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7. Abstract

This document describes the sampling plan for the PUREX Chemical Sewer (CSL), as required by the Tri-Party Agreement (TPA). The plan includes a description of the processes and lines contributing to the CSL and discussions of the three types of samples which will be taken of the CSL flow. These three types of samples are process samples, environmental record samples and TPA protocol samples.

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A. SAMPLING OBJECTIVES

This sampling and analysis plan discusses the sampling and analysis needs for the CSL stream produced by the PUREX plant at Hanford. The objectives of the sampling and analysis program are to:

- o Confirm that the waste stream characteristics do not significantly change over time, and to quantify the characteristics during demineralizer regeneration,
- o Confirm the stream specific report¹ waste designation of the CSL.
- o Provide support for preparation of the 200 Area Treated Effluent Disposal Facility (TEDF) 240 engineering report, as necessary,
- o Routinely monitor the stream for flow rate, radioactive contaminants, and pH, to assure that internal limits are met,
- o Support the design of wastewater treatment projects, as necessary.
- o Any amendment to this document will be considered a class 3 change to the TPA.

B. PUREX FACILITY DESCRIPTION

This section describes the processes which produce the CSL, the properties of the CSL, and the disposal site which receives the CSL.

B.1. PHYSICAL PLANT DESCRIPTION

The PUREX plant is a collection of buildings and facilities located in the 200 East area of the Department of Energy's Hanford Reservation (see figure B-1). The main building, 202-A, is a heavily shielded reinforced concrete structure of the sort known as a *canyon building*. Other facilities include the 203-A pumphouse and uranium product storage facility, the 211-A pumphouse and chemical storage facility, the chemical storage warehouse (2714-A), the acid fractionator building (206-A), the 291-A facility, the effluent monitoring buildings, the high tank, the 2712-A building, and the 2711-A-1 building. Figure B-2 is a plot plan for the PUREX plant.

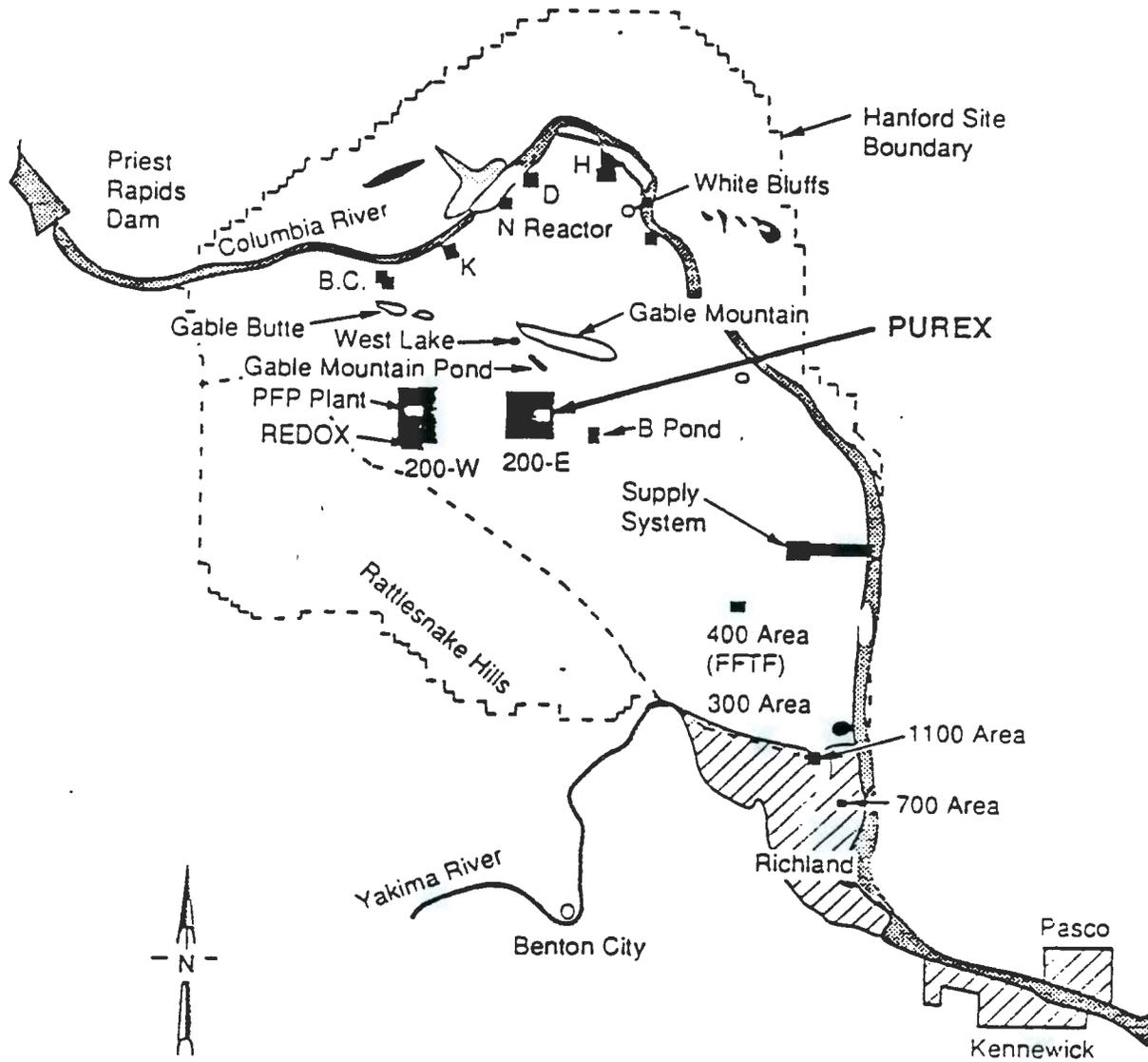
B.1.1. The 202-A Building.

The 202-A building is a reinforced concrete structure 1,005 feet long, 119 feet wide at its maximum, and 100 feet high, with about 40 feet of this height below grade (see Figure B-3). The *canyon* itself runs nearly the length of the 202-A building. The canyon contains and shields the process equipment used for reprocessing irradiated nuclear fuel. The canyon consists of the

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PUREX CSL Sampling and Analysis Plan

