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SYSTEM DESIGN DESCRIPTION
PFP LOW LEVEL WASTE
TREATMENT FACILITY

Dwayne M. Bershaw
PFP Process Engineering

MASTER

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1.0 PURPOSE

The purpose of this document is to provide a system design description (SDD) and design basis for the Plutonium Finishing Plant (PFP) Low Level Waste Treatment Facility (LLWTF) as described in the Preliminary Safety Analysis Report (PSAR, WHC 1992a) for Project 90L-EWB-680H (B-680), PFP Liquid Low Level Waste System Modification and Project 91G-GEC-040 (C-040), 291-Z Closed Loop Cooling Water System, WHC-SD-CP-PSAR-005, (WHC 1992a). The chief objective of the SDD is to document the Structures, Systems, and Components (SSCs) that establish and maintain the facility Safety Envelope necessary for normal safe operation of the facility; as identified in the Safety Analysis Report (SAR), Operational Safety Requirements (OSRs), or Safety Assessment Document (SAD). This safety equipment documentation should satisfy guidelines for the SDD given in WHC-SD-CP-TI-181, Criteria for Identification and Control of Equipment Necessary for Preservation of the Safety Envelope and Safe Operation of PFP.

The basis for operational, alarm response, maintenance, and surveillance procedures are also identified and justified in this document. This document and its appendices address the following elements of the PFP LLWTF:

- Safety Equipment and Safety Envelope Analysis
- Design description.
- General safety features and analysis.
- Operational, maintenance and surveillance procedures.

The appendices contain additional data for informational purposes only. The actual data bases and/or supporting documents should be consulted for the most current data.

2.0 SUMMARY

The function of the LLWTF is to support DOE 5400.5, Radiation Protection of the Public and the Environment, DOE 5820.2A, Radioactive Waste Management, the Tri-Party Agreement, and the Hanford site waste minimization program by providing Best Available Technology (BAT) treatment to the PFP low activity waste system. Thus the LLWTF will release treated liquid waste that meets the acceptance criteria for radionuclide discharge to the 200 East Area Treated Effluent Disposal Facility (TEDF) and a packaged solid or slurry waste suitable for transport to Waste Management for disposal.

The facility has no equipment rated higher than Safety Class 3, based on the Preliminary Safety Analysis Report (PSAR) WHC-SD-CP-PSAR-005, REV. 0. The specific pieces of equipment comprising the Safety Envelope for the LLWTF are listed, and their analysis summarized, in Section 9.0 of this document.

Previously, cooling water and various chemical drains from Buildings 236-Z, 234-5Z, and 291-Z were routed to the Very Low Activity Waste (VLA) stream that discharged directly into the 216-Z-20 (Z-20) crib. The BAT analysis stream characterization for this project indicates that the chemical sewer discharge is normally non-hazardous (chemically), therefore the primary scope of this project is to install BAT treatment for the removal of radionuclides such that the effluent meets acceptance standards for the 200 East Area TEDF. New environmental regulations limit/eliminate the practice of discharging low level radionuclides to the environment. The TEDF should come online in mid-1995. Discharging of LLWTF effluent to the Z-20 crib will cease at this time.

Appendix B gives a stream characterization of the PFP effluent routed to the LLWTF and some of the regulatory limits for this stream. Appendix B is a conservative list because the major source potential for hazardous chemicals and radionuclides has been removed by the following projects. The addition of Project 91G-GEC-040, 291-Z Closed Loop Cooling Water System, and Project 90L-EWB-680H (B-680), PFP Liquid Low Level Waste System Modification, have significantly reduced the flow rate of VLA and the possibility for highly contaminated waste releases to the LLWTF. The major source for hazardous chemical spills has been removed by the installation of Project C-035/036, PFP AMU Spill Containment/Instrument Upgrade. Operation of the LLWTF will provide a final level of engineering control for the VLA stream leaving PFP.

The LLWTF is designed with two treatment trains that can be used separately or simultaneously, thus allowing continuous operation of one train while the other is having canisters replaced or equipment repaired. Each treatment train consists of fifteen, 55 gallon drums: six containing granular activated carbon (GAC), six containing bone char (BC), and three containing cation exchange resin (IXR). The activated carbon is used to trap organics, the bone char to adsorb transuranic particles, and the ion exchange resin to capture ionic salts. The LLWTF will sample the waste stream both before and

after the treatment trains to monitor the treated effluent and the plutonium capturing ability of the system.

3.0 FUNCTIONS AND DESIGN REQUIREMENTS

The LLWTF is designed to provide a target effluent that meets acceptance criteria for the TEF facility. PFP will then be in compliance with DOE Orders 5820.2A, 6430.1A, and the 5400 series of Orders which dictate that the practice of disposing of contaminated liquids (radionuclides and hazardous wastes) to the soil column be discontinued.

The building, tanks, equipment, and instrumentation have been designed, procured, installed, and modified following the Functional Design Criteria specified in WHC-680-FDC-001 Rev. 4.

The LLWTF will accept VLAW from various plant sources (for a complete description see Appendix E) which empty into Manhole #3 & #4 and the gravity drain to the LLWTF sump. The Closed Loop Cooling System (CLCS) for process water from 234-5Z also has a drain to the 243-ZA sump. This drain accepts blowdown from the cooling tower spray pans for the secondary loop of the CLCS system.

The LLWTF will meet its design requirements by using the basic physical processes of adsorption and ion exchange. At the heart of the LLWTF are thirty 55 gallon drums (fifteen for each treatment train) filled with adsorbents and ion exchange beads which act as fixed bed columns for effluent treatment. Two adsorbents, activated carbon and bone char, will remove organic chemicals and radionuclides. An ion exchange resin (IXR) will further purify the effluent by removing unwanted cations (positively charged molecules, e.g. Al^{+3} , Cr^{+2}).

Adsorption is the process of accumulating solute molecules (organic pollutants or radionuclides) at an interface (the pores of activated carbon or bone char). The solute is attracted to the solid primarily by Van der Waals forces and weak bonds at the interface (Perry, et. al., 16.5-16.6). During the treatment process the adsorbent eventually becomes fully 'loaded' with solute molecules (adsorbate), at which point the fixed bed column (55 gallon drum) must be changed out and disposed. Regeneration in the LLWTF would be unfeasible, therefore the LLWTF canisters will be disposed of as non-transuranic (TRU) waste.

In experimental analysis bone char (BC) has proven to be an effective adsorbent of Pu in waste streams (Barney, G. S., et. al. 1989). Thus BC is expected to capture most of the radionuclides in the process stream. Two issues needed to be addressed when designing the bone char portion of the treatment trains; the total residence time of the effluent in the BC process (or the amount of BC needed to treat the given flow rate) and how often the BC canisters would need to be changed.

There are two possible limiting factors involved in the analysis of when the bone char canisters might need to be changed. The first factor involved in limiting BC use is the goal of keeping the BC drums below the TRU classification limit (<100 nCi/g) for disposal. The other factor is the Pu/Bone char chemical bonding characteristic. If the BC no longer effectively removes Pu from the process stream before the TRU classification limit is reached, then the BC must be changed out to maintain effluent stream radionuclide standards. Analysis of experimental bone char columns has suggested that BC has a very large capacity for binding Pu. One possible explanation for this is that Pu is captured by a precipitation reaction (as a phosphate from the $\text{Ca}_3(\text{PO}_4)_2$ in the BC). If precipitation is the primary method of capture, BC capacity for Pu could be very large (Green, J.W. and Lueck, K.J. 1990). Appendix C gives some calculations used to compare plutonium adsorption rates between a small pilot study and the LLWTF.

From this analysis it seems plausible that the TRU classification for the BC will be reached well before the BC has reached its Pu capacity. Though nondestructive analysis (NDA) will be necessary when the system is initially brought on line to determine BC loading rates, an estimated, conservative change-out time can be approximated to be 111 days using continuous operation at 30 gpm with plutonium concentrations at 1987-88 levels (see Appendix C).

Ion exchange is slightly different from adsorption. Ionic solutes are attracted to ionic groups bound in a solid phase accompanied by ions of opposite charge which may be displaced (Perry, et. al., 16.5-16.6). The ion exchange columns in the LLWTF are cation exchange columns; that is they exchange positive ionic species. Ion exchange may be written as a reversible reaction; an example for cation exchange is the familiar water-softening reaction

Since any plutonium in the waste stream will exist in an ionic form, the IXR will also prove beneficial in keeping radionuclide concentration of the effluent stream low.

3.1 PROCESS REQUIREMENTS

The LLWTF shall treat the VLAW, either continuously or intermittently, coming from drain lines D-1, D-2, and D-3 (234-5Z, 236-Z and 291-Z buildings) which drain through manholes #3 and #4 to sump tank TK-101. The 231-Z Building effluent will not be addressed by this project, but in a separate project. The total flow to the LLWTF is estimated to be approximately 10-15 gpm as described in WHC-SD-680-FDC-001 (WHC 1992b). The LLWTF is designed to handle continuous flow rates of up to 20 gpm and transient flow rates of up to 45 gpm.

The LLWTF shall treat the VLAW such that effluent from the facility meets or exceeds: drinking water standards as defined by the EPA, radionuclide limits as defined by Westinghouse administrative control limits (WHC-CM-7-5, Rev.0; Sec. 8.0 pg. 65), and Washington State effluent standards as defined by WAC 173-303. A characterization of the effluent stream from PFP and regulatory limits for some of these chemicals is listed in Appendix C.

The LLWTF will process wastes with low transuranic (TRU) activity levels and, due to the concentrating nature of adsorbents, may concentrate wastes to low TRU levels (non-TRU being $<100\text{nCi/g}$). However, through bone char NDA sampling and input stream analysis it will be an administrative goal to change out bone char canisters before TRU levels are reached or exceeded; thus easing restrictions on spent canister disposal.

3.2 INTERFACES

The LLWTF mechanical interfaces and system boundaries are shown on drawing H-2-82712. Existing process air and sanitary water lines from building 291-Z were tapped to supply the 243-Z building. These lines enter the building on the west side in between the two treatment trains. HVAC and HEPA filtration for the 243-Z building is contained within the facility, independent of any other buildings or processes. The HVAC and HEPA filtration systems are shown on drawing H-2-82747. Fire protection is supplied by a 6" fire protection line which enters the 243-Z building in the southeast corner.

3.2.1 Power

Power is fed to pumps P-101A and P-101B from switchgear Bus 500, breaker F8X508 in Building 291-Z to a motor control center, MCC-FC. The MCC-FC distributes power to the CLCS and LLWTF, and is provided with emergency power through automatic transfer switch, ATS-2. Emergency power is provided by diesel generators located in Building 2721.

Power is fed to Building 243-Z from switchgear Bus 600, breaker F8X601 in Room 501, Building 291-Z to the I-H panel. A line then runs to the main panel board, PP1, at the 243-Z Building. Figure 1 provides a simplified one-line diagram of the LLWTF power distribution.

Figure 1:ONELINE DIAGRAM FOR LLWTF COMPONENTS

3.2.2 Control

The LLWTF is operated by a MICON A/S™ control system (MICON A/S is a trademark of Powell Process Systems). The MICON software currently installed at PFP will also monitor and control related instrumentation and equipment presently connected to the control panels in the PFP Power Control Room 321A (234-5Z), the Closed Loop Cooling System, and facility support systems of Building 2736-ZB. The interface between the MICON system and the system which the MICON controls is at the digital/analog, input/output terminals. All changes to P&ID drawings which show the MICON as the control system shall be approved by the MICON cognizant engineer and the Engineering Change Notice (ECN) shall show the supporting document (i.e., WHC-SD-CP-CSWD-016) containing the software documentation as an "impacted document" in Block 19. The following is a brief description of the MICON control system hardware and software and the general control scheme used.

The MICON A/S™ distributed control system consists of control consoles or workstations, a data highway, and process control cabinets located in the field.

The operator consoles are located in building 234-5ZA and consist of touch screens, a keyboard and trackball, and printers. The touch screens, trackball, and keyboard allow operators to change equipment settings within the prescribed operating ranges, alter equipment line up, select data displays, backup operating files, print out historical and operational data, and in general, control and monitor facility systems and processes.

The data highway is the main data link between the consoles and the process control cabinets. It consists of two redundant coax cables that run between all control consoles and field cabinets. The data highway is redundant, meaning that if one of the two cables fail, communication is automatically passed on to the other.

The process control cabinets consist of two redundant main controllers, called U-32s and several process controllers called RCM-32s. The U-32s and the RCM-32s communicate via a small Local Access Network (LAN) called a field bus. The control cabinet for the LLWTF is located in building 243-Z.

The MICON controller operates under the UNIX operating system. The user interface to the system (controlled by the COG engineer) operates under Solaris™ software (Solaris is a trademark of Sun Microsystems). Finally, the control system software is called MICON-View and is provided by MICON company.

For more information on the MICON system configuration and how it is managed see WHC-SD-CP-CSCM-008 Computer Software Configuration Management Plan for Plutonium Finishing Plant MICON 'Open' Automation System.

3.2.3 Make Up Water

Sanitary water used for drum washing and general cleanup is supplied from an existing SW line coming from building 291-Z and entering 243-Z on the west side between the two treatment trains.

3.2.4 Influent

The LLWTF accepts VLAW from its various sources through drain lines D-1, D-2, and D-3; which empty into manholes #3 and #4. A complete list of the PFP sources for these drain lines may be found in Appendix E. Waste water from manhole #3 drains into manhole #4, which subsequently drains into the LLWTF sump (tank TK-101) via a 15" vitrified clay pipe.

