MAR 10 1995
35 Station 21

ENGINEERING DATA TRANSMITTAL

1. EDT 601861

2. To: (Receiving Organization) 300 Area Liquid Effluent Facilities	3. From: (Originating Organization) Liquid Effluent Process Engineering	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: L-045H/Effluent Programs	6. Cog. Engr.: A. R. Olander	7. Purchase Order No.: N/A
8. Originator Remarks: For release.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: Bldg. 310/ TEDF
11. Receiver Remarks: None		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: WA-002591-7
		14. Required Response Date: 3/17/95

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-LEF-PLN-001		0	300 Area Treated Effluent Disposal Facility Permit Reopener Run Plan	NA	1		

16. KEY

Approval Designator (F)	Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information	4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. A.R. Olander L6-04 AR Olander 3/10/95	L6-04		
1	1	Cog. Mgr. D.L. Halgren L6-04 [signature] 3/10			
6		Ops. Mgr. L. W. Roberts L6-05	OSTI (2) L8-07		
6		Env. R.W. Szelmeczka L4-96	Central Files (orig.+1) L8-04		
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6		A.J Diliberto H6-10			

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
A. R. Olander AR Olander 3/10/95 Signature of EDT Originator / Date	L. W. Roberts [signature] 3/10/95 Authorized Representative for Receiving Organization / Date	D. L. Halgren [signature] 3/10/95 Cognizant Manager / Date	[] Approved [] Approved w/comments [] Disapproved w/comments

BD-7400-172-1 (07/91)

RELEASE AUTHORIZATION

Document Number:	WHC-SD-LEF-PLN-001, REV. 0
Document Title:	300 AREA TREATED EFFLUENT DISPOSAL FACILITY PERMIT REOPENER RUN PLAN
Release Date:	3/10/95

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham

C. Willingham 3/10/95

A-6001-400.2 (09/94) WEF256

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SUPPORTING DOCUMENT		1. Total Pages 17
2. Title 300 AREA TREATED EFFLUENT DISPOSAL FACILITY PERMIT REOPENER RUN PLAN	3. Number WHC-SD-LEF-PLN-001	4. Rev No. 0
5. Key Words TREATED EFFLUENT DISPOSAL FACILITY, TEDF, 300 AREA, PROCESS SEWER, NPDES, PERMIT, PLAN	6. Author Name: A. R. OLANDER [signature] Signature Organization/Charge Code 86730/A2216	

7. Abstract

This document provides plans for gathering operating data that will be used in NPDES permit negotiations. The plans include operating septoints, sample points, and identifies parameters critical to the plant operation and permit compliance.

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cw 3-10-95

9. Impact Level NA

10. RELEASE STAMP

OFFICIAL RELEASE BY WHC

DATE MAR 10 1995

35 Station 21

300 Area Treated Effluent Disposal Facility

Permit Reopener Run Plan

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300 Area Treated Effluent Disposal Facility
Permit Reopener Run Plan

1.0 Introduction

The 300 Area Treated Effluent Disposal Facility (TEDF) is authorized to discharge treated effluent to the Columbia river by National Pollutant Discharge Elimination System permit WA-002591-7. The letter accompanying the final permit noted the following:

> "EPA recognizes that the TEDF is a new waste treatment facility for which full scale operation and effluent data has not been generated. The permit being issued by EPA contains discharge limits that are intended to force DOE's treatment technology to the limit of its capability."

Because of the excessively tight limits the permit contains a reopener clause which may allow limits to be renegotiated after at least one year of operation. The restrictions for reopening the permit are as follows:

1. The permittee has properly operated and maintained the TEDF for a sufficient period to stabilize treatment plant operations, but has nevertheless been unable to achieve the limitation specified in the permit.

2. Effluent data submitted by the permittee supports the effluent limitation modification(s).

3. The permittee has submitted a formal request for the effluent limitation modification(s) to the Director.

The purpose of this document is to guide plant operations for approximately one year to ensure appropriate data is collected for reopener negotiations.

2.0 Background

During permit limit negotiations Westinghouse identified two areas of concern. The concerns were the permit limits may not be achievable by the TEDF treatment technology and laboratories may not be able to consistently provide accurate analytical data.

