once a baseline concentration factor has been established (for use in projecting powder concentration based on concentrate tank data), the next concentrate tank, following verification tank sampling, will be sampled. In addition, the powder for each waste influent will be sampled annually for confirmation of the concentration factor. It is recommended that the verification sampling parameters of the concentrated waste be the same as those for verification sampling of the treated effluent. This might change based on if the effluent verification sampling parameters are revised as discussed previously.

If it is projected that the powder will fail to meet delisting levels, based on application of the baseline concentration factor to the evaporator brine data, the actual powder will be sampled to confirm the projection. If the powder fails to meet delisting levels or exhibits a characteristic, the powder will be managed as a listed or a characteristic waste respectively.

A streamlined sampling strategy will be applied to the evaporator brine destined for solidification (versus drying in the thin film dryer). It is proposed that the evaporator brine be delisted at the point of the concentrate tanks and before solidification. This approach will not account for the addition of the solidification media to the evaporator brine. If the brine meets delisting levels, the baseline has been established and the brine of the next concentrate tank, following verification tank sampling, will be sampled. However, in the event that evaporator brine waste concentrations exceed delisting levels, the solidified waste will be managed as a listed waste.

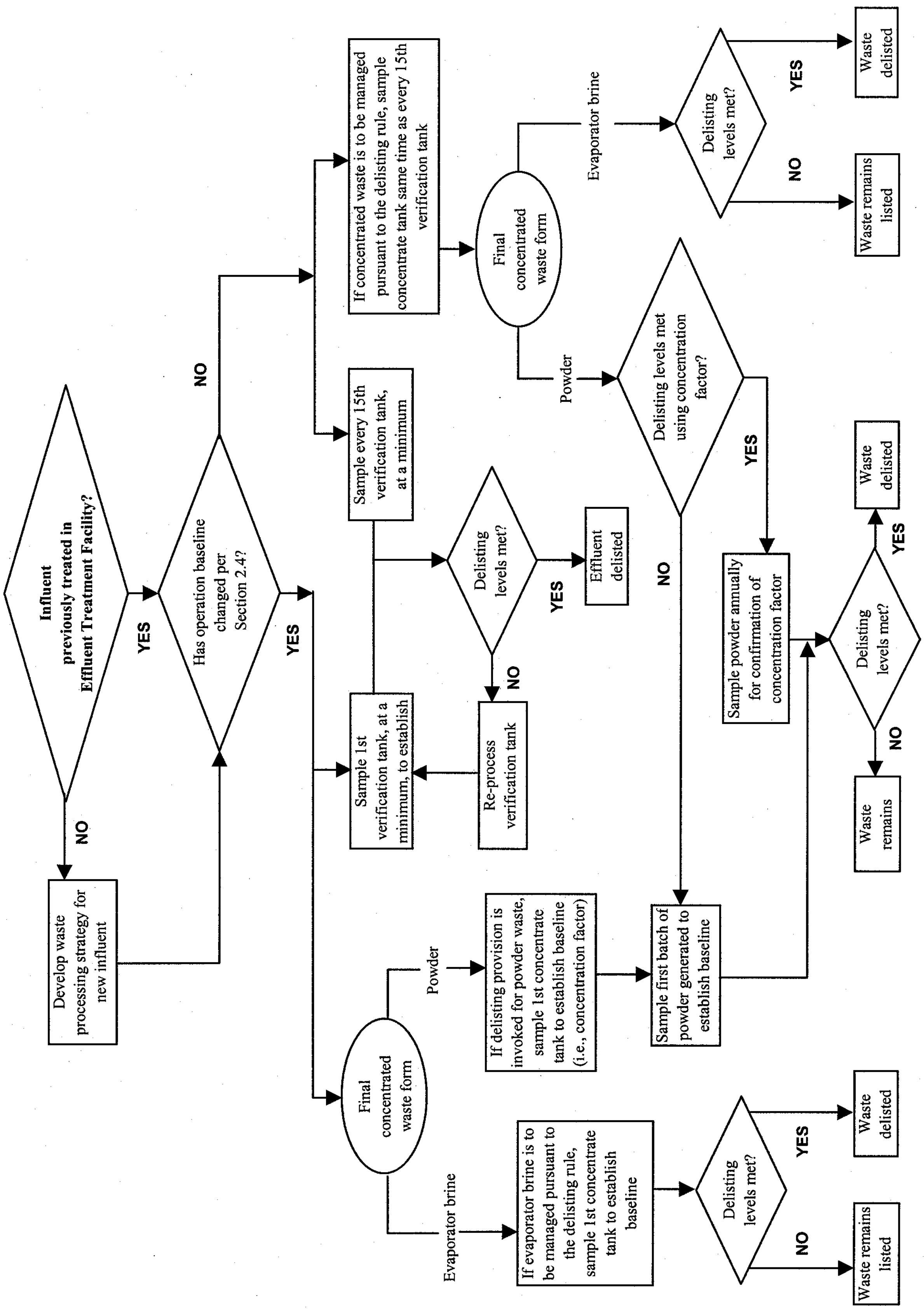

Figure 5-1. Proposed Verification Sampling Strategy.

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