3.2.5 Effluent

Treated waste leaves Building 243-Z through a 3" PVC pipe which empties into manhole #6. The piping from manhole #6 to the Z-20 crib will remain single containment piping. This should prove to be adequate containment until the Treated Effluent Disposal Facility (TEDF) in the 200 East Area is completed and 243-Z effluent can be appropriately routed.

4.0 SAFETY INTERLOCKS, SET POINTS, AND PRECAUTIONS

4.1 SAFETY INTERLOCKS

The safety interlocks shown below are for tanks TK-101 and TK-102, and flow control valves FCV-2 and FCV-3, as listed on drawing H-2-140583 SH. 2.

Interlock I-1 Flow control valve FCV-3 closes on tank TK-101 high-high alarm. This interlock shuts off flow from storage tank TK-102 to the TK-101 sump when the level in the sump tank reaches the high-high alarm point (6 ft.). This alarm will not clear until the sump level drops below 6 feet.

Interlock I-2 Pump P-101B starts under any of the following conditions:

HS-101 is switched to '101B'.
HS-101 is in '101A' and P-101A turns off.
TK-101 High Level (LIC-101) and HS-101 has selected '101B' as the lead pump.

This interlock function ensures liquid is being pumped from Tank TK-101 to avoid high level alarms (5 ft.). Pump P-101B stops on TK-101 Low Level (LIC-101). This interlock prevents pump P-101B damage by shutting the pump off when TK-101 level reaches low level alarm (3 ft.).

Interlock I-3 Pump P-101A starts under any of the following conditions:

HS-101 is switched to '101A'.
HS-101 is in '101B' and P-101B turns off.
TK-101 High Level (LIC-101) and HS-101 has selected '101A' as the lead pump.

This interlock function ensures liquid is being pumped from Tank TK-101 to avoid high level alarms (5 ft.). Pump P-101A stops on TK-101 Low Level (LIC-101). This interlock prevents pump P-101A damage by shutting the pump off when TK-101 level reaches low level alarm (3 ft.).

Interlock 1-4 Flow control valve FCV-2 will remain closed except on any of the following conditions:

HS-102 is ON and FE-1 = 0 (FIC-1)
HS-102 is ON and FE-1 + FE-2 > 30 GPM
(FIC-1 and FIC-2)

Interlock 4 allows FCV-2 to be used for maintenance on FCV-1 or FE-1. This interlock also keeps flow control closer to the midpoint of the control valve operating range; thus providing more precise control.

4.2 SET POINTS/RANGES

Equipment set points and ranges are listed in WHC-OSD-Z-184-00027, the Operating Specifications Document (OSD) for the LLWTF. Components requiring set points and/or ranges are listed below.

- A. Tank TK-101 Level
- B. Tank TK-102 Level
- C. Train Pressure
- D. Train Flow
- E. Solid Filter Differential Pressure
- F. Air/Water Pressure at Drum Washing Station
- G. Leak Detection in Secondary Containment Piping to detect leaks in the pipe
- H. Effluent pH
- I. Effluent Total Alpha
- J. Drum Handling

4.3 SET POINT ASSUMPTIONS

The dominating set point assumption on this project is the estimated flow rate to the LLWTF of 15 gpm. This flow rate is somewhat conservative, therefore if the flow is far below 15 gpm the LLWTF can either run semi-continuously or at a reduced flow rate. However, very small flow rates may cause some treatment canisters to receive more flow through them than others in the same flow series. If this condition were to persist over long periods of time it could lead to lower treatment effectiveness.

Tank height set points were determined by the physical dimensions of the tanks and an estimate of a reasonable response time for operators between the alarm and tank overflow.

5.0 OPERATION

5.1 OPERATIONAL PROCEDURES

- **ZO-106-101, Start Up, Operate, and Shutdown LLWTF**, provides instructions for the start up, operation, standby, and shut down of the PFP LLWTF using the MICON A/S[™] computer control system. Included are step by step instructions on opening and closing valves and on valve positions in building 243-Z. This procedure also provides instructions for performing surveillance on the LLWTF before, during, and after start up.
- **ZO-106-102, Change Out of Canisters for LLWTF**, provides instruction for canister change outs on Trains 1 and 2 for the 243-Z building LLWTF. Included are instructions for washing new canisters in the drum washing room, pre-filling canisters, draining canisters, air blowing canisters and transporting new and used canisters in the facility. Draining the solids prefilters for solids filter cartridge change out is also covered in this procedure.
- **ZO-106-103, Start Up/Shutdown Ventilation System LLWTF**, provides instructions for starting up and shutting down the heating, ventilation, and air conditioning (HVAC) system at PFP's LLWTF. Included are instructions for starting and shutting down the exhaust fan, supply fan, dampers, air conditioners, and unit heaters.
- **ZO-106-104, Perform Sampling at LLWTF**, provides instructions for sampling the inlet water, effluent, and intermediate streams in the process at building 243-Z and 243-ZA. Included are instructions for taking samples from the automatic Collins model 42 and 50 samplers for the inlet and effluent streams. Also, directions for sampling at various locations throughout the trains and sampling of the 243-ZA sump are provided.
- **ZO-106-800, Alarm Responses for LLWTF**, provides responses to alarms identified on the MICON A/S[™] system for the LLWTF. Specific alarm responses depend upon whether the facility is in an operating, standby, or shutdown mode.

5.2 ACCEPTANCE TEST PROCEDURE

- **WHC-SD-680H-ATP-001 Project B680 Process Control Configuration Acceptance Test Procedure**. This procedure verifies the proper operation of the Westinghouse configuration of the MICON A/S[™] Distributed Control System.

- **WHC-SD-680H-ATP-002** Project B-680H Waste Treatment Facility Acceptance Test Procedure. Demonstrates that the electric power, plumbing, HVAC equipment, process equipment, and instrumentation/control systems function as required by project criteria.
- **WHC-SD-680H-ATP-003** Project B-680H PFP Waste Treatment Facility Acceptance Test Procedure Fire Alarm System. Installation and test procedure for building 243-Z.

5.3 OPERABILITY TEST PROCEDURE

- **WHC-SD-B680H-OTP-005 Rev. 0**, PFP Low Level Wastewater Treatment Facility Drum Washing Operation, provides instructions for testing the functional performance of the drum washing stations and to wash the 24 GAC and BC drums required to fill the two treatment trains.
- **WHC-SD-B680H-OTP-006 Rev. 0**, PFP Low Level Wastewater Treatment Facility (Process), provides instructions for testing the operability of the low level waste treatment facility in building 243-Z and the MICON A/S[™] control system.

6.0 MAINTENANCE

6.1 MAINTENANCE PROCEDURES

Calibration maintenance activities are initiated using the CBRS system and PSCP and other general calibration procedures. Listed below are specific procedures used in the LLWTF system.

- PSCP-4-091 Pressure indicator test procedure.
- PSCP-5-012 pH calibration procedure for Rosemount 1054ApH analyzers.
- PSCP-5-036 Conductivity calibration procedure for Rosemount 1054AC analyzers.
- PSCP-5-037 Leak detection system test procedure for Arizona Inst. Soil Sentry Liquid 330.
- 7-GN-38 CBRS recalled instrumentation maintenance activities.
- 7-GN-31 Testing of pressure relief valves and combination pressure-temperature relief valves.
- PSCP-6-239 Flow rate calibration procedure for Nusonics 8400 flowmeters.
- PSCP-6-240 Tank level calibration procedure for Milltronics MicroRanger II level transmitters.

6.2 VENDOR INFORMATION FILES

The vendor information (VI) file is compiled to address all of the components installed in the LLWTF. The VI file is:

CVI Number	Description
22167	Pre-Engineered Building Fire Protection System Fluid Waste Treatment & Disposal Equipment Instrumentation

7.0 SURVEILLANCE

Surveillance of Safety Class 3 and other equipment is controlled and monitored through the CBRS System and plant-specific procedures. The CBRS System is a large database which tracks when equipment surveillance needs to occur and what information needs to be recorded. This database also contains historical data (past calibration or functional checks) for the equipment. The following table lists all System 24L equipment in the CBRS database, its Safety Class, and the surveillance interval.

LOOP NUMBER	SEQUENCE NUMBER	INSTRUMENT IDENTIFICATION	SAFETY CLASS	VERIFICATION INTERVAL
E0050	1	LE-1	4	12 MONTH
	2	LT-1	4	12 MONTH
	3	YL-1A	4	12 MONTH
	4	YL-1B	4	12 MONTH
	5	LAH-1	4	12 MONTH
	6	HS-1A	4	12 MONTH
	7	HS-1B	4	12 MONTH
	8	LY-1	4	12 MONTH
	9	LCV-1	4	12 MONTH
	A	LIC-101	4	12 MONTH
	B	LAL-101	4	12 MONTH
	C	LAH-101	4	12 MONTH
	D	LAHH-101	4	12 MONTH
	E	HS-101	4	12 MONTH
	F	HS-101A	4	12 MONTH
	G	HS-101B	4	12 MONTH
	H	ZI-101A	4	12 MONTH
	I	ZI-101B	4	12 MONTH
E0051	1	PI-1	3	12 MONTH
E0052	1	PI-2	3	12 MONTH
E0053	1	LE-2	4	12 MONTH
	2	LT-2	4	12 MONTH
	3	LI-2	4	12 MONTH
	4	LI-102	4	12 MONTH

LOOP NUMBER	SEQUENCE NUMBER	INSTRUMENT IDENTIFICATION	SAFETY CLASS	VERIFICATION INTERVAL
	5	LAL-102	4	12 MONTH
	6	LAH-102	4	12 MONTH
	7	LAHH-102	4	12 MONTH
E0054	1	FS-1	4	12 MONTH
	2	FAL-102	4	12 MONTH
E0055	1	FT-3	4	12 MONTH
	2	FE-3	4	12 MONTH
	3	FI-3	4	12 MONTH
	4	FY-3	4	12 MONTH
	5	FCV-3	3	12 MONTH
E0056	1	AE-4	4	3 MONTH
	2	AIT-4	4	3 MONTH
	3	AI-201	4	3 MONTH
	4	AAH-2	4	3 MONTH
	5	AAH-4	4	3 MONTH
E0060	1	FT-1	4	12 MONTH
	2	FE-1	4	12 MONTH
	3	FI-1	4	12 MONTH
	4	FY-1	4	12 MONTH
	5	FIC-1	4	12 MONTH
	6	FQ-1	4	12 MONTH
	7	FCV-1	4	12 MONTH
	8	FY-201H	4	12 MONTH
E0061	1	FT-2	4	12 MONTH
	2	FE-2	4	12 MONTH
	3	FI-2	4	12 MONTH
	4	FY-2	4	12 MONTH
	5	FCV-2	4	12 MONTH
E0062	1	AE-1	4	3 MONTH
	2	AIT-1	4	3 MONTH
	3	AI-1	4	3 MONTH
	4	AY-1	4	3 MONTH

LOOP NUMBER	SEQUENCE NUMBER	INSTRUMENT IDENTIFICATION	SAFETY CLASS	VERIFICATION INTERVAL
	5	HS-6	4	12 MONTH
	6	YL-28-B	4	12 MONTH
	7	YL-28-A	4	12 MONTH
E0063	1	LE-6	4	12 MONTH
	2	LT-6	4	12 MONTH
	3	LY-6	4	12 MONTH
	4	LAL-201	4	12 MONTH
	5	LALL-201	4	12 MONTH
E0064	1	LDP	3	12 MONTH
	2	LD-1	3	12 MONTH
	3	LD-2	3	12 MONTH
E0070	1	PDT-1	4	12 MONTH
	2	PDI-1	4	12 MONTH
	3	PDI-202	4	12 MONTH
	4	PDAH-202	4	12 MONTH
E0071	1	HS-28	4	12 MONTH
	2	MOV-1	4	12 MONTH
	3	ZS-1A	4	12 MONTH
	4	YL-1A	4	12 MONTH
	5	ZS-1B	4	12 MONTH
	6	YL-1B	4	12 MONTH
	7	ZI-MOV-1	4	12 MONTH
	8	MOV-3	4	12 MONTH
	9	ZS-3A	4	12 MONTH
	A	YL-3A	4	12 MONTH
	B	ZS-3B	4	12 MONTH
	C	YL-3B	4	12 MONTH
	D	ZI-MOV-3	4	12 MONTH
E0072	1	HS-29	4	12 MONTH
	2	MOV-2	4	12 MONTH
	3	ZS-2A	4	12 MONTH
	4	YL-2A	4	12 MONTH

LOOP NUMBER	SEQUENCE NUMBER	INSTRUMENT IDENTIFICATION	SAFETY CLASS	VERIFICATION INTERVAL
	5	ZS-2B	4	12 MONTH
	6	YL-2B	4	12 MONTH
	7	ZI-MOV-2	4	12 MONTH
	8	MOV-4	4	12 MONTH
	9	ZS-4A	4	12 MONTH
	A	YL-4A	4	12 MONTH
	B	ZS-4B	4	12 MONTH
	C	YL-4B	4	12 MONTH
	D	ZI-MOV-4	4	12 MONTH
E0075	1	PT-2	3	12 MONTH
	2	PI-4	3	12 MONTH
	3	PIR-2	3	12 MONTH
	4	PAH-2	3	12 MONTH
E0076	1	PI-3	4	12 MONTH
E0077	1	PSV-1	3	12 MONTH
E0078	1	PSV-2	3	12 MONTH
E0080	1	HS-31	4	12 MONTH
	2	MOV-5	4	12 MONTH
	3	ZS-5A	4	12 MONTH
	4	YL-5A	4	12 MONTH
	5	ZS-5B	4	12 MONTH
	6	YL-5B	4	12 MONTH
	7	ZI-MOV-5	4	12 MONTH
	8	MOV-7	4	12 MONTH
	9	ZS-7A	4	12 MONTH
	A	YL-7A	4	12 MONTH
	B	ZS-7B	4	12 MONTH
	C	YL-7B	4	12 MONTH
	D	ZI-MOV-7	4	12 MONTH
E0081	1	HS-30	4	12 MONTH
	2	MOV-6	4	12 MONTH
	3	ZS-6A	4	12 MONTH