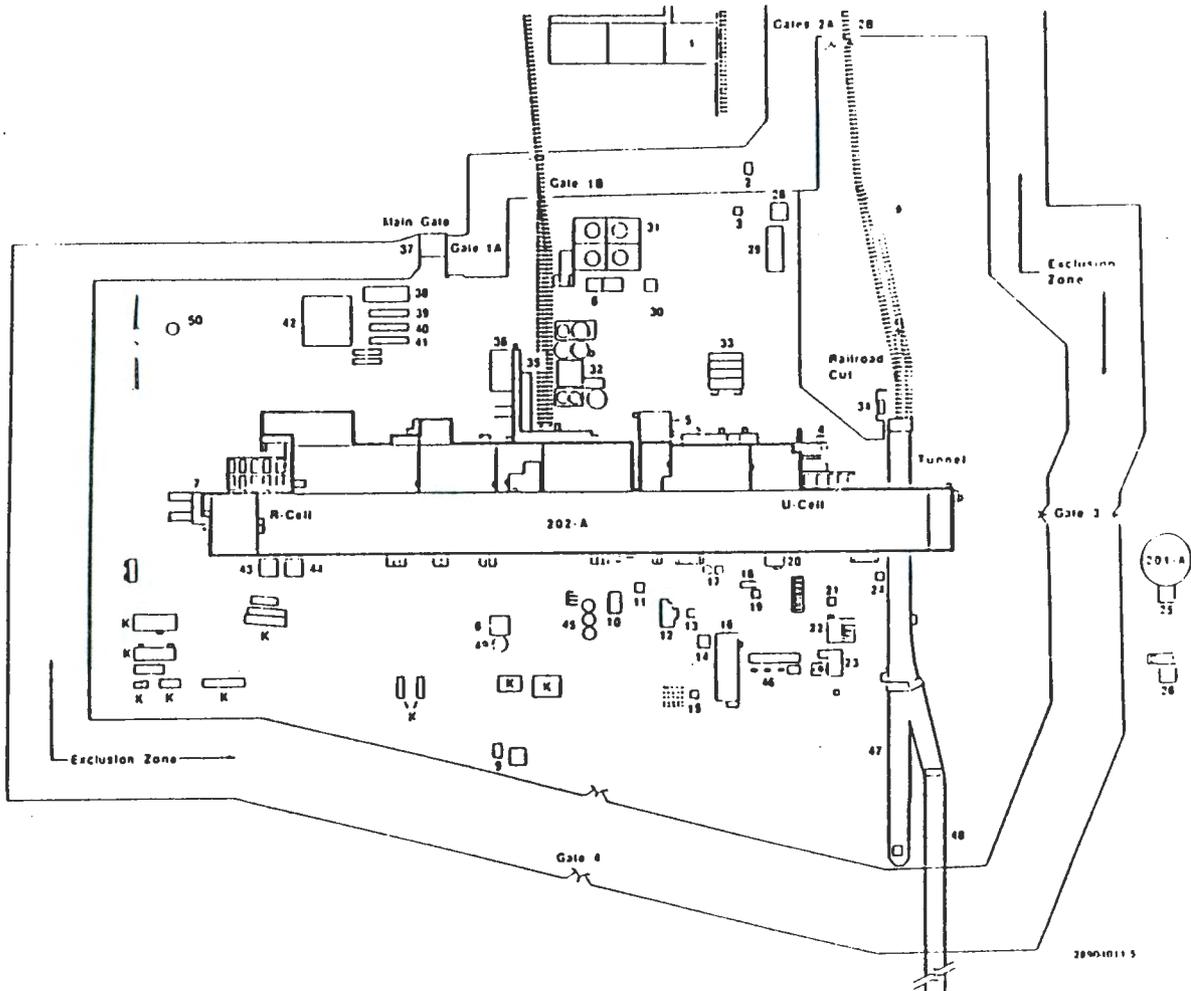
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Figure B-1: Location of PUREX Within Hanford



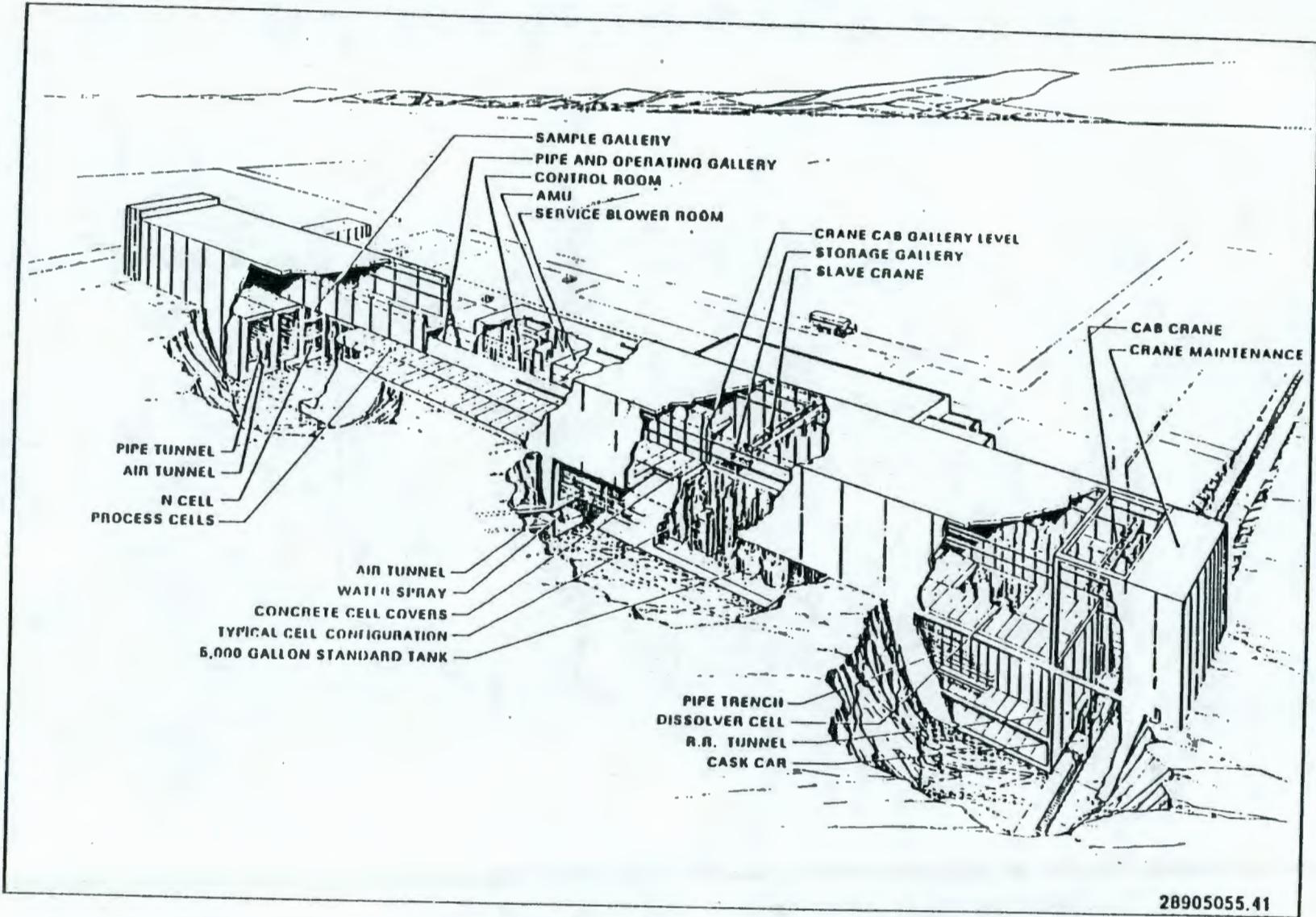
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- 1. 275 EA Warehouse
 - 2. CSL PIT
 - 3. 795-AC CSL (Chem Sewer Line)
 - 4. 206 A Fractionator
 - 5. Laboratory Sample Receiving Dock
 - 6. 203-A UNIT Pump House Control Room
 - 7. PR Dock
 - 8. 295-AB FDD (Process Distillate Discharge)
 - 9. A 4 PIT/FDD PIT
 - 10. 213-A Flag Maint. Workshop
 - 11. 201-AB Sample Shack
 - 12. Shielded Valve PIT
 - 13. 201-AC Instr. Shack
 - 14. 201-AG Instr. Shack
 - 15. 201-AJ Instr. Shack
 - 16. 201-AE 44 Filter Bldg.
 - 17. 205-AA SCD (Steam Condensate Discharge)
 - 18. 201-AH Ammonia Oil Gas Filter Bldg.
 - 19. 201-AH Ammonia Oil Gas Sampler Bldg.
 - 20. 212-A Load Out
 - 21. 204-A Instr. Shack
 - 22. 203-A Dissolver ON Gas Rldg.
 - 23. 202-AB Main Stack Bldg.
 - 24. 205-A ASD (Ammonia Scrubber Discharge)
 - 25. 201-A Pump PIT
 - 26. 205-AD CWL (Cooling Water Line)
 - 27. BT2 Exhauster Area
 - 28. 252-A
 - 29. 201-A Emergency Generators
 - 30. MO-322
 - 31. 203-A Storage Area
 - 32. 211-A Demineralizer Bldg.
 - 33. MO-409 Laboratory Trailer
 - 34. Railroad Storage Shed
 - 35. 214 A, B, C, D
 - 36. 2714-A
 - 37. 2701-A Badge House
 - 38. MO-035 Training Trailer
 - 39. MO-707
 - 40. 04-15323
 - 41. 202A-T-1
 - 42. MO 023 Engineering Trailer
 - 43. 2711-A-1
 - 44. 2712-A
 - 45. Hydrogen Peroxide Tanks
 - 46. 201-A Exhaust fans
 - 47. 218 E-14 Storage Tunnel
 - 48. 218 E-15 Storage Tunnel
 - 49. 216 A-5
 - 50. 2901-A Water Tank
- K - Kaiser Related Facilities