Permit No. WA-002591-7 specifies the analytical method and the minimum detection level for most of the parameters to be monitored. In the case of metals, the methods selected are the most sensitive CWA approved techniques available. With discharge limits near both the treatment limits and the analytical detection limits, operational difficulties are created. For example, if a permit limit is exceeded the data evaluator must determine if the exceedance is due to an analytical variability or a treatment problem. If the discharge limits were significantly higher than the analytical detection limit the data could be trusted and appropriate process decisions could be made.

Table 1 identifies the permit limits, design source term, final permit limits (average monthly and maximum daily), minimum level of detection (ML), the contracted lab detection limit, and the frequency and type of sample to be collected. All samples are required to be collected between the discharge of the effluent tank and the river outfall.

Table 1: Permit Limits

Chemical (Concentrations in ppb unless otherwise noted)	Design Source Term	Final Permit Limits		ML	Lab Limit & Method	Sample Frequency/Type
		AML	MDL			
Bis(2-Ethylhexyl) phthalate	80	3	5	10	10/625	Biweekly/Grab
Dichlorobromomethane	1.5	2.2	4	5	5/624	Biweekly/Grab
Chlorodifluoromethane	20	5	7		5/624	Biweekly/Grab
Methylene Chloride	5	3	5	10	5/624	Biweekly/Grab
Toluene	6.4	6	9	20	5/624	Biweekly/Grab
1,1,1-Trichloroethane	10	5	9	10	5/624	Biweekly/Grab
Trichloroethylene	0.4	1.9	3	5	5/624	Biweekly/Grab
Chloroform	40	15	26	5	5/624	Biweekly/Grab
1,1-Dichloroethane	40	4.7	7	10	5/624	Biweekly/Grab
Tetrachloroethylene	10	5	9	10	5/624	Biweekly/Grab
Aluminum	418	215	372	10/.2	3/202.2 or 10/200.8	Biweekly/Grab
Arsenic	10	3	5	3/3	3/206.2 or 28/200.8	Biweekly/Grab
Beryllium	30	2	4	.6/.3	3/210.2 or 3/200.8	Biweekly/Grab
Cadmium	10	2	4	.3/.3	1/213.2 or 5/200.8	Biweekly/Grab
Copper	80	3	5	3/.1	1/220.2 or 5/200.8	Biweekly/Grab
Cyanide	50	6	10	16[3]	10/335.3	Biweekly/Grab
Iron	600	846	1,460	3	1/236.2	Biweekly/Grab
Lead	60	2	4	3/.3	3/239.2 or 6/200.8	Biweekly/Grab