LOOP NUMBER	SEQUENCE NUMBER	INSTRUMENT IDENTIFICATION	SAFETY CLASS	VERIFICATION INTERVAL
	4	YL-6A	4	12 MONTH
	5	ZS-6B	4	12 MONTH
	6	YL-6B	4	12 MONTH
	7	ZI-MOV-6	4	12 MONTH
	8	MOV-8	4	12 MONTH
	9	ZS-8A	4	12 MONTH
	A	YL-8A	4	12 MONTH
	B	ZS-8B	4	12 MONTH
	C	YL-8B	4	12 MONTH
	D	ZI-MOV-8	4	12 MONTH
E0082	1	FS-2	4	12 MONTH
	2	FI-TR-1	4	12 MONTH
E0083	1	FS-3	4	12 MONTH
	2	FI-TR-2	4	12 MONTH
E0086	1	AE-2	4	3 MONTH
	2	AIT-2	4	3 MONTH
	3	AAH-2	4	3 MONTH
E0087	1	AE-3	4	3 MONTH
	2	AIT-3	4	3 MONTH
	3	AAH-3	4	3 MONTH
E0088	1	HS-32	4	12 MONTH
	2	MOV-9	4	12 MONTH
	3	ZS-9A	4	12 MONTH
	4	YL-9A	4	12 MONTH
	5	ZS-9B	4	12 MONTH
	6	YL-9B	4	12 MONTH
	7	ZI-MOV-9	4	12 MONTH
E0126	1	S-101	4	12 MONTH
E0127	1	S-202	4	12 MONTH
E0130	1	PI-26-23P	4	12 MONTH
	2	PI-27-23P	4	12 MONTH
E0131	1	PI-28-23P	4	12 MONTH

LOOP NUMBER	SEQUENCE NUMBER	INSTRUMENT IDENTIFICATION	SAFETY CLASS	VERIFICATION INTERVAL
	2	PRV-5	4	12 MONTH
	3	PI-29-23P	4	12 MONTH
E0132	1	PI-21-23P	4	12 MONTH
	2	PRV-4	4	12 MONTH
	3	PI-22-23P	4	12 MONTH
	4	RV-4	3	12 MONTH
E0133	1	PI-30-23P	4	12 MONTH
	2	PRV-3	4	12 MONTH
	3	PI-7-23P	4	12 MONTH
	4	RV-3	3	12 MONTH
E0135	1	PI-23-23E	4	12 MONTH
	2	PRV-6	4	12 MONTH
	3	PI-24-23E	4	12 MONTH
E0136	1	BP-1	4	12 MONTH
E0137	1	PI-20-23C	4	12 MONTH
	2	PRV-1	4	12 MONTH
	3	PI-9-23C	4	12 MONTH
	4	RV-1	3	12 MONTH
E0138	1	PI-25-23C	4	12 MONTH
	2	PRV-2	4	12 MONTH
	3	PI-10-23C	4	12 MONTH
	4	RV-2	3	12 MONTH

General surveillance activities occur through operating and maintenance procedures. Listed below are the procedures pertaining to LLWTF surveillance.

- Z0-060-117, Perform Power Equipment Surveillance, provides instructions for performing surveillances throughout PFP with specific sections for building 243-Z.
- 2Z-220037, Inspect 2735-Z, D-9, P-PD-3, and LLWTF pumps and lubricate LLWTF pumps.

8.0 SAFETY

There are no operational safety requirements (OSRs) associated with the PFP LLWTF. The above project is considered to be Low Hazard classification (WHC-SD-680-PSE-001 Rev.0; 25). The equipment installed by the LLWTF project was also determined to be no higher than Safety Class 3 based upon the Preliminary Safety Analysis Report, WHC-SD-680-PSAR-005 Rev.0, for Project B-680, PFP Liquid Low Level Waste System Modification. As noted in the PSAR, changes made between the writing of the PSAR through acceptance testing will be incorporated in the engineering change notice to the PFP Final Safety Analysis Report, WHC-SD-CP-FSAR-021 (WHC 1991). The designation of all components in the LLWTF as no higher than Safety Class 3 can also be verified in the PFP Safety Equipment List, found in WHC-SD-CP-TI-108 Rev.13.

Worker safety and accident analysis is also documented in the PSAR. Specific accident scenarios for the LLWTF that would result in a potential radioactive release are: a leak of the VLAW to the environment, a release of plutonium-contaminated bone char in the VLAW Treatment Facility (243-Z Bldg.), and a release from the cation exchange drums in 243-Z Building.

Calculations of the amount of plutonium contained on a typical drum of bone char show that it would take approximately 165 fully loaded drums of bone char released as respirable particles to cause a release that would be greater than a release considered an acceptable risk at an annual probability of 1.0. Since that many drums would not be stored in 243-Z Bldg., such a release would be incredible.⁵

8.1 WINTERIZATION

All double containment piping entering and leaving the 243-Z facility and all piping between tanks in the 243-ZA sump pit are insulated and heat traced for cold weather protection. The 243-Z building itself is also insulated to protect all building components. The TK-101 sump tank is not insulated. However, water will be continuously flowing through the tank, either in operating or standby mode, so freezing should not occur. Additionally, if the LLWTF is in standby mode (process water circulating between tanks TK-101 and TK-102) process water will be running through the heat traced cone section of tank TK-102.

8.2 RISKS/UNCERTAINTIES

As stated in paragraph three of the Summary (Section 2.0), all major chemical and/or radiological spill threats from PFP to the LLWTF have been eliminated by earlier projects. This makes the probability of a large chemical/radiological spike to the treatment system very low. Unfortunately,

additional holding tanks for the LLWTF were dropped from the project budget. Therefore if a large spike occurs which the LLWTF cannot effectively treat the effluent will not held for sampling or re-treatment but will be sent directly to the Z-20 crib or will be allowed to overflow the TK-102 containment basin directly to the soil in the PFP yard area.

The only current source for significant concentrations of chemical solutions to the LLWTF would be the Closed Loop Cooling System (CLCS). A major leak from the CLCS could result in propylene glycol entering the LLWTF and saturating the granulated activated carbon (GAC) canisters. However, the original 50% propylene glycol solution in the CLCS system has recently been replaced with plain water containing small concentrations of biocide and corrosion inhibitor. If the CLCS continues to use this solution there should be little risk of saturating the GAC beds with organics.

Saturation of the GAC canisters is a concern because of its effect on the bone char (BC) canisters. Saturation of GAC canisters would lead to organic breakthrough to the BC canisters. The BC would then adsorb organic material, thus reducing or eliminating Pu adsorption. Since Pu adsorption is the primary function of the LLWTF, this situation would require immediate attention.

8.3 ENVIRONMENTAL ASPECTS

The piping from manhole #4 to the 243-ZA sump pit and to building 243-Z, as well as the 243-Z building itself, have double containment construction. Thus the likelihood of environmental contamination from these sources is remote. Secondary containment is also provided by the specially lined sump pit to prevent/reduce the potential for environmental contamination. If a tank overflow to the sump pit occurs, the MICON control system will be in an alarm condition for tank level; thus alerting operators of the situation so corrective action may be initiated. Liquid detection probes in secondary containment pipes also provide an indication of any leaks in the primary piping.

8.4 CRITICALITY

The possibility of obtaining 15 grams of plutonium requires a Critical Safety Evaluation (Nuclear Criticality Safety Manual, WHC-CM-4-29 Rev.1, Section 1.0). Because of the nature of the waste streams to the LLWTF (Very Low Activity Waste) the probability of a criticality was determined to be impossible. This was documented in a memo, a paragraph of which is reproduced here:

Due to the nature of the PFP effluent a Minimum Critical Mass (MCM) of 15 grams plutonium will never be realized in the LLWTF (see reference in previous paragraph). With the addition of the

closed loop cooling system , the current PFP effluent alpha concentration is averaging between 10^{-5} to 10^{-4} μCi per liter. At these concentrations roughly 800 million gallons (50 years) of effluent would need to be processed and the plutonium collected in the treatment canisters to achieve a MCM.

15530-94-GGB-048, Low Level Waste Treatment Facility (243-Z)
Criticality Safety Analysis Exemption, 04/07/94.

8.5 ALARM RESPONSE

Alarms associated with the LLWTF will display on the MICON A/S^m system in the MICON control room (243-5Z new addition) and locally on the control board in 243-Z. Alarm response operator actions for the LLWTF are documented in ZO-106-800.

9.0 EQUIPMENT SAFETY CLASS ANALYSIS

Due to the remote possibility of hazardous chemicals or radionuclides from the LLWTF being released offsite in any accident scenario, it was determined that the LLWTF components would be rated no higher than Safety Class 3. Safety class analysis criteria may be found in WHC-CM-1-3, Rev 4 section MRP 5.46. Safety Envelope and Safety Equipment List (SEL) criteria are outlined in WHC-SD-CP-T1-108, Rev. 13. LLWTF equipment is listed in the PFP Safety Equipment List no higher than Safety Class 3.

ITEMS IN THE LLWTF SYSTEM WHICH ARE CONSIDERED SAFETY CLASS 3 ARE LISTED BELOW.

9.1 COMPONENTS LOCATED IN THE 243-ZA SUMP

Item: Tank TK-101

Basis: This tank, located in the 243-ZA sump, provides primary containment of the waste stream from manhole #4. Loss of tank integrity could cause contamination of the sump pit, leading to possible worker contamination or a small environmental release if the solution dried and Pu became airborne.

Item: Tank TK-102

Basis: This tank, also located in the 243-ZA sump, provides primary containment of excess waste water and should be considered Safety Class 3 for the same reasons as tank TK-101.

Item: Pumps P-101A and P-101B and related piping up to secondary containment piping.

Basis: These pumps, located in the 243-ZA sump, pump liquid from tank TK-101 into the treatment system in 243-Z. Failure of these pumps could lead to contamination of the sump pit from pipe failure, causing pumped liquid to leak onto the sump floor, or pump failure, causing tank TK-101 to overflow.

Item: Miscellaneous items in the 243-ZA sump (Ball valves V-001 and V-002, Pressure indicators PI-1 and PI-2, valves V-076 and V-077, and Check valves CVLV-1 and CVLV-2)

Basis: Failure of these components could also lead to pumped liquid leaking to the sump floor.

Item: Flow Control Valve FCV-3

Basis: This valve, located in the 243-ZA sump, controls flow from storage tank TK-102 to sump tank TK-101. If a large quantity of waste water were being stored in TK-102 and pumps P-101A and P-101B were not operating, FCV-3 in the open position would allow all the liquid in TK-102 to gravity drain to TK-101, thus possibly overflowing TK-101.

9.2 PRESSURE RELIEF VALVES

Item: Treatment Train Pressure Relief Valves PSV-1 and PSV-2

Basis: The treatment train pressure relief valves ensure water pressure to the treatment canisters does not exceed 15 PSIG. Vendor information suggests over pressurizing the treatment canisters could lead to a loss of tank integrity, thus causing fluid release.

Item: Air line pressure relief valves RV-3 and RV-4

Basis: The air pressure relief valves are designated Safety Class 3 because they keep process air entering the LLWTF treatment trains and drum washing stations below 10 PSIG, thus ensuring treatment canisters do not become over pressurized during air purging for canister change out and drum washing.

Item: Water pressure relief valves RV-1 and RV-2

Basis: The water pressure relief valves are designated Safety Class 3 because they keep sanitary water entering the LLWTF treatment trains and drum washing stations below 10 PSIG, thus ensuring treatment canisters do not become over pressurized during filling for canister change out and drum washing.

Item: Treatment train pressure indicator and alarm system: PT-2, PI-4, PIR-4, PAH-4

Basis: The pressure indicator and alarm system is essential in alerting operators if a treatment train is running with pressure over 15 PSIG. This system is designed as an added barrier to ensure canister integrity and worker safety.

9.3 TREATMENT CANISTERS

Item: Treatment Canisters S-203, S-204, S-205, S-206, S-207, and S-208

Basis: Treatment Canisters must be considered Safety Class 3 because they are essential in keeping LLWTF effluent within administrative and regulatory limits. The greatest concern for the waste water is that it not exceed administrative plutonium and americium limits.

9.4 LEAK DETECTION SYSTEM

Item: Leak Detectors LD-1 and LD-2

Basis: Double containment piping runs from just before manhole #5 to the 243-ZA sump, and from 243-ZA to 243-Z. The pipe from 243-ZA to manhole #6 is single containment. Double containment pipe is important to insure environmental release of contaminants is avoided. Leak detection must be considered Safety Class 3 because it verifies that double containment between liquid waste and the environment is maintained. Leak detection is found only on double containment piping containing untreated process water.

ITEMS IN THE LLWTF SYSTEM WHICH ARE NOT CONSIDERED SAFETY CLASS 3 BUT MAY WARRANT AN ANALYSIS AND EXPLANATION ARE LISTED BELOW.

9.5 pH ADJUSTMENT SYSTEM

Item: pH sensors AE-1, AE-3, and transmitters AIT-1 & AIT-3.

Basis: The pH adjustment system will not be considered Safety Class 3 because it only ensures the LLWTF process stays within administrative and regulatory limits and does not directly represent the discharge to the Z-20 crib. Since several other streams tie into the Z-20 system after the LLWTF, the only definitive measurement of environmental release is the pH probe located in manhole 9 (MH-9). Thus the MH-9 pH probe is Safety Class 3 while the probes in the LLWTF are process control indication only. However, because the LLWTF makes up a significant portion of the Z-20 stream the alarm response procedure (ZO-106-800) for a high pH alarm during LLWTF operation mandates checking the MH-9 pH and taking action if the MH-9 pH is also above the control limit.