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 Figure B-2: PUREX Plot Plan

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 Figure B-3: 202-A Sketch

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canyon proper, the crane cab gallery, the process cells, the hot pipe trench, and the ventilation air tunnel.

The process cells are rooms shielded with massive concrete (nine feet thick near the base on the north side) designed to reduce the radiation field on the outside of the canyon to 0.01 milli-Sievert (mSv) per hour. The process cells contain most of the process equipment. The floor of the canyon cells is a layer of reinforced concrete twenty feet thick. The process cells are covered by *cover blocks*, removable blocks of reinforced concrete designed to reduce the radiation field at their upper surface to one mSv per hour.

The ventilation air tunnel, located to the south of the process cells, conducts air from the process cells to the main ventilation exhaust system, which filters particulate matter from the air before releasing the air to the atmosphere. The ventilation exhaust system insures that air flows from areas of lower potential contamination to areas of higher potential contamination, thereby helping to prevent the spread of radioactive contamination.

The hot pipe trench, located above the ventilation air tunnel, contains pipes which connect pieces of process equipment. The hot pipe trench is covered by cover blocks, which, together with the cover blocks over the process cells, compose the *canyon deck*, the floor of the main part of the canyon proper. The process cells, hot pipe trench, and ventilation air tunnel are all located below grade.

The canyon proper is a large, long room which contains three bridge cranes used for canyon maintenance and for charging irradiated fuel into the process. On either end of the canyon proper is a crane maintenance platform. Near the east end of the canyon proper, just west of the crane maintenance platform, are a fuel storage basin and a horizontal door to the railroad tunnel, used for moving fuel into, and equipment into and out of, the canyon.

The crane cab gallery runs the length of the canyon proper, on the north side. It consists of a floor and a *parapet wall*, which provides shielding to the cabs of the two main canyon cranes.

Located below the crane cab gallery are three more galleries which run nearly the length of the building: the Pipe and Operating (P&O) gallery which contains cold side piping to the process, the sample gallery which contains sampling equipment used for taking process control samples from the equipment located in the process cells, and the storage gallery. The P&O gallery is the source of some of the CSL.

The service annexes located north of the galleries contain control rooms, offices, rest rooms, change rooms, lunch rooms, the PUREX laboratory, the aqueous makeup facility (AMU), and maintenance shops. The service annexes are made primarily of steel and transite. Most of the pipes leading into the CSL originate in the service annexes.

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B.1.2. 203-A Pumphouse and Tank Farm

The 203-A tank farm stores the aqueous uranium nitrate product from PUREX, together with recycled nitric acid from the UO_3 plant and contaminated uranium nitrate solution. The tank farm includes sampling equipment, as well as loading and unloading equipment for the tank trucks and cars used to transfer solutions between PUREX and the UO_3 plant. The 203-A pumphouse contains instruments for measuring the volumes contained in the tank farm, and pumps and piping to receive and transfer the solutions in the tank farm.

B.1.3. 211-A Pumphouse and Tank Farm

The 211-A tank farm stores bulk liquid chemicals for use in the PUREX process. The chemicals stored include AFAN (an aqueous mixture of ammonium fluoride and ammonium nitrate), 57 wt% nitric acid, 50 wt% sodium hydroxide, 45 wt% potassium hydroxide, demineralized water, hydrocarbon diluent (NPH, or Normal Paraffin Hydrocarbon), tributyl phosphate (TBP), aluminum nitrate, and 93 wt% sulfuric acid.

The 211-A Pumphouse, located in the midst of the 211-A tank farm, contains pumps used to transfer the chemicals stored in the tank farm, and the water demineralizers.

B.1.4. 2714-A Chemical Storage Warehouse

The 2714-A warehouse is a corrugated steel building set on a concrete dock next to a railroad spur. It stores liquid and dry containerized chemicals. The 2714-A warehouse has no floor drains.

B.1.5. 206-A Acid Fractionator Building

The 206-A building is a reinforced concrete structure located adjacent to the 202-A building. It houses the vacuum fractionator, used for concentrating recovered nitric acid, and associated equipment. When PUREX is processing fuel, the heat transfer piping in the vacuum fractionator is a major source of the CSL. The nitric acid recovery made possible by the vacuum fractionator substantially decreases the quantity of mixed waste produced by PUREX. This recovery also decreases the quantity of chemicals which must be bought to enable processing.

B.1.6. 291-A Ventilation Facility

The 291-A Ventilation Facility comprises filters, plenums, a fan house, a 200 foot tall concrete stack, a fiber reinforced resin stack, and monitoring equipment for the ventilation exhaust from the 202-A canyon and process vessels. Of particular interest is the fourth filter building, 291-AE. This building contains several stages of high efficiency particulate air (HEPA) filtration for the canyon exhaust system. The heating system for this building produces a steam condensate which will be re-routed to the CSL.

B.1.7. Effluent Monitoring Buildings

Several small buildings and other enclosures contain equipment for monitoring the liquid and gaseous effluent streams. The 295-AC building houses sampling and monitoring equipment for the CSL.

B.1.8. High Tank

The 2901-A water tank provides an emergency supply of water to the PUREX plant. The continuous overflow from this tank flows into the CSL.

B.1.9. The 2712-A Building

The 2712-A building contains vacuum pumps. The vacuum produced by these pumps is piped through the 202-A building and used for air sampling and monitoring. These pumps produce a seal water effluent which will flow into the CSL.