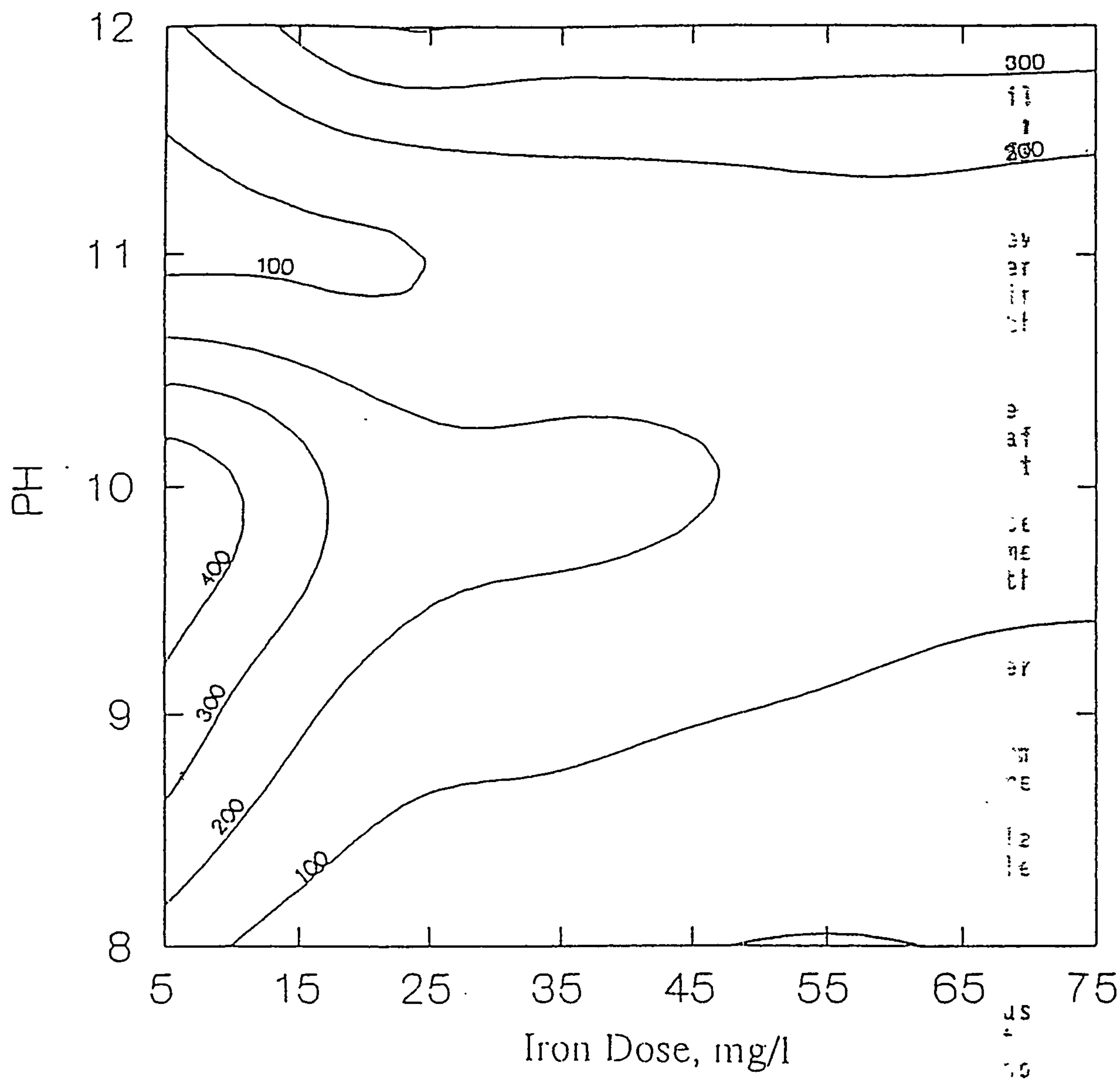
Chemical (Concentrations in ppb unless otherwise noted)	Design Source Term	Final Permit Limits		ML	Lab Limit & Method	Sample Frequency/Type
		AML	MDL			
Manganese	60	10	17	.6/.3	0.2/243.2 or 1/200.8	Biweekly/Grab
Mercury	3	0.9	1.5	.2	0.2/245.1	Biweekly/Grab
Nickel	60	35	60	3/.6	1/249.2 or 5/200.8	Biweekly/Grab
Nitrite	400	60	104	--	50/353.1	Biweekly/Grab
Selenium	6	5	7	6/16	3/270.2 or 160/200.8	Biweekly/Grab
Silver	20	6	10	.6/.2	5/272.2 or 1/200.8	Biweekly/Grab
Zinc	211	25	43	.2/.6	0.05/289.2 or 18/200.8	Biweekly/Grab
Total Radium (pCi/l)	0.2	0.2	0.4		1/903.0	Biweekly/Grab
Suspended Solids (TSS)	9,000	3,000	9,000		100/160.2	2 per week/Grab
Temperature (°F)	45-75	95	105		NA	Continuous
Total Coliform Bacteria	230	85	146		2/100--SM 9222B	Biweekly/Grab
Flow	--	--	325		--	Continuous
Total Ammonia (as N)	--	--	--		--	Biweekly/Grab
pH	9	6-9	6-9		NA	Continuous

1. Average daily discharge based on limited data.
2. Influent flow shall be monitored continuously, data may be required by regulators.
3. Quarterly WET testing.

<u>Treatment Capability</u> Jar testing (WHC 1994) was performed to test the co-precipitation technology removal capabilities for most of the metals in the permit. The data was used to generate isopleth curves for each metal. The ordinate and abscissa for the curves are pH and iron (see figure 1). For a selected iron dose and pH the residual concentration left in the wastewater can be estimated from the corresponding curve. Not surprisingly, the optimum pH and iron dose for each metal is different. All of the metal isopleths curves can be found in the jar test report (WHC 1994).

A close examination of all of the isopleths shows it is unlikely the permit limits can be attained. Meeting the permit limits becomes even more unlikely when scale up factors and process variations are considered.