Item: Tank TK-201, Pumps P-201.

Basis: Tank TK-201 and pump P-201, integral parts of the pH adjustment system, are not considered Safety Class 3 from an environmental standpoint using the argument stated in the previous paragraph. In addition, these components could be considered Safety Class 3 items due to the industrial safety hazard of chemical spills around the tank. No KOH is currently being stored in the tank and there are plans to use a buffer solution (sodium or potassium phosphate) for pH adjustment, if needed, instead of KOH.

9.6 GENERAL 243-Z BUILDING EQUIPMENT

Item: All piping and valves located in the 243-Z facility not previously mentioned.

Basis: Valves and piping located within the walls of the 243-Z Building is not a safety class issue from an environmental perspective. If any equipment in the

243-Z facility fails, the specially lined floor of the facility and its drain to tank TK-101 will prevent a potential radioactive or chemical release to the environment.

10.0 REFERENCES

- 1 Perry, Robert H., et. al. Perry's Chemical Engineers' Handbook. 6th Ed. McGraw-Hill Inc. New York. 1984.
- 2 WHC, 1990. Calculation of Column Size and Plutonium Capacity for Bone Char Columns to Be Used in the Plutonium Finishing Plant (PFP) Low Level Waste Treatment Facility. J. W. Green, and K. J. Lueck. 10/4/90.
- 3 WHC, 1989b. Evaluation of Adsorbents for Removal of Plutonium From a Low-Level Process Wastewater. WHC-SA-0533. G.S. Barney, A. E. Blackman, K. J. Lueck, and J. W. Green. February, 1989.
- 4 WHC, 1991. Plutonium Finishing Plant Final Safety Analysis Report (FSAR). WHC-SD-CP-SAR-021, Rev. 0, 1/31/91.
- 5 WHC, 1992a. Preliminary Safety Analysis Report for Project 90L-EWB-680H, PFP Liquid Low Level Waste System Modification and Project 91G-GEC-040, 291-Z Closed loop Cooling Water System. WHC-SD-CP-PSAR-005, Rev. 0-A, 6/18/92.
- 6 WHC, 1992b. Functional Design Criteria Plutonium Finishing Plant Liquid Level Waste System Modifications. WHC-SD-680-FDC-001, Rev. 4, 4/15/92.
- 7 WHC, 1994. Operating Specifications for Plutonium Finishing Plant Low Level Waste Treatment Facility. WHC-OSD-Z-184-00027, Rev. 0-A.

APPENDIX A

LLWTF DRAWING LIST

PFP LOW LEVEL WASTE TREATMENT FACILITY DRAWING LIST		
Drawing Number	Index No.	Title
DRAWING LIST		
H-2-82708	0100/ 0000	TITLE SHEET, DRAWING LIST AND VICINITY MAP
H-2-82709	0000	LEGEND
H-2-82710	0000	LEGEND AND ABBREVIATIONS
CIVIL		
H-2-82711	0110	PARTIAL SITE PLAN
H-2-82712	0105	PLAN, PROFILE & SECTION
STRUCTURAL		
H-2-82713	0800	GENERAL STRUCTURAL CRITERIA
H-2-82714	0900	LLWTF BUILDING FOUNDATION PLAN & SECTIONS
H-2-82715	0901	CONCRETE PLANS, SECTIONS, & DETAILS
H-2-82716	0901	CONCRETE DETAILS & SECTIONS
H-2-82717	0800	EQUIPMENT SUPPORT DETAILS
H-2-82718	0800	STRUCTURAL STACK PLAN, SECTIONS, & DETAILS
H-2-82719	0800	TANK FOUNDATION PLAN & SECTIONS
H-2-82720	0800	SUMP PIT CONCRETE SECTIONS & DETAILS
H-2-82721	0800	SUMP PIT FRAMING PLAN & SECTIONS
H-2-82722	0901	PIPING SUPPORT PLAN & DETAILS
H-2-82723	8511	PIPING SUPPORT PLAN & DETAILS
ARCHITECTURAL		
H-2-82724	0800	FLOOR PLAN AND SECTIONS
H-2-82725	0801	EXTERIOR ELEVATIONS
H-2-82726	0800	BUILDING SECTIONS & REFLECTED CEILING PLAN
H-2-82727	0802	SCHEDULES, ELEVATIONS, & DETAILS

* **Controlled Print File Drawings:** These drawings contain essential information on configuration and boundaries between System 24L and other systems.

PFP LOW LEVEL WASTE TREATMENT FACILITY DRAWING LIST		
Drawing Number	Index No.	Title
PLUMBING		
H-2-82728	8509	PLUMBING FLOOR PLAN
H-2-82729	8509	TANK PLUMBING FLOOR PLAN
H-2-82730	8554	PLUMBING DETAILS, SCHEDULE
PROCESS		
H-2-82731	7004	PROCESS FLOW DIAGRAM
H-2-82732	7004	P&ID ----- REPLACED BY H-2-140583 -----
H-2-82733	7004	P&ID ----- REPLACED BY H-2-140583 -----
H-2-140583 SH. 1 *	7004	P&ID
H-2-140583 SH. 2 *	7004	P&ID KEY PLAN
H-2-140583 SH. 3 •	7004	P&ID TANKS TK-101 & TK-102
H-2-140583 SH. 4 •	7004	P&ID FLOW CONTROL & STATIC MIXERS
H-2-140583 SH. 5 *	7004	P&ID SOLIDS PRE-FILTER
H-2-140583 SH. 6 *	7004	P&ID pH NEUTRALIZATION
H-2-140583 SH. 7 *	7004	P&ID TRAIN 2
H-2-140583 SH. 8 *	7004	P&ID TRAIN 1
H-2-140583 SH. 9 •	7004	P&ID EFFLUENT SAMPLING AND RECYCLE
H-2-140583 SH. 10 *	7004	P&ID DRUM WASHING
PIPING & VESSELS		
H-2-82735	8400	PROCESS PIPING PLAN
H-2-82736	8510	AIR, WATER & DRAIN PIPING PLAN
H-2-82737	8407	TANK PIPING PLAN
H-2-82738	8548	PROCESS TRAIN SCHEMATIC
H-2-82739	8510	DETAILS
H-2-82740	8510	DETAILS
H-2-82741	8407	SUMP PLAN, ELEVATIONS, & DETAILS
H-2-82743	2500	TANK TK-102
H-2-82744	2500	TANK TK-101
PROCESS EQUIPMENT		
H-2-82745	2500	BUILDING EQUIPMENT PLAN

* Controlled Print File Drawings: These drawings contain essential information on configuration and boundaries between System 24L and other systems.

PFP LOW LEVEL WASTE TREATMENT FACILITY DRAWING LIST		
Drawing Number	Index No.	Title
H-2-82746	2500	TANK EQUIPMENT PLAN
MECHANICAL		
H-2-82747	8900	HVAC ONE-LINE DIAGRAM
H-2-82748	8900	HVAC FLOOR PLAN
H-2-82749	8900	DETAILS
H-2-82750	4600	AIR SAMPLER DETAIL
H-2-82751	0800	SCHEDULES & DETAILS
INSTRUMENTATION		
H-2-82752	5902	CONTROL PANEL
H-2-82753	5901	INSTRUMENTATION CONTROL FLOOR PLAN
H-2-82754	5901	TANK INSTRUMENTATION CONTROL PLAN
H-2-82755	5904	CONDUIT SCHEDULES & TERMINAL DETAILS
H-2-82756	5903	PROCESS CONTROL SCHEMATICS
ELECTRICAL		
H-2-82757	7201	ONE LINE DIAGRAM
H-2-82758	7301	POWER, RECEPTACLE, HVAC & GROUND PLAN
H-2-82759	7401	LLWTF BUILDING LIGHTING PLAN
H-2-82760	7601	TELEPHONE, PA & SPECIAL SYSTEMS PLAN
H-2-82761	7701	TANK LIGHTING, POWER & RECEPTACLES
H-2-82762	7301	PANEL SCHEDULES, SCHEMATICS & DETAILS
FIRE PROTECTION		
H-2-82763	7701	ALARM AND DETECTION PLAN
H-2-82764	7702	CONDUIT SCHEDULE & WIRING DIAGRAM

* Controlled Print File Drawings: These drawings contain essential information on configuration and boundaries between System 24L and other systems.

APPENDIX B

STREAM CHARACTERIZATION AND REGULATORY LIMITS ON VLAW TO LLWTF

PFP WASTEWATER CHARACTERIZATION CONCENTRATIONS AND LIMITS			
CONTAMINANTS PRESENT IN PFP WASTE STREAM (1)	1987 AVERAGE ⁽¹⁾ (ppb)	1990 AVERAGE ⁽³⁾ (ppb)	STANDARD REGULATORY LIMIT OR ADMINISTRATIVE RELEASE LIMIT (ppb)
CATIONS			
Aluminum	190	170	50-200 (2)
Ammonium	53	53	
Antimony	<100		6 (4)
Barium	29	28	1000 (2)&(4)
Beryllium	<5		4 (4)
Cadmium	<2		5 (2), 10 (4)
Calcium	18000	18000	
Chromium	<10		50 (4), 100 (2)
Copper	13	13	1000 (2)&(4)
Iron	44	73	300 (2)&(4)
Lead	<5		50 (4)
Magnesium	4100	4300	
Manganese	6	6.5	50 (2)&(4)
Mercury	0.1	0.28	2 (4)
Nickel	<10		100 (4)
Potassium	1300	720	
Silver	<10		50 (4), 100 (2)
Sodium	2400	2000	
Zinc	22	15	5000 (2)&(4)
ANIONS			
Chloride	3500	2500	250000 (2),(4)
Cyanide	<10		200 (4)
Fluoride	114	140	2000 (4)

PFP WASTEWATER CHARACTERIZATION CONCENTRATIONS AND LIMITS			
CONTAMINANTS PRESENT IN PFP WASTE STREAM ⁽¹⁾	1987 AVERAGE ⁽¹⁾ (ppb)	1990 AVERAGE ⁽³⁾ (ppb)	STANDARD REGULATORY LIMIT OR ADMINISTRATIVE RELEASE LIMIT (ppb)
Nitrate	935	620	1000 ⁽²⁾ , 10000 ⁽⁴⁾
Phosphate	<1000		
Sulfate	15000	13000	250000 ^{(2)&(4)}
Sulfide	<1000		
ORGANICS			
Acetone	330	11	
Chloroform	27	21	7.0 ⁽⁴⁾
RADIONUCLIDES	1987 AVERAGE ⁽¹⁾ (pCi/L)	1990 AVERAGE ⁽³⁾ (pCi/L)	LIMIT (pCi/L)
^{239,240} Pu	430	8.7	1.2 ⁽⁵⁾
²⁴¹ Pu	1500		80 ⁽⁵⁾
²⁴¹ Am	< 1100	1.3	1.2 ⁽⁵⁾
Gross Alpha	800	8.4	15 ^{(2)&(4)}
Gross Beta	110	3.5	50 ⁽⁴⁾

(1) Characterization results of the PFP wastewater stream for the years 1987 and 1988.
Jungfleisch, F.M., Preliminary Evaluation of Hanford Liquid Discharges to the Ground. WHC-EP-0052.
Westinghouse Hanford Co. Richland, WA. 1988.

(2) Primary and Secondary Maximum Contaminant Levels. The MCL values are used by several State and Federal laws and agencies as threshold levels for groundwater discharged to the soil.
WHC 1993. Environmental Compliance. WHC-CM-7-5 Appendix D, Rev. 0. 3/1/93.

(3) PFP Waste Stream Characteristics in 1990.
WHC 1992. 200 Area Treated Effluent Disposal Facility (Project W-049H) Wastewater Engineering Report. WHC-SD-W049H-ER-003 Volume 1, Rev. 0. Table 2-2. 2/28/92.

(4) Water Quality Standards for Groundwater.
WAC 173-200 Washington Administrative Code Standards as reported in WHC-CM-7-5 Rev 1, section 8.0 pg. 49. Values may also be found in 40 CFR § 141.62, and 40 CFR 143.3

(5) 1/25 of the Derived Concentration Guides (DCG) for Radionuclides. The DCG values relate to a 100 mrem dose only when applied at the point of exposure to humans. If a standard person consumes the standard amount of water (as noted in ICRP 23) each day for 1 year, they will receive an effective committed dose equivalent of 100 mrem.

WHC 1993. Environmental Compliance. WHC-CM-7-5 Appendix C, Rev. 0. 3/1/93.