B.1.10. The 2711-A-1 Building

The 2711-A-1 building contains a dry air supply system. This system produces a cooling water stream which will flow into the CSL.

B.2. PROCESS DESCRIPTION

The PUREX plant is not currently operating. Nevertheless, past operations are responsible for the current state of liquid effluent releases from PUREX. Past operations are also responsible for the presence and potential for many contaminants in the PUREX liquid effluent streams. Consequently, the discussion of PUREX processing begins with an overview of the PUREX process, and then discusses conditions during the transition to standby and standby.

B.2.1. PUREX Process Overview

The PUREX (Plutonium Uranium Reduction Extraction) nuclear fuel processing plant, located in the 200 East area of the Hanford Site, is designed to separate the usable actinides from the fission products in irradiated nuclear fuel. Briefly, the process consists of dissolving the fuel and then separating the actinides using liquid-liquid solvent extraction. The driving forces for the separations consist of concentration changes, temperature changes, and chemical additions. When processing, the PUREX Plant is the source of five liquid effluent streams, which are mostly by-products of the various driving forces. These liquid effluent streams (and their commonly used mnemonic colloquialisms) are the CSL (Chemical Sewer), SCD (Steam Condensate), PDD (Process Condensate), ASD (Ammonia Scrubber Condensate), and CWL (Cooling Water).

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B.2.2. Standby and Transition to Standby

In late 1990, DOE determined that the plutonium contained in the irradiated fuel stored at Hanford was no longer needed for defense program purposes. The DOE subsequently determined that other alternatives for disposition of the irradiated fuel should be considered and that a new Environmental Impact Statement (EIS) be prepared to provide input on the environmental impacts of all viable alternatives. Processing of irradiated fuel at PUREX, which is one alternative, has been suspended pending the outcome of the review of disposition alternatives for the irradiated fuel. In the interim, PUREX is being placed in standby. During standby, the plant needs to be maintained in a safe and environmentally acceptable manner so that it can be utilized in any way that the Record of Decision (ROD) might specify. During this period, there will be no PDD or ASD. The CWL and SCD streams will be eliminated by blanking most potential tributaries to the streams. A few minor tributaries will be rerouted to the CSL.

B.3. WASTE STREAM DESCRIPTION

The CSL consists of non-process building services waste water, demineralizer regenerant, and non-contact non-radioactive process heat exchange effluent. During fuel processing, the CSL also contains non-contact heat exchange effluent from the vacuum fractionator, which then accounts for the majority of the stream. During fuel processing, the CSL flow averages approximately 1000 gpm. When a demineralizer is regenerated during fuel processing, the CSL flow increases to approximately 1200 gpm. During standby, the CSL flow rate is expected to be in the range of 300 to 400 gpm, but may exceed 500 gpm during extreme temperatures.

Radiologically, the CSL is expected to contain extremely low concentrations of contaminants, only slightly above the levels in natural background waters. An incident during the first decade of operation of the PUREX plant is known to have contaminated the CSL pipe with plutonium, which might be expected to leach into the stream. Recent samples² have revealed that the current plutonium concentrations in the CSL are less than 1 pCi/l. This same series of samples yielded total alpha activity concentrations of less than 2 pCi/l, and beta activity concentrations (excluding ³H) of less than 5 pCi/l.

Chemically, the CSL is quite similar to the raw water pumped from the Columbia River. During normal operation, the CSL differs from the raw water by containing approximately twice the concentration of chloride and manganese, and approximately three times the concentration of copper and iron. During demineralizer regeneration, the CSL contains higher concentrations of the solutes found in raw water, as well as additional sodium and sulfate used in the regenerant.

This stream has been designated non-hazardous by comparing sample data to the dangerous waste criteria (WAC 173-303-100) and dangerous waste

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characteristics (WAC 173-303-090). The stream specific report³ provides detailed documentation of this comparison. The stream specific report also provides estimated concentrations of components other than water in the tributaries to the CSL.

The CSL is a complex stream fed by many tributaries. The following process discussion of the CSL consists of two parts. The first part describes the two major trunks of the CSL collection system and the routing of the effluent. The second part describes the instrumentation which provides data for environmental monitoring of the CSL. Appendix I describes the processes which generate the effluents which combine to form the CSL and the tributaries to the CSL collection system in detail.

B.3.1. The CSL Collection, Characterization, and Transport System

The PUREX CSL collects waste water from the service areas of the PUREX plant (Building 202-A and supporting facilities), as well as steam condensate and cooling water from the vacuum fractionator. Most of these effluents are fairly clean, consisting of steam condensate from ventilation air heaters, water cooler drains, shower drains, and floor drains. The floor drains, especially in the P&O Gallery, AMU, and 211-A Building, have a potential for chemical contamination. Figure B-4 is a schematic of the CSL collection, characterization, and transport system.

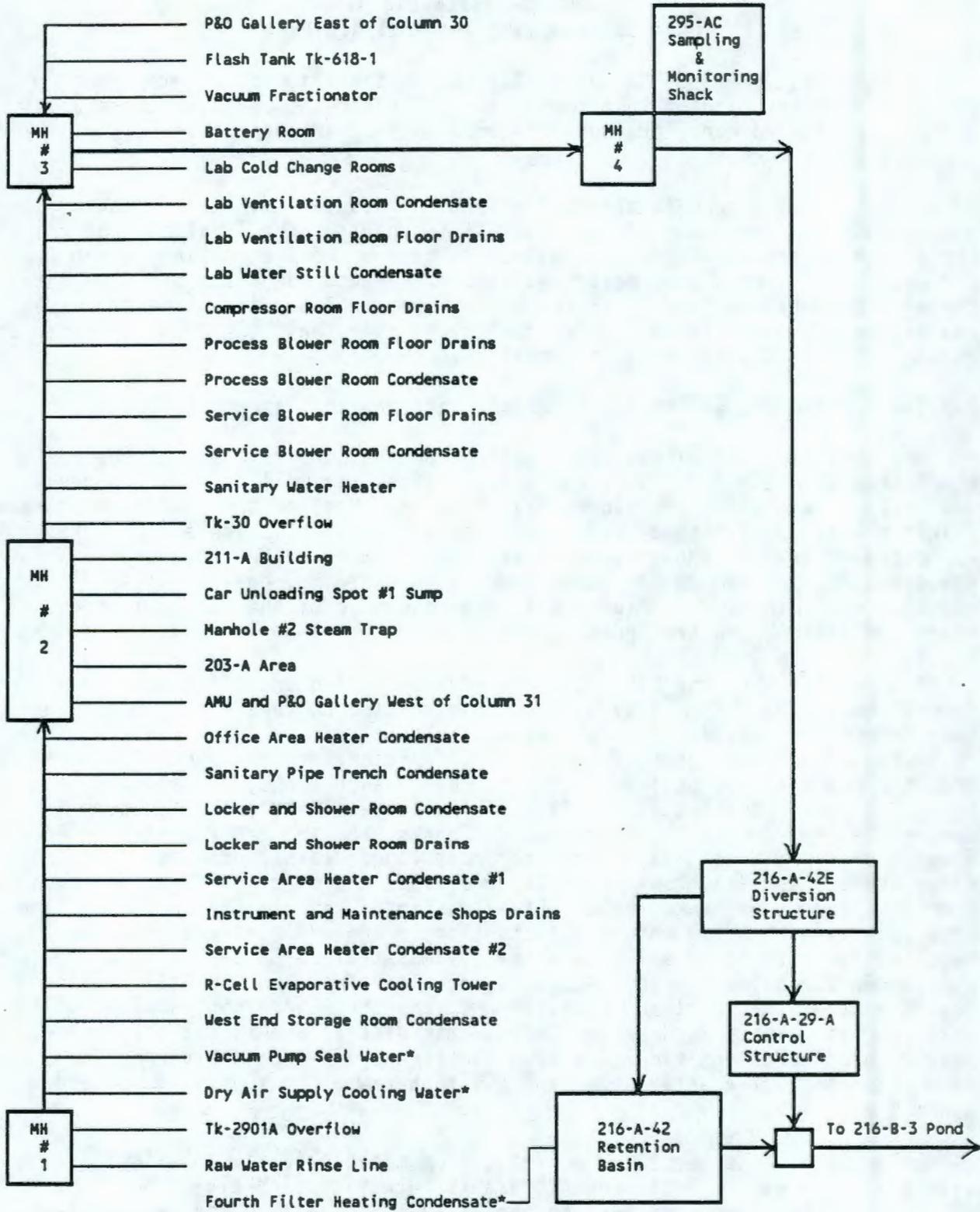
Input lines to the CSL leave the 202-A building and 211-A area and connect to two vitrified clay headers, one running 80 feet east of manhole #3, and one running west for 790 feet along the front of the 202-A building. The east leg collects effluents from the acid fractionator, sink and floor drains from the P&O Gallery, battery room, lab cold change rooms, and flash tank 618-1. Between manholes #2 and #3, the 12-inch west leg collects steam condensate from several sources, and effluents from the Lab Ventilation Room floor drains, water stills, compressor room floor drains, process blower room floor drains, service blower room floor drains, and overflow from the demineralized water tank, Tk-30. Five legs enter manhole #2: a 6-inch line from the 211-A building which collects floor drain and demineralizer regeneration effluents, a 1-inch steam condensate line, a 3-inch line from the sump under Car Unloading Spot #1, an 8-inch line from the P&O Gallery floor drains west of Column 31 and from the AMU, and the 8-inch continuation of the west CSL leg. The 8-inch header between manholes #1 and #2 collects several heater condensates and floor drains. Two lines, a 6-inch drain and overflow line from the 2901-A water tower and a 3-inch raw water supply line, feed manhole #1.