Figure 1: Aluminum Isopleth



ALUMINUM CONCENTRATION IN ug/
Versus pH and Iron Dose

<u>Analytical Capability</u> The permit specifies analytical methods and detection levels based on the minimum levels (ML) concept. The minimum level concept employed by the EPA does not account for analytical bias, analyst's proficiency, matrix effects, and other considerations that routinely affect analytical results between laboratories. The two principle data quality indicators that must be considered for a valid compliance threshold are analytical imprecision and bias, which, when combined express accuracy. Accuracy encompasses the analytical bias, the analyst's proficiency, matrix effect, and other considerations that affect the analytical results within and between laboratories. The MLs are estimates of analytical imprecision within a given laboratory at a given time. Because MLs are not estimates of levels at which laboratories can measure the concentration of an analyte with an acceptable accuracy, it is not appropriate statistics for a valid compliance threshold.

If funding is available and analytical data is suspected to be unreliable, a laboratory test will be conducted. Laboratory tests conducted by non-WHC companies have successfully documented the inaccuracy of results. A WHC laboratory test plan would be modeled after these successful efforts if inexplicable results are obtained.

3.0 Run Plan Objectives

In general, the data gathering objectives for the first year need to determine the treatment capabilities of the plant. The discharge permit limits were based on jar test data which does not reflect full scale treatment capability. The plant capabilities need to be determined for varying influent contamination loads and should account for seasonal variations. Additionally, the optimum operating criteria and conditions need to be developed. The primary optimization parameters to consider are decontamination factors, chemical and ultraviolet lamp use, and sludge production. The next several sections contain specific objectives and plans for accomplishing the objectives.

<u>Decontamination Factors</u> The decontamination factors for metals and organics can be estimated for the entire plant and across each treatment unit. Some organic contaminants in the influent stream may adsorb or absorb onto the settling sludge while the carryover is treated in the UV oxidation unit. Some metals that do not precipitate and clarify may adsorb on the ion exchange resin. The adsorbed metals will remain in the resin until a metal for which the resin selectivity is higher displaces them. Just sampling the influent and effluent may not provide a clear picture of the plant capabilities. Sampling between unit operations will be necessary to fully understand plant performance.

The critical process parameters affecting decontamination are listed in Table 2.

Table 2: Critical Process Parameters

Process Parameter	Control	Comments
Ferric Chloride Dose	TEDF has flow proportional control and manual addition capability.	Ferric chloride is contaminated with significant amounts of Al, Cu, Pb, Mn, and Ni.
Chemical Mix Tank pH	TEDF has two pH probes and control logic to control sodium hydroxide addition.	Sodium may interfere with analyses.
IX Feed Tank pH	TEDF has two pH probes and control logic to control sulfuric acid addition.	None
Peroxide Dose	TEDF has flow proportional control and manual addition capability.	The peroxide is blended with service water.
Ultraviolet Lights (Exposure)	The UV oxidation treatment unit has 18 mercury vapor lamps. The number of operating lamps can be changed.	The NPDES permit has a high temperature limit. Operating with fewer lamps may be necessary to comply with the permit temperature limits, which may reduce destruction capability.
Flowrate	The TEDF control system allows for flow control.	Influent flowrate will determine the required treatment rate.

Other parameters easily controlled included polymer dose and sludge recycle into the chemical mix tank. Pilot scale testing data showed these parameters had no effect on metals removal.

The strategy for determining decontamination factors will include variations of the process parameters listed in Table 2.

<u>Design Source Treatment Test</u> It is unlikely the influent to the TEDF will be contaminated with the design source term levels (DST) of contaminants. The DST is a compilation of historical data with projected concentrations based on anticipated volume minimization. The DST was used as the design basis for the process. Testing and performance estimates were based on the influent being at the DST concentrations. In order to compare full scale plant operation with the laboratory test data the influent would have to be "spiked" up to the DST concentrations.

If the plant continues to treat influent water with contaminant concentrations below the DST the actual capabilities of the plant may never be learned. If the plant cannot treat the DST levels and the influent contaminants reach the DST, permit violations will occur. The best available treatment capability should be determined prior to reopener negotiation.

If this performance test of TEDF is conducted NPDES permit limits may be violated. Prior to implementation, test authorization will be obtained from RL. The authorization document will be referenced in appendix A, the run plan log.