APPENDIX C

BONE CHAR CALCULATIONS USED IN PILOT STUDY AND LLWTF TREATMENT ANALYSIS

CONCENTRATION ANALYSIS

bone char density: $0.722 \text{ g/ml} = 45.08 \text{ lb/ft}^3$
average activity of PFP effluent(WHC-SD-680-FDC-001 REV.3) = $3.03 \times 10^{-3} \mu\text{Ci/L}$

For the Test column from Green and Lueck, 1990
column size = 2.30 mL
flow rate $\approx 0.5 \text{ mL/min}$
total throughput = 30,723 mL
average absorption effectiveness $(C/C_o) = 0.8$

Mass of bone char used in test column:

$$\text{gramsBC} = 2.30 \text{ mL BC} \left(0.722 \frac{\text{g}}{\text{mL}} \right) = 1.66 \text{ g BC}$$

Total microcuries absorbed in test column:

$$3.03 \times 10^{-3} \frac{\mu\text{Ci}}{\text{L}} (30,723 \text{ mL}) \left(\frac{\text{L}}{1000 \text{ mL}} \right) \left(0.8 \left(\frac{C}{C_o} \right) \right) = 7.44 \times 10^{-2} \mu\text{Ci}$$

Minimum plutonium capturing capacity of bone char:

$$\frac{7.44 \times 10^{-2} \mu\text{Ci}}{1.66 \text{ g BC}} = 4.49 \times 10^{-2} \frac{\mu\text{Ci}}{\text{g BC}}$$

Average residence time for experimental column:

$$2.30 \text{ mL column} \left(\frac{\text{min}}{0.5 \text{ mL}} \right) = 4.60 \text{ min}$$

LLWTF PARAMETERS

average flow rate = 15 gpm
maximum flow rate = 40 gpm
usable drum volume = 5 ft³
number of BC drums in series = 3

Mass of bone char per drum:

$$5ft^3 \left(\frac{45.08lbm BC}{ft^3} \right) = 225lbm BC$$

Total mass of bone char in each BC column series:

$$225lbm BC * 3drums = 675lbm BC$$

Minimum capturing capacity of LLWTF using pilot study data and 1987-88 PFP effluent concentrations:

$$675lbm BC \left(\frac{1kg}{2.205lbm} \right) \left(\frac{1000g}{1kg} \right) 4.49 * 10^{-2} \frac{\mu Ci}{g BC} = 1.37 * 10^4 \mu Ci$$

Approximate shortest change out time for bone char canisters using pilot study BC data, 1987-88 PFP effluent concentrations, and a constant 15 gpm flow rate to the LLWTF:

$$\left(\frac{min}{7.5gal} \right) \left(\frac{L}{3.03 * 10^{-3} \mu Ci} \right) \left(\frac{1gal}{3.79L} \right) (1.37 * 10^4 \mu Ci) \left(\frac{day}{1440min} \right) = 111days$$

Approximate change out time for bone char canisters at TRU level using 1987-88 PFP effluent concentrations and a constant 15 gpm flow rate to the LLWTF (TRU level: <100nCi/g):

$$\left(\frac{min}{7.5gal} \right) \left(\frac{gal}{3.79L} \right) \left(\frac{L}{3.03 * 10^{-3} \mu Ci} \right) \left(\frac{C}{0.8Co} \right) \left(\frac{100nCi}{g} \right) \left(\frac{\mu Ci}{1000nCi} \right) \left(\frac{1000g}{2.205lbm} \right) (675lbm) \left(\frac{days}{1440min} \right) = 308days$$

RESIDENCE TIME

Average residence time of process water in each bone char series (15 gpm with one train operating):

$$\frac{5 \text{ ft}^3}{\text{drum}} \left(\frac{264.17 \text{ gal}}{35.313 \text{ ft}^3} \right) * 3 \text{ drums} \left(\frac{\text{min}}{7.5 \text{ gal}} \right) = 15 \text{ min}$$

Minimum residence time of process water in each bone char series (45 gpm with both trains operating):

$$\frac{5 \text{ ft}^3}{\text{drum}} \left(\frac{264.17 \text{ gal}}{35.313 \text{ ft}^3} \right) * 3 \text{ drums} \left(\frac{\text{min}}{11.3 \text{ gal}} \right) = 9.9 \text{ min}$$

COMPARISON OF PILOT COLUMN AND LLWTF

Average residence time comparison (15 gpm with one train operating):

$$\frac{15\text{min}-4.6\text{min}}{4.6\text{min}} = 226\% \text{ increase in residence time of LLWTF over pilot column}$$

Minimum residence time comparison (45 gpm with both trains operating):

$$\frac{9.9\text{min}-4.6\text{min}}{4.6\text{min}} = 115\% \text{ increase in residence time of LLWTF over pilot column}$$

Capacity for Plutonium absorption Scale-up from pilot column to LLWTF:

$$\frac{1.37*10^4\mu Ci}{4.49*10^{-2}\mu Ci} = 3.1*10^5$$

PLUTONIUM CAPACITY SCALE-UP RATIO FROM PILOT COLUMN TO LLWTF = 1 : 310,000

Flow Rate Scale-up from pilot column to LLWTF

$$\frac{(\frac{7.5\text{gal}}{\text{min}})(\frac{10^6\text{mL}}{264.17\text{gal}})}{0.5\frac{\text{mL}}{\text{min}}} = 5.7*10^4$$

FLOW RATE SCALE UP RATIO FROM PILOT COLUMN TO LLWTF = 1 : 57,000

APPENDIX D

LLWTF VALVE LIST

VALVE NUMBER	FUNCTION	LOCATION
V-001	PUMP P-101A OUTLET VALVE	243-ZA
V-002	PUMP P-101B OUTLET VALVE	243-ZA
V-003	T-101 to T-102	243-ZA
V-004	TK-102 OUTLET VALVE	243-ZA
V-005	S-201B ISOLATION VALVE	Room 105
V-006	S-201A ISOLATION VALVE	Room 105
V-007	OUTLET VALVE FROM TK-201 (KOH)	Room 105
V-008	KOH ADD LINE TO PROCESS LINE #1	Room 105
V-009	KOH ADD LINE TO PROCESS LINE #2	Room 105
V-010	S-201B ISOLATION VALVE	Room 105
V-011	S-201A ISOLATION VALVE	Room 105
V-012	ISOLATION FOR PDT-1	Room 105
V-013	BYPASS FOR PDT-1	Room 105
V-014	ISOLATION FOR PDT-1	Room 105
V-015	INLET FOR FILTER F-202A	Room 105
V-016	FILTER F-202A DRAIN VALVE	Room 105
V-017	OUTLET FOR FILTER F-202A	Room 105
V-018	INLET FOR FILTER F-202B	Room 105
V-019	FILTER F-202B DRAIN VALVE	Room 105
V-020	OUTLET FOR FILTER F-202B	Room 105
V-021	INLET TO PT-2	Room 105
V-022	VENT FOR PT-2	Room 105
V-023	INLET TO TRAIN 2	Train 2
V-024	DRAIN LINE FROM GAC TRAIN 2	GAC Train 2
V-025	DRAIN LINE FROM GAC TRAIN 2	GAC Train 2
V-026	DRAIN LINE FROM GAC TRAIN 2	GAC Train 2
V-027	SAMPLE FOR GAC TRAIN 2	GAC Train 2
V-028	AIR TO GAC, TRAIN 2	GAC Train 2

VALVE NUMBER	FUNCTION	LOCATION
V-029	WATER TO GAC, TRAIN 2	GAC Train 2
V-030	AIR LINE TO CANISTERS	GAC Train 2
V-031	DRAIN LINE FROM BONE CHAR, TRAIN 2, SIDE B	BC Train 2
V-032	WATER TO BONE CHAR, TRAIN 2, SIDE A	BC Train 2
V-033	DRAIN LINE FROM BONE CHAR, TRAIN 2, SIDE A	BC Train 2
V-034	WATER TO BONE CHAR, TRAIN 2, SIDE B	BC Train 2
V-035	DRAIN LINE FROM BONE CHAR, TRAIN 2, SIDE B	BC Train 2
V-036	DRAIN LINE FROM BONE CHAR, TRAIN 2, SIDE A	BC Train 2
V-037	SAMPLE FOR BONE CHAR, TRAIN 2, SIDE A	BC Train 2
V-038	SAMPLE FOR BONE CHAR, TRAIN 2, SIDE B	BC Train 2
V-039	AIR TO BONE CHAR, TRAIN 2, SIDE A	BC Train 2
V-040	AIR TO BONE CHAR, TRAIN 2, SIDE B	BC Train 2
V-041	AIR TO IX, TRAIN 2	IX Train 2
V-042	DRAIN LINE FROM IX TRAIN 2	IX Train 2
V-043	DRAIN LINE FROM IX TRAIN 2	IX Train 2
V-044	WATER TO IX, TRAIN 2	IX Train 2
V-045	SAMPLE FOR IX TRAIN 2	IX Train 2
V-046	OUTLET FROM TRAIN 2	Train 2
V-047	INLET TO TRAIN 1	Room 105
V-048	CANISTER DRAIN	GAC Train 1
V-049	CANISTER DRAIN	GAC Train 1
V-050	CANISTER DRAIN	GAC Train 1
V-051	SAMPLE VALVE	GAC Train 1
V-052	AIR LINE TO CANISTERS	GAC Train 1
V-053	WATER LINE TO CANISTERS	GAC Train 1
V-054	AIR LINE TO CANISTERS	GAC Train 1
V-055	CANISTER DRAIN, SIDE A	BC Train 1
V-056	WATER TO BONE CHAR, TRAIN 1, SIDE A	BC Train 1
V-057	DRAIN LINE FROM BONE CHAR, TRAIN 1, SIDE A	BC Train 1
V-058	WATER TO BONE CHAR, TRAIN 1, SIDE B	BC Train 1
V-059	DRAIN LINE FROM BONE CHAR, TRAIN 1, SIDE B	BC Train 1
V-060	DRAIN LINE FROM BONE CHAR, TRAIN 1, SIDE B	BC Train 1
V-061	SAMPLE FROM BONE CHAR, TRAIN 1, SIDE A	BC Train 1

VALVE NUMBER	FUNCTION	LOCATION
V-062	SAMPLE FROM BONE CHAR, TRAIN 1, SIDE B	BC Train 1
V-063	AIR TO BONE CHAR, TRAIN 1, SIDE A	BC Train 1
V-064	AIR TO BONE CHAR, TRAIN 1, SIDE B	BC Train 1
V-065	DRAIN LINE FROM IX TRAIN 1	IX Train 1
V-066	DRAIN LINE FROM IX TRAIN 1	IX Train 1
V-067	WATER TO IX, TRAIN 1	IX Train 1
V-068	AIR TO IX, TRAIN 1	IX Train 1
V-069	TRAIN 1 OUTLET	Train 1
V-070	243-Z OUTLET to MOV-9	243-ZA
V-071	SAMPLER 202 SUPPLY	Room 105
V-072	SAMPLE FROM IX TRAIN 1	IX Train 1
V-073		
V-074		
V-075		
V-076	VALVE TO ISOLATE PI-1	243-ZA
V-077	VALVE TO ISOLATE PI-2	243-ZA
V-078		
V-079	SAMPLER 101 SUPPLY	Room 105
V-080	ISOLATION VALVE FOR PI-23	
V-081	SANITARY WATER ISOLATION VALVE	
V-082	ISOLATION VALVE FOR PI-24	
V-083	INLET TO BP-1	
V-084	OUTLET FROM BP-1	
V-085	WATER ISOLATION FOR TANK T-201	
V-086	ISOLATION VALVE FOR PI-20	
V-087	INLET TO PRV-1	
V-088	OUTLET FOR PRV-1-24L	
V-089	ISOLATION VALVE FOR PI-9	
V-090	WATER INLET TO DRUM WASH STATION #1	
V-091	AIR DRAIN TO SUMP DRUM WASH STATION #1	
V-092	WATER INLET TO DRUM WASH STATION #2	
V-093	AIR DRAIN TO SUMP DRUM WASH STATION #2	
V-094	WATER INLET TO DRUM WASH STATION #3	

VALVE NUMBER	FUNCTION	LOCATION
V-095	AIR DRAIN TO SUMP DRUM WASH STATION #3	
V-096		
V-097	ISOLATION VALVE FOR PI-25-24L	
V-098	INLET TO PRV-2	
V-099	OUTLET FROM PRV-2	
V-100	ISOLATION FOR PI-10	
V-101	GAC-1-1 ISOLATION VALVE	
V-102	GAC-1-2 ISOLATION VALVE	
V-103	GAC-1-3 ISOLATION VALVE	
V-104	GAC-1-4 ISOLATION VALVE	
V-105	GAC-1-5 ISOLATION VALVE	
V-106	GAC-1-6 ISOLATION VALVE	
V-107		
V-108		
V-109		
V-110		
V-111		
V-112		
V-113		
V-114		
V-115		
V-116		
V-117		
V-118		
V-119		
V-120		
V-121		
V-122		
V-123		
V-124		
V-125	BUILDING AIR SUPPLY ISOLATION VALVE	
V-126	ISOLATION FOR PI-26	
V-127	ISOLATION FOR PI-27	

VALVE NUMBER	FUNCTION	LOCATION
V-128	KOH TANK FILL PUMP ISOLATION VALVE	
V-129	DRUM WASHING AIR ISOLATION	
V-130	DRUM WASH AIR ISOLATION VALVE	
V-131	ISOLATION VALVE FOR PI-21	
V-132	INLET TO PI-22	
V-133	DRUM WASH AIR ISOLATION VALVE	
V-134		
V-135	AIR INLET TO DRUM WASH STATION #1	
V-136	WATER DRAIN TO SUMP DRUM WASH STATION #1	
V-137	AIR INLET TO DRUM WASH STATION #2	
V-138	WATER DRAIN TO SUMP DRUM WASH STATION #2	
V-139	AIR INLET TO DRUM WASH STATION #3	
V-140	WATER DRAIN TO SUMP DRUM WASH STATION #3	
V-141	PROCESS AIR ISOLATION VALVE	
V-142	ISOLATION FOR PI-30-24L	
V-143	ISOLATION FOR PI-30	
V-144		
V-145		
V-146		
V-147		
V-148		
V-149		
V-150		
V-151		
V-152		
V-153		
V-154	PROCESS AIR ISOLATION VALVE	
V-155	ISOLATION FOR PI-29	
V-156	ISOLATION FOR PI-28	
V-157		
V-158	MH-5 DRAIN LINE ENCASEMENT LINE DRAIN	243-ZA
V-159	243-Z to 243-ZA LINE ENCASEMENT DRAIN	243-ZA
V-160	FILTER F-202A VENT VALVE	Room 105