The CSL leaves the 202-A building from manhole #3 via a 12-inch vitrified clay pipe. This feeds into a 15-inch vitrified clay pipe at manhole #8. The 15 inch line continues to the 216-A-42E diversion box, which diverts the flow to the 216-A-42 retention basin if the stream displays high radiation levels or high or low pH, or if the stream contains hazardous chemicals. (The disposition of water in the basin is based on sample analyses.) From the

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Figure B-4. CSL Schematic



*Originally flowed to SCD or CWL, will flow into CSL by June 1992.

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216-A-42E diversion box, CSL effluents flow through the 216-A-29-A control structure which routes them through a short section of high density polyethylene pipe into the old CWL pipe. The CWL pipe then conducts the effluent to the 216-B-3 Pond complex, either via the 216-B-3-3 Ditch or via a new pipe system which leads directly to the expansion lobes.

B.3.2. Environmental Instrumentation

The 295-AC sample shack and manhole #4 contain equipment used to sample and monitor the CSL. This monitoring location is downstream of all continuously released tributaries of the CSL, and measures what is actually released to the environment. This monitoring location does not measure any parameters for individual CSL tributaries. Official monitoring devices include a flow monitor, a pH monitor, and a flow proportional composite sampler. (Due to the poor accuracy of most real-time monitors, together with the DOE emphasis on yearly average concentrations, the official monitoring results for radionuclides have come from laboratory analyses of the composite samples.)

A combination magnetic and pneumatic flowmeter measures the volumetric flow rate of the CSL into manhole #4. The magnetic flowmeter portion measures the flow velocity at the bottom of the pipe. The pneumatic portion measures the depth of the liquid in the pipe. A transmitter combines these two measurements and sends an analogue signal to a strip chart recorder, a flow totalizer, and a flow counter. The flow totals allow laboratory personnel to prepare the monthly record effluent composite sample from several weekly composite samples.

A sample pump located in Manhole #4 pushes a continuous stream of CSL through the 295-AC sample shack. This stream provides the sample for the flow-proportional composite sampler, the grab sampler, the pH monitor, and the gamma radiation monitor.

A flow proportional composite sampler located in the 295-AC sample shack uses the signals from the flow counter to pull several milliliters from the sample stream on a flow-periodic basis. The flow period is adjusted to yield at least three litres of composite sample per week.

A valve and open pipe located in the 295-AC sample shack allows the collection of a grab sample from the CSL. This grab sampler is used for collecting protocol samples of the CSL.

A continuously operating pH monitor sends an analogue signal to a strip chart recorder and alarm switches. The alarm switches send an alarm signal to a continuously occupied location if the pH of the CSL sample stream in the 295-AC sample shack exceeds the range of 5 to 11. An operator then diverts the stream to the 216-A-42 retention basin if the pH appears likely to exceed the range of 2.5 to 12.

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A process control monitor alarms if the gamma radiation reading on the CSL sample stream in the 295-AC sample shack exceeds the current setpoint, which is adjusted⁴ to be as low as practicable without causing excessive false alarms, in accordance with the Environmental Compliance Manual. The alarm setpoint for the CSL gamma monitor is approximately 6500 counts per minute, which corresponds to approximately 50 pCi/ml. The gamma alarm automatically diverts the stream to the 216-A-42 retention basin.

B.4. RECEIVING SITE DESCRIPTION

On July 15, 1991, the CSL was diverted from the 216-A-29 ditch, which previously conducted the CSL to the 216-B-3 Pond. The CSL now flows to the 216-B-3 Pond system via the CWL pipe. Decommissioning of the 216-A-29 ditch, which had become radiologically contaminated from earlier operations at PUREX, was subsequently initiated. Figure B-4, the CSL schematic flow diagram, shows the configuration after this diversion, accomplished at the 216-A-29-A Control Structure.

The following description of the 216-B-3 pond system has been taken from *Liquid Effluent Study Final Project Report*⁵:

The 216-B-3 Pond system consists of a series of four earthen, unlined, interconnected ponds and the 216-B-3-3 Ditch that receive wastewater from various 200 East Area operating facilities. The four ponds, collectively referred to as "B Pond System," are designated the 216-B-3, 216-B-3A, 216-B-3B, and 216-B-3C ponds. These ponds were placed into service in 1945, 1983, 1984, and 1985, respectively.

Currently 216-B-3 Pond covers a surface area of approximately 39 acres. Historical records indicate the surface area has varied from 19 to 46 acres. The maximum depth of the pond is about 18 feet. The 216-B-3A, 216-B-3B, and 216-B-3C expansion lobes are 10, 10, and 41 acres, respectively. These expansion lobes have a maximum capacity depth of about 4 ft. The -3A and -3B lobes have a single trench in the bottom, while the -3C lobe has a series of nine trenches. These trenches are on the order of 4 ft in depth and provide additional infiltration capacity.