4.0 Run Plan

As noted in Table 1, the samples collected biweekly are grab samples. There are no permit requirements for monitoring TEDF influent. Unless influent samples are collected and analyzed decontamination capabilities cannot be assessed. Correlating effluent grab samples with influent grab samples may be difficult and would only provide a momentary picture of plant performance. In order to determine TEDF decontamination capabilities, influent and effluent composite samples must be collected and analyzed. As previously discussed, samples will be collected upstream and downstream of some unit operations rather than relying on the entire plant influent and effluent. The permit compliance samples are of little use for determining the TEDF process capabilities. Figure 2 is a simplified TEDF flow diagram with sample points 1 through 5. Table 3 contains a list of the sample points, type of samples to be collected, and the constituents to be analyzed for.

Table 3: Run Plan Samples

Sample Point	Sample Type	Analytes
#1 Waste Collection Sump	2 Week Composite, Grab	*All permit analytes except for Coliform
#2 Co-precipitation Influent (V-463)	2 Week Composite, Grab	Al, As, Be, Cd, Cu, Fe, Pb, Mn, Ni, Se, Ag, Zn, TSS, and Organics
#3 Co-precipitation Effluent/IX Influent (V-510)	2 Week Composite, Grab	Al, As, Be, Cd, Cu, Fe, Pb, Mn, Ni, Se, Ag, Zn, TSS, and Organics
#4 IX Effluent/UV Oxidation Influent (V-1381)	Grab	TSS, Hg, Cu, and Organics
#5 UV Oxidation Effluent (V-583)	Grab	Organics

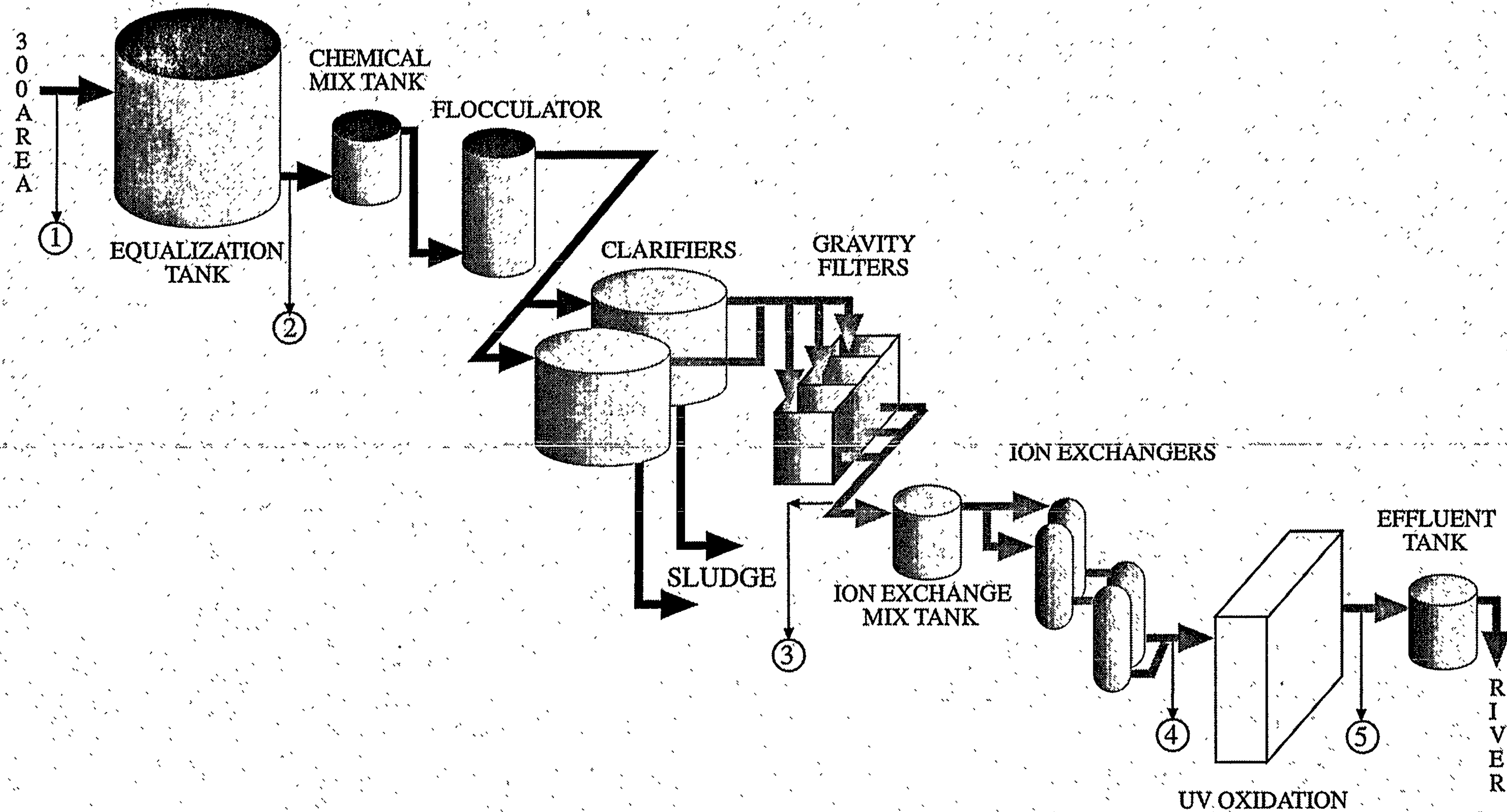
* Coliform samples have a short hold time and the data may not be valid. Coliform is also readily treated by UV oxidation. Temperature, pH, and flow are continually monitored.