VALVE NUMBER	FUNCTION	LOCATION
V-161	FILTER F-202B VENT VALVE	Room 105
V-162	AF-1-24L DRAIN VALVE	Room 105
V-163	SANITARY WATER STRAINER VALVE	Room 105
V-164		
V-165		
V-166		
V-167	KOH TANK FILL PUMP ISOLATION VALVE	
V-168		
V-169		
V-170		
V-171		
V-172		
V-173		
V-174		
V-175		
V-176		
V-177		
V-178		
V-179		
V-180		
V-181		
V-182		
V-183		
V-184		
V-185		
V-186		
V-187		
V-188		
V-189		
V-190		
V-191		
V-192		
V-193		

VALVE NUMBER	FUNCTION	LOCATION
V-194		
V-195		
V-196		
V-197		
V-198		
V-199		
V-200	TRAIN 1 GAC-1 ISOLATION VALVE	GAC Train 1
V-201	TRAIN 1 GAC-2 ISOLATION VALVE	GAC Train 1
V-202	TRAIN 1 GAC-3 ISOLATION VALVE	GAC Train 1
V-203	TRAIN 1 GAC-4 ISOLATION VALVE	GAC Train 1
V-204	TRAIN 1 GAC-5 ISOLATION VALVE	GAC Train 1
V-205	TRAIN 1 GAC-6 ISOLATION VALVE	GAC Train 1
V-206	TRAIN 1 SIDE A BC-1 ISOLATION VALVE	BC Train 1
V-207	TRAIN 1 SIDE A BC-2 ISOLATION VALVE	BC Train 1
V-208	TRAIN 1 SIDE A BC-3 ISOLATION VALVE	BC Train 1
V-209	TRAIN 1 SIDE B BC-1 ISOLATION VALVE	BC Train 1
V-210	TRAIN 1 SIDE B BC-2 ISOLATION VALVE	BC Train 1
V-211	TRAIN 1 SIDE B BC-3 ISOLATION VALVE	BC Train 1
V-212	TRAIN 1 IX-1 ISOLATION VALVE	IX Train 1
V-213	TRAIN 1 IX-2 ISOLATION VALVE	IX Train 1
V-214	TRAIN 1 IX-3 ISOLATION VALVE	IX Train 1
V-215	TRAIN 2 GAC-1 ISOLATION VALVE	GAC Train 2
V-216	TRAIN 2 GAC-2 ISOLATION VALVE	GAC Train 2
V-217	TRAIN 2 GAC-3 ISOLATION VALVE	GAC Train 2
V-218	TRAIN 2 GAC-4 ISOLATION VALVE	GAC Train 2
V-219	TRAIN 2 GAC-5 ISOLATION VALVE	GAC Train 2
V-220	TRAIN 2 GAC-6 ISOLATION VALVE	GAC Train 2
V-221	TRAIN 2 SIDE A BC-1 ISOLATION VALVE	BC Train 2
V-222	TRAIN 2 SIDE A BC-2 ISOLATION VALVE	BC Train 2
V-223	TRAIN 2 SIDE A BC-3 ISOLATION VALVE	BC Train 2
V-224	TRAIN 2 SIDE B BC-1 ISOLATION VALVE	BC Train 2
V-225	TRAIN 2 SIDE B BC-2 ISOLATION VALVE	BC Train 2
V-226	TRAIN 2 SIDE B BC-3 ISOLATION VALVE	BC Train 2

VALVE NUMBER	FUNCTION	LOCATION
V-227	TRAIN 2 IX-1 ISOLATION VALVE	IX Train 2
V-228	TRAIN 2 IX-2 ISOLATION VALVE	IX Train 2
V-229	TRAIN 2 IX-3 ISOLATION VALVE	IX Train 2
V-230	DRUM WASH STATION #1 OUTLET VENT VALVE	ROOM 103
V-231	DRUM WASH STATION #1 INLET VENT VALVE	ROOM 103
V-232	DRUM WASH STATION #2 OUTLET VENT VALVE	ROOM 103
V-233	DRUM WASH STATION #2 INLET VENT VALVE	ROOM 103
V-234	DRUM WASH STATION #3 OUTLET VENT VALVE	ROOM 103
V-235	DRUM WASH STATION #3 INLET VENT VALVE	ROOM 103
DIVERTER VALVES		
DV-1	DIVERTER VALVE TRAIN 1	TRAIN 1
DV-2	DIVERTER VALVE TRAIN 1	TRAIN 1
DV-3	DIVERTER VALVE TRAIN 1	TRAIN 1
DV-4	DIVERTER VALVE TRAIN 2	TRAIN 2
DV-5	DIVERTER VALVE TRAIN 2	TRAIN 2
DV-6	DIVERTER VALVE TRAIN 2	TRAIN 2
MOTOR OPERATED VALVES		
MOV-1	MOTOR OPERATED VALVE FOR F-202A INLET	Room 105
MOV-2	MOTOR OPERATED VALVE FOR F-202B INLET	Room 105
MOV-3	MOTOR OPERATED VALVE FOR F-202A OUTLET	Room 105
MOV-4	MOTOR OPERATED VALVE FOR F-202B OUTLET	Room 105
MOV-5	MOTOR OPERATED VALVE INLET TO TRAIN 2	TRAIN 2
MOV-6	MOTOR OPERATED VALVE INLET TO TRAIN 1	TRAIN 1
MOV-7	MOTOR OPERATED VALVE OUTLET FROM TRAIN 2	TRAIN 2
MOV-8	MOTOR OPERATED VALVE OUTLET FROM TRAIN 1	TRAIN 1
MOV-9	MOTOR OPERATED VALVE DIVERTS STREAM TO MH-6 OR TANK T-101	243-ZA

APPENDIX E
LIQUID EFFLUENT SOURCES TO THE LLWTF

BLDG	ROOM	SOURCE	DRAIN LINE
234-5Z	CORR-13	DRINKING FOUNTAIN	D-2
234-5Z	CORR-4C	HVAC DRAIN	D-2
234-5Z	CORR-4D	EYEWASH DRAIN	D-2
234-5Z	RM-132	90# AIR LINE COND TRAP	D-3
234-5Z	RM-141	COLD CHEM SINK	D-3
234-5Z	RM-145	SINTER FURNACE COOL H2O	D-1
234-5Z	RM-169	HA-40F FURNACE(2) COND(4)	D-2
234-5Z	RM-170	HC-46F CONDENSERS (4)	D-2
234-5Z	RM-179	ANALYZER COOLING WATER	D-2
234-5Z	RM-202	EYEWASH DRAIN - MEZZANINE	D-3
234-5Z	RM-202	SINK DRAIN - CENTER	D-3
234-5Z	RM-202	SINK DRAIN - EAST	D-3
234-5Z	RM-202	SINK DRAIN - WEST	D-3
234-5Z	RM-221-A	HPT A/C CW & COND DRAINS	D-2
234-5Z	RM-228-B	HC-15ABC COOLING WATER	D-3
234-5Z	RM-229	RMC CONT A/C CONDENSATE	D-2
234-5Z	RM-232	HA-46 COOLING H2O DRAIN	D-3
234-5Z	RM-235A2	HYDRAULIC PUMP	D-3
234-5Z	RM-235B	RMA LINE CW DRAINS ****	D-3
234-5Z	RM-262	COLD WATER OVERFLOW	D-3
234-5Z	RM-262	HEAT EXCH SW DRAIN (G22)	D-2
234-5Z	RM-262	HVAC CONDENSATE (G2)	D-3
234-5Z	RM-262	HVAC CONDENSATE (G3)	D-3
234-5Z	RM-262	HVAC CONDENSATE (G5)	D-2
234-5Z	RM-262	HVAC CONDENSATE (H2)	D-3
234-5Z	RM-262	HVAC COOLING WATER (G2)	MH 3
234-5Z	RM-262	HVAC COOLING WATER (G3)	MH 3
234-5Z	RM-262	HVAC COOLING WATER (G5)	MH 3
234-5Z	RM-262	HVAC COOLING WATER (H2)	MH 3

BLDG	ROOM	SOURCE	DRAIN LINE
234-5Z	RM-262	HYDRAULIC UNIT FOR RM-145	MH 3
234-5Z	RM-264	RMA INDUCTOR UNIT CW DRAIN	D-3
234-5Z	RM-265	BACKFLOW PREVENTER (B14)	D-3
234-5Z	RM-265	TOCCO UNIT CW DRAIN (A15)	D-3
234-5Z	RM-340	COMPUTER ROOM HVAC DRAIN	MH 3
234-5Z	RM-340	FLOOR DRAIN - EAST	MH 3
234-5Z	RM-340	FLOOR DRAIN - WEST	HM 3
234-5Z	ROOF	ROOF DRAIN, EAST END (3)	MH 3
236-Z	CORR-11	FIRE WATER DRAIN	D-3
236-Z	CORR-14	FIRE WATER DRAIN	D-3
236-Z	CORR-21	FIRE WATER DRAIN	D-3
236-Z	CORR-25	FIRE WATER DRAIN	D-3
236-Z	CORR-30	100# STEAM LINE COND	SCD
236-Z	CORR-30	EAST SIDE PROCESS STM COND	SCD
236-Z	CORR-30	RH-1 AFTER COIL STM COND	SCD
236-Z	CORR-30	RH-2 AFTER COIL STM COND	SCD
236-Z	CORR-30	RH-3 AFTER COIL STM COND	SCD
236-Z	CORR-30	RH-4 AFTER COIL STM COND	SCD
236-Z	CORR-30	RH-5 AFTER COIL STM COND	SCD
236-Z	CORR-30	RH-6 AFTER COIL STM COND	SCD
236-Z	CORR-30	RH-7 AFTER COIL STM COND	SCD
236-Z	CORR-30	VENT RH-1 SUPPLY STM COND	SCD
236-Z	CORR-30	VENT RH-2 SUPPLY STM COND	SCD
236-Z	CORR-30	VENT RH-3 SUPPLY STM COND	SCD
236-Z	CORR-30	VENT RH-4 SUPPLY STM COND	SCD
236-Z	CORR-30	VENT RH-5 SUPPLY STM COND	SCD
236-Z	CORR-30	VENT RH-6 SUPPLY STM COND	SCD
236-Z	CORR-30	VENT RH-7 SUPPLY STM COND	SCD
236-Z	CORR-30	WEST SIDE PROCESS STM COND	SCD
236-Z	CORR-31	BACKFLOW PREVENT DRAIN - 3	D-1
236-Z	CORR-31	BACKFLOW PREVENT DRAIN - 4	D-1
236-Z	CORR-31	DIP TUBE BLOWDOWN	D-1

BLDG	ROOM	SOURCE	DRAIN LINE
236-Z	CORR-31	FIRE WATER DRAIN	D-3
236-Z	CORR-31	OPEN DRAIN PIPE	D-1
236-Z	CORR-31	TK-43 STM SUP COND DRAIN	D-1
236-Z	CORR-31	TK-57 OVERFLOW DRAIN	D-1
236-Z	CORR-33	BACKFLOW PREVENT DRAIN - 1	D-1
236-Z	CORR-33	BACKFLOW PREVENT DRAIN - 2	D-1
236-Z	CORR-33	CHEM PREP RM STM SUP TRAP	SCD
236-Z	CORR-33	DIP TUBE BLOWDOWN	D-1
236-Z	CORR-33	FIRE WATER DRAIN	D-3
236-Z	CORR-33	OLD 100# STM LINE COND (2)	SCD
236-Z	CORR-33	OPEN DRAIN PIPE	D-1
236-Z	CORR-33	TK-01 ACID PREHEAT STM CND	D-1
236-Z	CORR-33	TK-02 ACID PREHEAT STM CND	D-1
236-Z	CORR-33	TK-21 STM SUP COND DRAIN	D-1
236-Z	CORR-47	FIRE WATER DRAIN	D-3
236-Z	FLOOR-1	TK-09 PPCW & STM COND	D-3
236-Z	FLOOR-1	TK-11 COOLING JACKET DRAIN	D-3
236-Z	FLOOR-1	TK-125 PPCW & STM COND	D-3
236-Z	FLOOR-1	TK-13 COOLING JACKET DRAIN	D-3
236-Z	RM-35	90# AIR FILTER DRAINS	D-1
236-Z	RM-35	FLOOR DRAIN	D-1
236-Z	RM-35	PROCESS H2O SUPP. BACKFLOW	D-1
236-Z	RM-41	H-3 TK-144 COOLING WATER	D-1
236-Z	RM-41	H-4 FURNACE OFFGAS COOL	D-1
236-Z	RM-41	H-4 STILL CONDEN COOLING	D-1
236-Z	RM-42	FIRE WATER DRAIN	D-3
236-Z	RM-45	SHIFT OFFICE HVAC DRAIN	D-1
236-Z	RM-50	FIRE WATER DRAIN	D-3
236-Z	RM-60	FIRE WATER DRAIN	D-3
291-Z	RM-500	TRANSFORMER RM FLOOR DRAIN	SUMP
291-Z	RM-501	90 PSIG IN LINE FILTER	SUMP
291-Z	RM-501	FLOOR DRAIN 1	SUMP

BLDG	ROOM	SOURCE	DRAIN LINE
291-Z	RM-501	HVAC S-15 COND DRAIN	SUMP
291-Z	RM-502	HVAC S-13 COND DRAIN	SUMP
291-Z	RM-502	HVAC S-14 COND DRAIN	SUMP
---	---	FC-1 COOLING TOWER SPRAY PAN FOR CLCS	SUMP
---	---	FC-2 COOLING TOWER SPRAY PAN FOR CLCS	SUMP
		FC-1 COOLING TOWER BACKFLOW PREVENTER	SUMP
		FC-1 COOLING TOWER BACKFLOW PREVENTER	SUMP