B.5. SOURCE REDUCTION AND MINIMIZATION

The Hanford site in general, and the PUREX plant in particular, have a long history of source reduction and waste minimization. The following sections describe some of the waste source reductions and waste generation minimizations which have been employed over the years at PUREX.

B.5.1. Standby Reductions

The most obvious CSL reductions are connected with the decision to place PUREX in standby: stopping the cooling water flow to the vacuum fractionator and minimizing the frequency of demineralizer regeneration. Even though these reductions are temporary (both processes will be needed if PUREX runs again, and may be needed for terminal cleanout efforts if the decision is made not to run PUREX again), they are worth recognizing.

The vacuum fractionator does not operate when PUREX is not processing fuel. Shortly after the vacuum fractionator was shut off following the Stabilization Run, the now unneeded cooling water flow to the vacuum fractionator was stopped. Halting this tributary decreased the flow volume of the CSL to less than one half of its previous value.

The PUREX process requires demineralized water to produce acceptably pure products. Since PUREX is not currently operating, there has been very little need for demineralized water, and no demineralizer regenerations have been performed for over a year. This is significant because regeneration contributes significant concentrations of ions to the CSL, and can decrease the CSL pH to less than 2 or increase it to greater than 12.5.

B.5.2. Chemical Inventory Reduction

PUREX is not currently processing fuel, and will not for several years. Consequently, there is currently no need to maintain the inventories of chemicals used for processing. Efforts are currently under way to dispose the unneeded chemicals elsewhere. The preferred disposition is use by another facility or return to the supplier. Some of the process chemical inventory has already been removed from the PUREX plant. These stored chemicals do not normally flow into the CSL. (Many are stored in the 2714-A building, which has no drains.) Nevertheless, removing them from the plant makes a spill of the removed chemicals to the environment (including the CSL) impossible.

B.5.3. Unauthorized Disposal

The CSL collection system includes many drains down which personnel can dispose maintenance chemicals. Waste minimization efforts at Hanford and PUREX include educating personnel that such behavior is not acceptable, decreasing the number of maintenance chemical products used at PUREX, and substituting more environmentally acceptable products.

The Hanford site has begun publishing biennial reports on the waste minimization program. The last one⁶ was published in 1990.

B.5.4. Corrosivity Control

Several measures ensure against the release of corrosive waste (pH less than 2 or greater than 12.5) to the environment via the CSL. The most recent

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of these is the 211-A neutralization system. Other measures include the use of the pH monitor together with the retention basin, and co-regeneration of the demineralizers.

Project B-669 provided a three-chamber pH control system for the effluent from the 211-A Building, primarily the demineralizer regenerant. The system achieves pH control by the addition of H_2SO_4 (to lower the pH) and KOH or NaOH (to increase the pH). This system was originally permitted by rule as elementary neutralization. Permitting for this system under the new regulations (WAC-173-216) is currently being pursued.

Section 2.1.2.2 describes the CSL pH monitor. This monitor provides information used to prevent the release of high or low pH material to the environment by diverting the material to the 216-A-42 retention basin. The diverted material can then be sampled, neutralized as needed, and disposed.

In recent years, demineralizer regeneration has been the primary source of corrosive material in the CSL. The regeneration of the demineralizers occurs in pairs, one anion and one cation unit. Although the individual regenerants are corrosive (the cation regenerant strongly acidic and the anion regenerant strongly basic), each can neutralize the other. Consequently, co-regeneration, or regenerating the two units concurrently, can produce an effluent of acceptable pH. In practice, the overlap is not perfect, requiring that the CSL be diverted to the retention basin during the regeneration. After thorough mixing, the pH of the resulting material has always been acceptable for release.

B.5.5. Administrative Controls

Before 1987, PUREX routinely discharged out-of-specification chemical makeups and other chemical wastes through the CSL to B Pond. The practice of such routine disposal has since been discontinued. Methods used to discontinue such intentional disposal have included warnings in procedures and ongoing training.

B.5.6. Chemical Overflow Prevention

In 1987, project CK0081 installed an extensive chemical collection and re-use system in the AMU. At about the same time, containment dikes were built around the bulk chemical storage tanks in the 211-A Tank Farm, and the overflow lines were disconnected from the CSL. These changes ensure that simple tank overflow incidents will not contaminate the CSL with chemicals. The changes in the AMU also allow the re-use of spills and chemical make-ups which were out of specification.

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B.5.7. Vacuum Fractionator Overheads Modifications

When PUREX operates, the Vacuum Fractionator separates water from recovered nitric acid, producing 50% nitric acid for use in the process, and slightly radioactive, slightly acidic distilled water.

Before July 1969, raw water flowed into a barometric condenser to condense the water vapor distilled out of the nitric acid. The resulting radioactive and acidic mixture then flowed into the CSL.

In July 1969, the barometric condenser was replaced with a shell and tube condenser, which kept the cooling water (which continued to flow to the CSL) from the distillate. Further changes in the nitric acid recovery system allowed the re-use of much of the contaminated distillate. The excess distillate overflowed into the CSL.

Ongoing changes in the process water systems allowed the re-routing of all of the distillate back into the process. In 1986, the overflow pipe from the distillate collection (tailwater) tank to the CSL was blanked, thereby preventing the further contamination of the CSL with acid and radionuclides distilled out of the recovered nitric acid.

B.5.8. Floor Drains in the P&O Gallery

In the first few years of operation of PUREX, an accident resulted in the contamination of a portion of the P&O Gallery with process solution containing high concentrations of plutonium. Some of this solution ran down a floor drain into the CSL, contaminating the CSL pipe and the 216-A-29 Ditch. To prevent a recurrence of such a contamination incident, diversion valves were installed in the headers connecting the P&O Gallery drains to the CSL, and additional connections were made to routinely route the drain effluent into the radioactive waste handling systems via the F-Cell sump and the U3 tank.

C. RESPONSIBILITIES

C.1. SAMPLING

PUREX Operations will have the responsibility of scheduling and collecting process control samples and record effluent samples.

PUREX Operations will have the responsibility to schedule protocol samples and to provide for their collection. The samples may be collected by personnel designated by the Office of Sample Management (OSM), or they may be collected by PUREX Operations personnel who have been trained to SW-846.

PUREX Engineering will prepare sampling procedures for protocol sampling, and will continue to maintain procedures for collecting process control samples and record effluent samples.

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PUREX management will have the responsibility of designating an appropriately qualified person to serve as the protocol sampling task leader.

C.2. SAMPLE ANALYSIS

PUREX Engineering will have the responsibility of providing for analysis of process control samples. The PUREX Laboratory or other organization identified by PUREX Engineering will perform the analyses.

Environmental Assurance will have the responsibility of providing for analysis of record effluent samples.

PUREX Operations will deliver process control and record effluent samples to the PUREX Laboratory. The PUREX Laboratory will have the responsibility to transport the record effluent samples to the laboratory specified by Environmental Assurance.

The Office of Sample Management will provide for laboratory analytical services for protocol samples.