<u>4.1 Decontamination Factors</u> Decontamination factors will be determined for different unit processes as well as the entire treatment train.

<u>Co-precipitation</u> The metal removal capability of the TEDF will be determined by comparing data from sample points 2 and 3. The wastewater at sample point 2 will contain the influent contaminants and the contaminants that are recycled from other parts of the process. The backwash water from the ion exchange resin and gravity filters will contain metal hydroxides and possible adsorbed organics. Using data from sample point 1 would not account for recycled and process added contaminants.

The influent waste composition is likely to vary. Composite samples are more likely to account for the influent variations than are grab samples. Composite samples are cost effective and will also reduce the operator workload.

Figure 2: Sample Points



Grab samples will also be collected at points 2 and 3. These will be analyzed for volatile and semi-volatile organics. Samples of filtered sludge contain normal paraffin hydrocarbon and the precipitation process may be removing other organic materials. Co-precipitation influent and effluent organic analysis will help determine the organic removal efficiency in the precipitation process.

Influent contaminant variations, pH, ferric chloride dose, and temperature are expected to have the largest impact on the co-precipitation process. The solubility of metal hydroxides fluctuates with temperature. A 5.6° C temperature increment will be used to define the sampling period. Five temperature windows are anticipated. The lowest expected temperature is 4.4° C and the highest is 32.4° C. During each sampling period 5 different pH and ferric chloride dose settings will be used (see Table 4). Four of the pH/ferric dose setpoints will be selected to match pilot study work. This will allow for direct data comparison. The fifth setpoint will be used to see if removal efficiency is lost at a lower ferric chloride dose (minimize sludge generation rate).

If the temperature does not fluctuate into all of the temperature windows as expected pH/ferric dose settings other than those listed will be used. Additional settings will allow for estimating decontamination factors over a broader treatment range. The additional setpoints will be bound by the Operating Specifications Document limits. For ferric chloride the dose must be between 5 and 75 ppm. The pH must remain between 8 and 12.

Table 4: Co-precipitation Setpoints

Operating Windows	Setpoints	Setpoint Justification
Every 5.6° C between 4.4° C & 32.4° C	1. $FeCl_3$ = 20, pH = 9 2. $FeCl_3$ = 40, pH = 9 3. $FeCl_3$ = 20, pH = 11 4. $FeCl_3$ = 40, pH = 11 5. $FeCl_3$ = 10, pH = 11	1. Match pilot study. 2. Match pilot study. 3. Match pilot study. 4. Match pilot study. 5. Minimize sludge.

<u>Ion Exchange</u> Grab samples will be collected at sample points 3 and 4 twice per month and will be analyzed for TSS, Hg, and Cu. Limited sampling is warranted because mercury contamination in the TEDF influent is not anticipated and the resin will be capable of removing any that may appear.

<u>UV Oxidation</u> Volatile and semi-volatile organic compounds evaporate readily. To avoid losing organic compounds from a sample matrix the accepted protocol for sampling is to collect grab samples. Grab samples of the UV oxidation unit influent and effluent, sample points 4 and 5, will be collected once per day until sufficient data is obtained to support frequency reduction. Starting in August grab samples will be collected 2 times per week. All the samples will be analyzed for total organic carbon (TOC), semi-volatile, volatile organics. The data from these analyses will allow estimates of organic destruction efficiency.