APPENDIX F

MASTER COMPONENT INDEX LIST
LOW LEVEL WASTE TREATMENT FACILITY

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/CAL
24L	AAH-3-24L	Analyzer Alarm (High):Treated Water pH	H-2-140583 SHT. 9 and H-2-82752		Control Panel mounted display in 243-Z			E0087-3
024L	AAH-4-24L	Analyzer Alarm (High): Outlet Water Conductivity	H-2-140583 SHT. 9 and H-2-82752		Control Panel mounted display in 243-Z			E0056-5
24L	AE-1-24L	pH Probe: Inlet water	H-2-140583 SHT. 9	Rosemount Analytical Inc.	Model# 399 Stability: +- .01 pH/30 days non-cum. 1" MNPT 100 PSIG Max.	22167 SUPP #48		E0062-1
24L	AE-3-24L	Conductivity Probe: Outlet Water	H-2-140583 SHT. 4	Rosemount Analytical Inc.	Model# 160	22167 SUPP #50		E0086-1
24L	AE-2-24L	pH Probe: Outlet Water	H-2-140583 SHT. 9	Rosemount Analytical Inc.	Model# 399 Stability: +- .01 pH/30 days non-cum. 1" MNPT 100 PSIG Max.	22167 SUPP #48		E0087-1
24L	AE-4-24L	Conductivity Probe: Inlet Water	H-2-140583 SHT. 3	Rosemount Analytical Inc.	Model# 160	22167 SUPP #50		E0056-1
24L	AF-1-24L	Air Filter	H-2-140583 SHT. 6	Zypher Mech./Van Air Systems	Max. 250 PSIG @ 225°F 0.75 PSID	22167 SUPP #19		
24L	AI-1-24L	pH Indicator: Inlet Water	H-2-140583 SHT. 4		Control Panel mounted display			E0062-3

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFG#	COMPONENT DATA	CVI NO.	SPARE	CGRS/CAL
24L	A1T-1-24L	pH Indicator Transmitter: Inlet Water	H-2-140583 SHT. 4	Rosemount	Model# 1054PH 4-20mA output to MICON	22167 SUPP #48		E0062-2
24L	A1T-2-24L	Conductivity Transmitter: Outlet Water	H-2-140583 SHT. 9	Rosemount	Model# 1054AC 4-20mA output to MICON	22167 SUPP #50		E0086-2
24L	A1T-3-24L	pH Indicator Transmitter: Outlet Water	H-2-140583 SHT. 9	Rosemount	Model #1054PH 4-20mA output to MICON	22167 SUPP #48		E0087-2
24L	A1T-4-24L	Conductivity Transmitter: Inlet Water	H-2-140583 SHT. 3	Rosemount	Model# 1054AC 4-20mA output to MICON	22167 SUPP #50		E0056-2
24L	AY-1-24L	Analyzer Relay	H-2-140583 SHT. 6					E0062-4
24L	BPR-1-24L	Backpressure Regulator	H-2-140583 SHT. 3	Zypher Mech./Fisher	1½" NPT, 20-65 PSIG Color Code: Light Blue	22167 SUPP #10		E0136-1
24L	CV-1-24L CV-2-24L CV-8-24L CV-9-24L CV-(11+17)-24L	Check Valves	H-2-140583 SHT. 3 (CV-1,2) SHT. 6 (CV-8,9) SHT. 10 (CV-11+17)			22167 SUPP #29 SHT 402		
24L	DV-(1-6)-24L	Diverter Valves	H-2-140583	Zypher Mech./PBM Inc.	3-Way valve, Model# 2" DP-H-37- f15-2/PE-CI-36H			
24L	F-202A-24L	Filter A: Main Process Filter	H-2-140583 SHT. 5	Zypher Mech./Filter Specialists, Inc.	150 PSI, 250°F Max. Model# FSC-630-304SS	22167 SUPP #55		
24L	F-202B-24L	Filter B: Main Process Filter	H-2-140583 SHT. 5	Zypher Mech./Filter Specialists, Inc.	150 PSI, 250°F Max. Model# FSC-630-304SS	22167 SUPP #55		
24L	FCV-1-24L	Flow Control Valve: from main process line to S-201B	H-2-140583 SHT. 4	Worcester Controls	CPT Characterized Seat Control Valve Model# 1 94 6 6T 150 R1	22167 SUPP #29		E0060-7
24L	FCV-2-24L	Flow Control Valve: from main process line to S-201A	H-2-140583 SHT. 4	Worcester Controls	CPT Characterized Seat Control Valve Model# 1 94 6 6T 150 R1	22167 SUPP #29		E0061-5

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVL NO.	SPARE	CBRS/CAL
24L	FCV-3-24L	Flow Control Valve: from TK-102 to TK-101	H-2-140583 SHT. 3	Worcester Controls	CPT Characterized Seat Control Valve Model# 1 94 6 6T 150 R1	22167 SUPP #29		E0055-5
24L	FE-1-24L	Flow Element: flow to S-201B	H-2-140583 SHT. 4	Zypher Mech./Nusonics Inc.	1½" PVC flowtube Model 8400 1000 PSIG Max	22167 SUPP #11		E0060-2
24L	FE-2-24L	Flow Element: flow to S-201A	H-2-140583 SHT. 4	Zypher Mech./Nusonics Inc.	1½" PVC flowtube Model 8400 1000 PSIG Max	22167 SUPP #11		E0061-2
24L	FE-3-24L	Flow Element: flow from TK-102 to TK-101	H-2-140583 SHT. 3	Zypher Mech./Nusonics Inc.	1½" PVC flowtube Model 8400 1000 PSIG Max	22167 SUPP #11		E0055-2
24L	FI-1-24L	Flow Indicator: flow to S-201B	H-2-140583 SHT. 4	Electronic Signal Co./Potter	10GPM MIN. FLOW RATE FOR ALARM MAX. SURGE 18 FPS	22167 SUPP #65		E0060-3
24L	FI-2-24L	Flow Indicator: flow to S-201A	H-2-140583 SHT. 4	Electronic Signal Co./Potter	10GPM MIN. FLOW RATE FOR ALARM MAX. SURGE 18 FPS	22167 SUPP #65		E0061-3
24L	FI-3-24L	Flow Indicator: flow from TK-102 to TK-101	H-2-140583 SHT. 3	Electronic Signal Co./Potter	10GPM MIN. FLOW RATE FOR ALARM MAX. SURGE 18 FPS	22167 SUPP #65		E0055-3
24L	FS-1-24L	Flow Switch: flow after BPR-1 to TK-102	H-2-140583 SHT. 3	Power Engineering & Equipment Co.	Model# NT-F 600 PSIG, 300°F Max.			E0054-1
24L	FS-2-24L	Flow Switch: flow to Train 1	H-2-140583 SHT. 8	Power Engineering & Equipment Co.	Model# NT-F 600 PSIG, 300°F Max.			E0082-1
24L	FS-3-24L	Flow Switch: flow to Train 2	H-2-140583 SHT. 7	Power Engineering & Equipment Co.	Model# NT-F 600 PSIG, 300°F Max.			E0083-1
24L	FT-1-24L	Flow Transmitter: flow to S-201B	H-2-140583 SHT. 4	Nusonics	Model# 8400 0-60 gpm	22167 SUPP# 65		E0060-1
24L	FT-2-24L	Flow Transmitter: flow to S-201A	H-2-140583 SHT. 4	Nusonics	Model# 8400 0-60 gpm	22167 SUPP# 65		E0061-1
24L	FT-3-24L	Flow Transmitter: flow from TK-102 to TK-101	H-2-140583 SHT. 3	Nusonics	Model# 8400 0-60 gpm	22167 SUPP# 65		E0055-1
24L	FY-1-24L	Flow Relay: flow to S-201B	H-2-140583 SHT. 4					E0060-4

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFGR	COMPONENT DATA	CVI NO.	SPARE	CBRS/CAL
24L	FY-2-24L	Flow Relay: flow to S-201A	H-2-140583 SHT. 4					E0061-4
24L	FY-3-24L	Flow Relay: flow from TK-102 to TK-101	H-2-140583 SHT. 3					E0055-4
24L	HS-1A-24L	Hand Switch: for P-101A start/stop	H-2-140583 SHT. 3					E0050-6
24L	HS-1B-24L	Hand Switch: for P-101B start/stop	H-2-140583 SHT. 3					E0050-7
24L	HS-6-24L	Hand Switch: for P-201 start/stop	H-2-140583 SHT. 6					E0062-5
24L	HT-1-24L HT-2-24L HT-3-24L HT-4-24L	Heat Traces	H-2-140583					
24L	LAH-101-24L	High Level Indicator Light: TK-101	H-2-140583 SHT. 3					E0050-C
24L	LCV-1-24L	Level Control Valve: diverts flow from TK-101 to TK-102	H-2-140583 SHT. 3	Worcester Controls	Series CPT Characterized Seat Control Valve	22167 SUPP #29		E0050-9
24L	LD-1-24L	Leak Detector: process line from 243-Z to 243-ZA	H-2-140583 SHT. 3	Arizona Instrument Corp.	IR detectors 1/2" NPT threads 117 Volts	22167 Supp #18		E0064-2
24L	LD-2-24L	Leak Detector: inlet line from MH-5 to 243-ZA	H-2-140583 SHT. 3	Arizona Instrument Corp.	IR detectors 1/2" NPT threads 117 Volts	22167 SUPP #18		E0064-3
24L	LE-1-24L	Level Element: TK-101	H-2-140583 SHT. 3	H.D. Fowler Co., Inc./Milltronics Corp.	Microranger II ST25C Transducer 4"PVC flange 0'-20' range	22167 Supp #49		E0050-1
24L	LE-2-24L	Level Element: TK-102	H-2-140583 SHT. 3	H.D. Fowler Co., Inc./Milltronics Corp.	Microranger II ST25C Transducer 4"PVC flange 0'-20' range	22167 SUPP #49		E0053-1

WHC-SD-CP-SDD-018
REV. 0

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFG	COMPONENT DATA	CVI NO.	SPARE	CBRS/ CAL
24L	LE-6-24L	Level Element: TK-201	H-2-140583 SHT. 6	H.D. Fowler Co., Inc./Milltronics Corp.	Microranger II ST25C Transducer 4"PVC flange 0'-20' range	22167 SUPP #49		E0063-1
24L	LI-2-24L	Level Indicator: TK-102	H-2-140583 SHT. 3	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		E0053-3
24L	LI-5-24L	Level Indicator:	H-2-140583 SHT. 6	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		
24L	LI-6-24L	Level Indicator	H-2-140583 SHT. 6	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		
24L	LT-1-24L	Level Transmitter: TK-101	H-2-140583 SHT. 3	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		E0050-2
24L	LT-2-24L	Level Transmitter: TK-102	H-2-140583 SHT. 3	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		E0053-2
24L	LT-6-24L	Level Transmitter: TK-201	H-2-140583 SHT. 6	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		E0063-2
24L	LY-1-24L	Level Relay: TK-101	H-2-140583 SHT. 3	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		E0050-8
24L	LY-6-24L	Level Relay: TK-201	H-2-140583 SHT. 6	H.D. Fowler Co., Inc./Milltronics Corp.		22167 SUPP #49		E0063-3
24L	MOV-1-24L	Motor Operated Valve: to F-202A	H-2-140583 SHT. 5	Worcester Controls	Series 75 fail safe operation			E0071-2
24L	MOV-2-24L	Motor Operated Valve: to F-202B	H-2-140583 SHT. 5	Worcester Controls	Series 75 fail safe operation			E0072-2
24L	MOV-3-24L	Motor Operated Valve: after F-202A	H-2-140583 SHT. 5	Worcester Controls	Series 75 fail safe operation			E0071-8

WHC-SD-CP-SDD-018
REV. 0

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/CAL
24L	MOV-4-24L	Motor Operated Valve: after F-202B	H-2-140583 SHT. 5	Worcester Controls	Series 75 fail safe operation			E0072-8
24L	MOV-5-24L	Motor Operated Valve: to train 2	H-2-140583 SHT. 7	Worcester Controls	Series 75 fail safe operation			E0080-2
24L	MOV-6-24L	Motor Operated Valve: to train 1	H-2-140583 SHT. 8	Worcester Controls	Series 75 fail safe operation			E0081-2
24L	MOV-7-24L	Motor Operated Valve: outlet of train 2	H-2-140583 SHT. 7	Worcester Controls	Series 75 fail safe operation			E0080-8
24L	MOV-8-24L	Motor Operated Valve: outlet of train 1	H-2-140583 SHT. 8	Worcester Controls	Series 75 fail safe operation			E0081-8
24L	MOV-9-24L	Motor Operated Valve: process water discharge	H-2-140583 SHT. 9	Worcester Controls	Series 75 fail safe operation			E0088-2
24L	P-101A-24L	Sump Pump 101A	H-2-140583 SHT. 3	Zypher Mech./Ingersoll-Rand	VGRP TYPE 100FT HEAD, 5BHP, 45 GPM	22167 SUPP #6		
24L	P-101B-24L	Sump Pump 101B	H-2-140583 SHT. 3	ZYPHER MECH. INC./INGERSOLL-RAND	VGRP TYPE 100FT HEAD, 5BHP, 45 GPM	22167 SUPP #6		
24L	P-201-24L	KOH Transfer Pump	H-2-140583 SHT. 6	GE Motor, Alling/Landler metering pump	1.6 GPH Max.			
24L	PDI-1-24L	Pressure Differential Indicator Over Solids Filters	H-2-140583 and H-2-82752		Control Panel mounted display in 243-2			E0070-2
24L	PDT-1-24L	Pressure Differential Transmitter	H-2-140583 SHT. 5	Honeywell	ST 3000 Series 900	22167 supp #56		E0070-1
24L	PI-(1-4)-24L PI-(7-10)-24L PI-20-24L PI-21-24L	Pressure Indicator	H-2-140583	Weksler Instruments	Ratings: 0-15, 0-30, 0-60, 0-160 PSIG	Field Mounted		E0051 E0052 E0075 E0076