If the samples are to be shipped offsite for laboratory analysis, PUREX operations will be responsible for the following:

- o transporting protocol samples to the 222-S laboratory for total activity screening and site release,
- o arranging for sample transportation from the 222-S laboratory to the shipping area downtown and having the sample shipped to the OSM specified laboratory,
- o preparing all associated shipping paperwork.

If samples are to be analyzed on site, PUREX operations will be responsible for arranging for sample shipment to the laboratory.

C.3. DATA VALIDATION

The PUREX Laboratory will provide such data validation as is needed for process control samples.

Environmental Assurance will have the responsibility of providing for data validation for record effluent samples. (Data validation is currently performed by the laboratory which performs the analyses.)

The operations contractor will provide for data validation for protocol samples. Because this validation process is merely a check on hold times, analytical procedures, and other quality indicators having to do with the generation of the data, validation cannot make incorrect data correct. Validation can merely screen out some of the more obviously questionable data.

C.4. DATA REPORTING

The PUREX Laboratory will report the analytical results for process control samples to PUREX Operations. The PUREX Laboratory will also make these results available to PUREX Engineering. PUREX Operations and PUREX Engineering are the end users for these data. The validated results will be delivered to the Environmental Data Management Center (EDMC) or such other reporting agency as may be specified by the DOE. A note will be sent to the regulators that the data are available.

Environmental Assurance will publish Annual Release Reports of the validated data for the record effluent samples. These reports will contain, at a minimum, the yearly average concentrations of analytes of concern, the total yearly flow, and the total quantities of analytes of concern discharged to the environment. These reports will be transmitted to the Department of Energy, which will make them available to the public. Regulators will be on distribution for the annual release report.

The Office of Sample Management will report all of the data from protocol samples to PUREX Engineering. PUREX Engineering will ensure that the validated results are delivered to the EDMC or such other reporting agency as may be specified by the DOE. A note will be sent to the regulators that the data are available. PUREX Engineering will ensure that the data are delivered to the appropriate record retention organization within PUREX.

C.5. DATA RETENTION

The PUREX Laboratory will provide for data retention for process control samples.

Environmental Assurance will retain documentation of the Annual Release Report.

The Office of Sample Management will provide for data retention for protocol samples. Additionally, PUREX will retain copies of all data for protocol samples.

Data from the record effluent samples and the protocol samples will be transmitted to, and stored in, the Hanford Environmental Information System (HEIS) starting in January 1992. If HEIS is not operational by January 1992, the Environmental Data Management Center (EDMC) will be used. The United States EPA and the Washington State Department of Ecology will be notified when the data are transmitted.

D. SAMPLE LOCATION AND FREQUENCY

Due to the differences in their requirements, the sampling locations and frequencies of two types of CSL sample are discussed separately: first the routine record effluent and process control samples, and then the protocol samples.

D.1. ROUTINE MONITORING

Record effluent samples provide greater sensitivity to unusual releases than the continuous process control monitors, and also provide documentation that the CSL continues to meet DOE radionuclide requirements on an annual average. Under normal conditions, the record effluent samples originate in the flow proportional sampler located in the 295-AC Sample Shack. A minimum of three liters of composite sample is collected every week. One liter is analyzed by the PUREX laboratory for gross radiation, pH, and cadmium. The results of these analyses are used to notify plant personnel of any unusual condition in the CSL requiring correction.

The other two liters of the weekly composite sample are shipped to the 222-S (REDOX) laboratory. Personnel at the REDOX laboratory use the flow totalizer data to produce a large monthly composite CSL sample, and then perform more sensitive analyses which are used to document the total yearly emissions of radionuclides via the CSL.

When a stream is diverted to the 216-A-42 retention basin, it might not be sampled by the flow proportional sampler. Therefore, the liquid in the retention basin is recirculated, and a grab sample obtained. Analyses of the grab sample provide information for determining whether releasing the material will violate DOE orders for environmental protection. Extra grab sample material is sent to the REDOX laboratory, together with an estimate of the volume of liquid, to be used in preparing the monthly composite.

D.2. PROTOCOL SAMPLES

Characterization and verification samples comprise all planned RCRA protocol samples for routine discharges. These samples fall naturally into three groups. The first comprises routinely collected samples (at least one per year) of the entire CSL and background. The second comprises the characterization and background streams for the demineralizer regenerant. The third comprises the routine samples taken of the material routed to the CSL via the 216-A-42 Retention Basin. Table D-1 lists these samples, their locations and frequencies, and any special data that need to be recorded when the samples are collected.

The CSL will continue to flow while the PUREX plant is shut down. Consequently, annual testing of the CSL will be required to ensure that it has not become a dangerous waste stream, and to help determine more exactly how the CSL effluent generation processes affect the water quality of the CSL. Achievement of the second goal will require concurrent or nearly concurrent sampling of the streams which feed the CSL: raw water, sanitary water, and condensed steam. The first such sample will be taken after the transition to standby configuration is complete (June 1992). In addition to the samples listed in Table D-1, an initial sample will be taken at the 295-AC sample shack which will undergo full characterization in accordance with the analyte list in the Quality Assurance Project Plan (QAPP).

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Table D-1 CSL Protocol Samples

<u>Description</u>	<u>Location</u>	<u>Timing</u>	<u>Additional Data</u>
CSL Verification	295-AC Sample Shack	Once each year. Twice the first year. An additional sample when flow restrictions implemented.	
Raw Water Background	202-A P&O Gallery	Same day as CSL Verification Sample	Column Number Nearest Sample Point
Sanitary Water Background	(See section on Sanitary Water)	Same day as CSL Verification Sample	Location at which Sanitary Water Background Sample collected
Condensed Steam Background	Steam Trap and French Drain Northwest of PUREX	Same day as CSL Verification Sample	
Acid Regenerant	211-A Building, Regenerant Sump	After acid flow started to cation column, before acid flow stopped	Which cation column is being regenerated
Base Regenerant	211-A Building, Regenerant Sump	After base flow started to anion column, before base flow stopped	Which anion column is being regenerated
Sanitary Water	211-A Building	While regeneration in progress	
The DOE and their contractors reserve the right to take additional samples not covered by the Tri-Party Agreement.			
Fourth Filter Condensate	216-A-42 Retention Basin	Once a year. No liquid has flowed into that section since it was recirculated.	Primary level reading and volume of liquid, any information on other liquids added to section.
NOTE: The Fourth Filter Condensate is included as a contingency only. In the event that the Fourth Filter Condensate is not routed to the retention basin, this sample will not be taken.			

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The CSL verification sample will be taken at the 295-AC sample shack because it is an accessible location downstream of all the tributaries of the CSL. The raw water background sample will be collected in the 202-A P&O gallery, because it is an accessible location which is representative of the raw water. The yearly sanitary water background samples will be collected from different locations within PUREX. Possible locations include lunchroom and restroom sinks, safety showers, and electric water coolers (preferably those that drain into the CSL). The condensed steam background sample will be collected from a trap on the main steam supply pipe drains into a "french drain" at the northwest corner of the PUREX exclusion area.