Organic destruction in the UV oxidation depends on wastewater temperature, exposure to ultraviolet light, pH, and peroxide dose. Temperature cannot be controlled by the TEDF process, but exposure, pH and peroxide dose can be controlled as required. Wastewater exposure to ultraviolet light is controlled by the number of operating bulbs and flowrate. The pH and peroxide dose is regulated by the plant control system.

The anticipated setpoints for determining the capabilities and optimum operating parameters are outlined in Table 5. The initial setpoints will be set as recommended in feasibility testing (WHC 1992). From the initial setpoints the strategy is to fix exposure time and increase peroxide dose until minimal additional organic destruction is observed. Then the peroxide and exposures setpoints will be held constant while the pH is increased. After determining the impact of pH on treatment, the pH and peroxide setpoints will be held constant as the exposure time is reduced.

Using the data collected the optimum operating conditions will be selected. The optimum operating conditions for the UV oxidation process will minimize the number lamps and peroxide required. The optimum pH will enhance organic destruction while minimizing sulfuric acid consumption.

Table 5: UV Oxidation Setpoints

Exposure Time	pH	Peroxide Dose	Setpoint Justification
1.04 Minutes	6.5	20 ppm	Recommended by feasibility testing.
1.04 Minutes	6.5	30 ppm	Additional peroxide should improve performance.
1.04 Minutes	7.0	30 ppm	Higher pH may decrease performance, but will save acid and caustic.
1.04 Minutes	7.0	40 ppm	Additional peroxide should improve performance.
0.92 Minutes	7.0	40 ppm	Lower exposure may decrease performance, but will save energy and decrease temperature gain.
0.81 Minutes	7.0	40 ppm	Lower exposure may decrease performance, but will save energy and decrease temperature gain.
0.81 Minutes	7.0	30 ppm	Less peroxide may decrease performance, but will save peroxide and reduce carryover.
0.81 Minutes	7.0	20 ppm	Less peroxide may decrease performance, but will save peroxide and reduce carryover.
0.81 Minutes	7.0	15 ppm	Less peroxide may decrease performance, but will save peroxide and reduce carryover.

4.2 Design Source Treatment Test Plan After several months of data are collected decontamination factors can be calculated. Also the optimum operating conditions should be known for the each unit operation. If the decontamination factors predict DST concentrations of contaminants can be treated a process test should be conducted. A test plan will be prepared and the equalization tank will be spiked with metal salts and organics. During the treatment samples will be collected to determine decontamination across each treatment unit. Short term composites samples will be collected upstream and downstream of the co-precipitation process and will be analyzed. Grab samples will be collected around the IX and UV oxidations systems. The samples will be analyzed as described in section 4.1.

5.0 Run Plan Control

This run plan is not an operating document and will not be used to communicate operating parameters. Timely orders or an approved operator aid will be used by the TEDF cognizant engineer staff to provide setpoint changes to operations that will conform to this plan. A copy of the documentation will be included in appendix B of this document.

Appendix A will contain a run plan log. Each time a setpoint is changed a new log page will be started. The log page will have a section for run plan critical setpoints, support equipment setpoints, plant data, sample numbers, and a narrative section.

At the conclusion of this run plan a run plan report will be issued. The run plan is expected to take approximately one year to complete. The report will contain data table summaries and conclusions that will provide information needed for permit renegotiation.

The Liquid Effluent Process Engineering Manager has overall responsibility for the execution of this run plan.

6.0 References

EPA 1994; *Authorization to Discharge Under the National Pollutant Discharge Elimination System*; WA-002591-7; United State Environmental Protection Agency Region 10; Seattle, Washington; October 1994.

WHC 1992; *Hanford 300 Area Treated Effluent Disposal Facility Engineering Summary Report*; WHC-SD-L-045H-ER-002, Rev. 0; Westinghouse Hanford Company; Richland, Washington; July 1992.

WHC 1994; *Hanford 300 Area Treated Effluent Disposal Facility Operational and NPDES Analytical Testing Report*; Westinghouse Hanford Company; Richland Washington; June 1994.

Appendix A

Date:	Applicable Timely Orders & Operator Aids:		
Critical Parameters	$FeCl_3$_______	Chemical Mix pH_______	IX pH_______
	H_2O_2	Number of Lamps	Temp
Other Parameters	Average Flowrate_______	Polymer 1 Dose_______	
	Sludge Recycle RPM		

Appendix B: Timely Orders & Setpoint Aids