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/ CAL
24L	PI-(20-30)-23P	Pressure Indicator	H-2-140583	Weksler Instruments	Ratings: 0-15, 0-30, 0-60, 0-160 PSIG	Field Mounted		E0130 E0131 E0132 E0133
24L	PRV-1-24L	Pressure Regulating Valve: drum wash water	H-2-140583 SHT. 6	Zypher Mech./O.C. Keckley Co.	1½", 10 PSIG	22167 supp #16, 21, 39, 40, 42		E0137-2
24L	PRV-2-24L	Pressure Relief Valve: process water	H-2-140583 SHT. 6	Zypher Mech./O.C. Keckley Co.	1½", 10 PSIG			E0138-2
24L	PRV-3-24L	Pressure Relief Valve: train 1 & 2	H-2-140583 SHT. 6	Zypher Mech./O.C. Keckley Co.	1½", 10 PSIG			E0133-2
24L	PRV-4-24L	Pressure Relief Valve: drum wash air	H-2-140583 SHT. 6	Zypher Mech./O.C. Keckley Co.	1½", 10 PSIG			E0132-2
24L	PRV-5-24L	Pressure Relief Valve: process air	H-2-140583 SHT. 6	Zypher Mech./O.C. Keckley Co.	1½", 50 PSIG			E0131-2
24L	PRV-6-23E	Pressure Relief Valve: Sanitary Water System	H-2-140583 SHT. 6	Zypher Mech./O.C. Keckley Co.	2" Line, 64 PSIG			E0135-2
24L	PSV-1-24L	Pressure Safety Valve: train 2	H-2-140583 SHT. 7		15 PSIG			
24L	PSV-2-24L	Pressure Safety Valve: train 1	H-2-140583 SHT. 8		15 PSIG			
24L	PT-2-24L	Pressure Transmitter	H-2-140583 SHT. 7					E0075-1
24L	RO-101-24L	Restrictive Orifice	H-2-140583 SHT. 3	Zypher Mech. Inc.	1/8" SS 1 7/32" dia. with 0.15" hole cntrd in plate	22167 SUPP# 57		
24L	RV-1-24L	Relief Valve: drum wash water	H-2-140583 SHT. 10	Model# 6010ED01 Kunkle Valve Co.	3/4" 15 PSI 108 CFM Max.			E0137-4
24L	RV-2-24L	Relief Valve: water to train 1 & 2	H-2-140583 SHT.. 6	Model# 6010ED01 Kunkle Valve Co.	3/4" 15 PSI 108 CFM Max.			E0138-4

Low Level Waste Treatment Facility Master Component Index								
SYS. No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/ CAL
24L	RV-3-24L	Relief Valve: air to train 1 & 2	H-2-140583 SHT. 6	Model# 6010ED01 Kunkle Valve Co.	3/4" 10 PSIG 108 CFM Max.			E0133-4
24L	RV-4-24L	Relief Valve: drum wash air	H-2-140583 SHT. 6	Model# 6010ED01 Kunkle Valve Co.	3/4" 10 PSIG 108 CFM Max.			E0132-4
24L	S-101-24L	LLWTF Inlet Sampler	H-2-140583 SHT. 3		Model 42-2P6-R-SM	22167 SUPP# 25		E0126-1
24L	S-201A-24L	Static Mixer A	H-2-140583 SHT. 4	Eric R. Brown Co./Koch Engineering		22167 supp# 28		
24L	S-201B-24L	Static Mixer B	H-2-140583 SHT. 4	Eric R. Brown Co./Koch Engineering		22167 supp# 28		
24L	S-201C-24L	Static Mixer C	H-2-140583 SHT. 4	Eric R. Brown Co./Koch Engineering		22167 supp# 28		
24L	S-202-24L	LLWTF Outlet Sampler	H-2-140583 SHT. 9	Zypher Mech./Collins Products Co.	Model 50, 4-20 mA DC Input	22167 supp# 26		E0127-1
24L	S-203-24L	Granulated Activated Carbon (GAC) Canisters	H-2-140583 SHT. 8	TIGG Corporation	Cansorb C-15 inlet 1F (NPT) outlet 1F (NPT) 0.5 psid/canister @15 gpm, 75°F	22167 Supp #71		
24L	S-204-24L	Bone Char (BC) Canisters	H-2-140583 SHT. 8	TIGG Corporation	Cansorb C-15 inlet 1F (NPT) outlet 1F (NPT) 0.5 psid/canister @15 gpm, 75°F 8x24 Mesh	22167 SUPP# 71		
24L	S-205-24L	Ion Exchange Resin (IXR) Canisters	H-2-140583 SHT. 8	TIGG Corporation	Cansorb C-15 inlet 1F (NPT) outlet 1F (NPT) 0.5 psid/canister @15 gpm, 75°F	22167 SUPP# 71		
24L	S-206-24L	Granulated Activated Carbon (GAC) Canisters	H-2-140583 SHT. 7	TIGG Corporation	Cansorb C-15 inlet 1F (NPT) outlet 1F (NPT) 0.5 psid/canister @15 gpm, 75°F	22167 SUPP#71		

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Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/CAL
24L	S-207-24L	Bone Char (BC) Canisters	H-2-140583 SHT. 7	TIGG Corporation	Cansorb C-15 inlet 1F (NPT) outlet 1F (NPT) 0.5 psid/canister @15 gpm, 75°F	22167 SUPP# 71		
24L	S-208-24L	Ion Exchange Resin (IX) Canisters	H-2-140583 SHT. 7	TIGG Corporation	Cansorb C-15 inlet 1F (NPT) outlet 1F (NPT) 0.5 psid/canister @15 gpm, 75°F	22167 SUPP# 71		
24L	SCV-1-24L	Supervisory Control Valve	H-2-140583 SHT. 3					
24L	TK-101-24L	Collection Sump Tank	H-2-140583 SHT. 3	Fiberglass Structures Inc.	Fiberglass 90°F, 5'dia x 7', 1000gal	22167 supp #61		
24L	TK-102-24L	Lag Storage Tank	H-2-140583 SHT. 3	Fiberglass Structures Inc.	Fiberglass 90°F, 8'dia x 24', 8000gal	22167 supp #61		
24L	TK-201-24L	KOH Tank	H-2-140583 SHT. 6	Eric Brown Construction Inc./General Electric		22167 supp #44		
24L	V-(001-020)-24L	Ball Valves 001-020	H-2-140583	Zypher Mech./PBM, Inc.	1/4"-2"	22167 Supp #29		
24L	V-021-24L V-022-24L	Needle Valve	H-2-140583					
24L	V-022-24L	Needle Valve	H-2-140583					
24L	V-(023-072)-24L	Ball Valves 023-072	H-2-140583	Zypher Mech./PBM	1/4"-2"	22167 supp #29		
24L	V-076-24L V-077-24L V-079-24L	Ball Valves 076, 077, & 079	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		
24L	V-085-24L	Gate Valve 085	H-2-140583	Zypher Mech./Waterous Co.	Series 500 OS&Y Resilient Wedge Valve	22167 supp #70		
24L	V-086-24L V-087-24L	Ball Valves 086 & 087	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFGR	COMPONENT DATA	CVI NO.	SPARE	CBRS/CAL
24L	V-088-24L	Gate Valve 088	H-2-140583	Zypher Mech./Waterous Co.	Series 500 OS&Y Resilient Wedge Valve	22167 supp #29		
24L	V-(089-095)-24L	Ball Valves 089-095	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		
24L	V-099-24L	Gate Valve 099	H-2-140583	Zypher Mech./Waterous Co.	Series 500 OS&Y Resilient Wedge Valve	22167 supp #29		
24L	V-100-24L	Ball Valve 100	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		
24L	V-130-24L	Gate Valve 130	H-2-140583	Zypher Mech./Waterous Co.	Series 500 OS&Y Resilient Wedge Valve	22167 supp #29		
24L	V-131-24L V-132-24L V-133-24L	Ball Valves 131-133	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		
24L	V-135-24L V-136-24L V-137-24L	Ball Valves 135-137	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		
24L	V-139-24L V-140-24L V-143-24L V-154-24L V-160-24L V-161-24L	Ball Valves 139, 140, 143, 154, 160, & 161	H-2-140583	Zypher Mech./PBM Inc.	1/4"-2"	22167 supp #29		
24L	FI-(1-36)-24L	Visual Flow Indicators 1-36	H-2-140583 SHT. 2-10	Ernst Gage Co.	Stainless 1"	22167 supp #8		
24L	YL-101A-24L	Status Flow Light: pump 101A on	H-2-140583 SHT. 3 <u>labelled incorrectly as YL-1A</u>					E0050-3
24L	YL-101B-24L	Status Flow Light: pump 101B on	H-2-140583 SHT. 3 <u>labelled incorrectly as YL-1B</u>					E0050-4
24L	YL-1A-24L	Status Light: MOV 1 open	H-2-140583 SHT. 5					E0071-4
24L	YL-2A-24L	Status Light: MOV 2 open	H-2-140583 SHT. 5					E0072-4

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/CAL
24L	YL-3A-24L	Status Light: MOV 3 open	H-2-140583 SHT. 5					E0071-A
24L	YL-4A-24L	Status Light: MOV 4 open	H-2-140583 SHT. 5					E0072-A
24L	YL-5A-24L	Status Light: MOV 5 open	H-2-140583 SHT. 7					E0080-4
24L	YL-6A-24L	Status Light: MOV 6 open	H-2-140583 SHT. 8					E0081-4
24L	YL-7A-24L	Status Light: MOV 7 open	H-2-140583 SHT. 7					E0080-A
24L	YL-8A-24L	Status Light: MOV 8 open	H-2-140583 SHT. 8					E0081-A
24L	YL-9A-24L	Status Light: MOV 9 open	H-2-140583 SHT. 9					E0088-4
24L	YL-1B-24L	Status Light: MOV 1 closed	H-2-140583 SHT. 5					E0071-6
24L	YL-2B-24L	Status Light: MOV 2 closed	H-2-140583 SHT. 5					E0072-6
24L	YL-3B-24L	Status Light: MOV 3 closed	H-2-140583 SHT. 5					E0071-C
24L	YL-4B-24L	Status Light: MOV 4 closed	H-2-140583 SHT. 5					E0072-C
24L	YL-5B-24L	Status Light: MOV 5 closed	H-2-140583 SHT. 7					E0080-6
24L	YL-6B-24L	Status Light: MOV 6 closed	H-2-140583 SHT. 8					E0081-6
24L	YL-7B-24L	Status Light: MOV 7 closed	H-2-140583 SHT. 7					E0080-C
24L	YL-8B-24L	Status Light: MOV 8 closed	H-2-140583 SHT. 8					E0081-C
24L	YL-9B-24L	Status Light: MOV 9 closed	H-2-140583 SHT. 9					E0088-6

Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/ CAL
24L	YL-28A-24L	Indicator Light: KOH pump on	H-2-140583 SHT. 6					E0062-7
24L	YL-28B-24L	Indicator Light: KOH pump off	H-2-140583 SHT. 6					E0062-6
24L	ZS-1A-24L	Position Switch: MOV 1 open	H-2-140583 SHT. 5					E0071-3
24L	ZS-2A-24L	Position Switch: MOV 2 open	H-2-140583 SHT. 5					E0072-3
24L	ZS-3A-24L	Position Switch: MOV 3 open	H-2-140583 SHT. 5					E0071-9
24L	ZS-4A-24L	Position Switch: MOV 4 open	H-2-140583 SHT. 5					E0072-9
24L	ZS-5A-24L	Position Switch: MOV 5 open	H-2-140583 SHT. 7					E0080-3
24L	ZS-6A-24L	Position Switch: MOV 6 open	H-2-140583 SHT. 8					E0081-3
24L	ZS-7A-24L	Position Switch: MOV 7 open	H-2-140583 SHT. 7					E0080-9
24L	ZS-8A-24L	Position Switch: MOV 8 open	H-2-140583 SHT. 8					E0081-9
24L	ZS-9A-24L	Position Switch: MOV 9 open	H-2-140583 SHT. 9					E0088-3
24L	ZS-1B-24L	Position Switch: MOV 1 close	H-2-140583 SHT. 5					E0071-5
24L	ZS-2B-24L	Position Switch: MOV 2 close	H-2-140583 SHT. 5					E0072-5
24L	ZS-3B-24L	Position Switch: MOV 3 close	H-2-140583 SHT. 5					E0071-B
24L	ZS-4B-24L	Position Switch: MOV 4 close	H-2-140583 SHT. 5					E0072-B
24L	ZS-5B-24L	Position Switch: MOV 5 close	H-2-140583 SHT. 7					E0080-5

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Low Level Waste Treatment Facility Master Component Index								
SYS No.	CID	DESCRIPTION	DRAWING	VENDOR MFR	COMPONENT DATA	CVI NO.	SPARE	CBRS/ CAL
24L	ZS-6B-24L	Position Switch: MOV 6 close	H-2-140583 SHT. 8					E0081-5
24L	ZS-7B-24L	Position Switch: MOV 7 close	H-2-140583 SHT. 7					E0080-B
24L	ZS-8B-24L	Position Switch: MOV 8 close	H-2-140583 SHT. 8					E0081-B
24L	ZS-9B-24L	Position Switch: MOV 9 close	H-2-140583 SHT. 9					E0088-5