With the PUREX plant in standby, the need for demineralized water is dramatically reduced, and there are expected to be very few opportunities to sample either the demineralizer regenerant or the CSL during regenerant discharge. Consequently, samples will be collected for each of the next five demineralizer regenerations. The sump in the 211-A building is chosen as the collection point for the regenerant because it is the first accessible point downstream of each effluent generation point. Mixing of the regenerants should not be a problem for two reasons. First, each regenerant will be highly variable, so that even diluting it in half would be a small change relative to the normal variability. Second, with the installation of the elementary neutralization unit, there is no longer any need to perform a co-regeneration to neutralize the effluents. The sanitary water background for these characterization samples will be collected from the sink in the 211-A building. This location will make the sanitary water background as representative of the demineralizer feed as possible.

The fourth filter condensate and other former tributaries of the CWL and SCD may be routed to the CSL and the 216-B-3 pond complex via the 216-A-42 retention basin. In this case, at least one protocol sample will be taken of this material each year. The sample will be collected at the 216-A-42 retention basin. Because this material will have collected over a long period of time, there will be no reason to collect any concurrent background samples; the CSL verification background samples will be used instead.

Additional CSL tributary samples will not be taken for the following reasons:

- o Most of the volume in the CSL comes from tributaries which merely pass through the plant or process. Since there is no opportunity to generate or dispose of regulated wastes to these tributaries, there is no need to sample them. Samples of the water supply sources will be sufficient to characterize nearly all aspects of these tributaries. (Some uncertainty will remain, of course, about the exact concentrations of corrosion products. However, the concentrations of these substances are so low that the value of

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determining which pipes contribute what is negligible.)

- o The tributaries which are most likely to conduct regulated substances to the CSL, probably as a result of a spill, are primarily floor drains, which rarely have any flow, and would probably provide only a fraction of the liquid required for a protocol sample each year. Additionally, these tributaries are inaccessible for sampling, with the pipes usually set under concrete. Spill sampling is handled on a case by case basis per spill recovery procedures.

After a sufficient body of data is developed to show that the CSL is well understood, the frequency of any of these samples or the number of analytes may be decreased with concurrence of Ecology and the EPA.

E. SAMPLE DESIGNATION

Sample numbers for the record effluent samples are assigned serially by the Dispatcher from a sample log in accordance with plant operating procedures. These numbers are a part of an information processing system covering all process control samples analyzed by the PUREX laboratory. Additional sample numbers may be generated by the REDOX laboratory for the monthly composite samples, but traceability is maintained to the PUREX sample numbers. Any particular sample number can be found by examining the sample log maintained by the Dispatcher.

Protocol samples will require a new numbering scheme, explained in Table E-1. As an example, the first bottle of transfer blank taken in the 295-AC sample shack with the CSL verification sample on October 5, 1992, would be numbered A-921005-CPV-A-A. Similarly, the third sample bottle of acid regenerant collected from the 211-A sump on March 23, 1994, would be numbered A-940323-ARC-S-C.

F. SAMPLING EQUIPMENT AND PROCEDURES

F.1. PROCESS CONTROL AND RECORD EFFLUENT SAMPLES

Routine process control and record effluent samples will be drawn from the CSL automatically by flow-proportional sampler described in section B.3.2 (Environmental Instrumentation). This sampler can also be adjusted to collect samples on a time-proportional basis. In case of failure of this sampler, the samples can be collected by a commercially available time-proportional sampler.

Table E-1 Protocol Sample Numbering Scheme

A-xxxxxx-sss-u-n		
where	xxxxxx	is the date of sample collection (last two digits of the year, two digit month, and two digit day).
	sss	identifies what is being sampled:
	CPV	CSL Verification
	RWB	Raw Water Background (accompanying CSL verification sample)
	SWB	Sanitary Water Background (accompanying CSL verification sample)
	CSB	Condensed Steam Background (accompanying CSL verification sample)
	ARC	Acid Regenerant
	BRC	Base Regenerant
	SWR	Sanitary Water (accompanying demineralizer regeneration samples)
	VFH	Fourth Filter Condensate (collected from the 216-A-42 retention basin)
	u	is the kind of sample:
	S	Stream Sample
	A	Transfer Blank
	I	Trip Blank
	n	is the sequential bottle letter.

Routine process control and record effluent samples will be collected from the CSL sampler once every week. The sample will consist of three 1-liter plastic bottles of composite CSL, collected in accordance with operations contractor procedures.

Prior to discharge of liquid contained in the 216-A-42 retention basin, the liquid will be recirculated and sampled in accordance with operations

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contractor procedures. Changes to these procedures require approval of Environmental Assurance.

The process control and record effluent samples are collected in bottles which have not previously been used. There are no special cleaning requirements for these sample bottles. There are no documentation requirements to ensure that the bottles have not been used previously.

The process control and record effluent samples will be delivered to the PUREX laboratory. The PUREX laboratory will perform or arrange for the performance of the process control analyses, and will transport the record effluent samples to the laboratory specified by Environmental Assurance (currently the REDOX laboratory).

The laboratory specified by Environmental Assurance will perform the record effluent sample analyses.

F.2. PROTOCOL SAMPLES

The Protocol sampling procedures will be based on recommended practices found in SW-846, Chapter Nine. Sampling will be surveilled by a cognizant Quality Assurance person who has received training in environmental sampling requirements. Distilled-demineralized water trip blank will be provided for each sized sample container each time the stream is sampled.

If samples are shipped to an offsite laboratory, activity screens will accompany all samples to the laboratory.

Sample bottles shall be new commercially available certified precleaned glass or plastic bottles. The sample shall be drawn only with a new precleaned bottle. The sample volumes and number of containers are prescribed by the analytical laboratory and are subject to change. If the samples are to be shipped offsite for analysis, OSM will provide PUREX operations with required sample size, sample container types, and sample preservatives for the protocol analysis requested. Tentative sample volumes for Protocol Samples are:

1. 125 ml plastic container with polytetrafluoroethene (PTFE) lined cap, no preservative for Ion Chromatograph anions and pH
 - a. chloride
 - b. fluoride
 - c. nitrate
 - d. sulfate
2. 250 ml plastic container with PTFE lined cap, pH<2 by nitric acid preservative for Inductive Coupled Plasma Metals.
3. 500 ml plastic container with PTFE lined cap, pH<2 by nitric acid preservative for mercury.

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4. 250 ml glass container with PTFE lined septum cap, pH<2 by sulfuric acid preservative for Total Organic Halogens.
5. 40 ml amber glass container with septum cap (PTFE lined), for Volatile Organics, ; The volatiles will be taken in duplicate.
6. 1 liter amber glass container with PTFE lined cap for Semivolatile organics.
7. 1 liter plastic container with PTFE lined cap preserved with 2 ml nitric acid, for Gross alpha and beta.
8. 1 liter plastic container with PTFE lined cap, preserved with 2 ml of 6 Molar sodium hydroxide for cyanide/sulfur reactivity.

Containers for volatiles, semi-volatiles and Total Organic Halogens shall be filled without bubble formation and without leaving a head space.

Preservative required for Protocol Samples will be vendor supplied and added to the containers in the field. The caps will be sealed to the containers with tamper proof tape.

Each sample or sample preparation shall be labeled with the operations contractor assigned sample number or a unique laboratory number. Labels shall be affixed to sample containers prior to or at the time of sampling and should be filled out at the time of sampling. The labels shall include at least the following information:

- o an unique sample identification number (Section 5, above),
- o the name of the person collecting the sample,
- o the date and time when the sample was collected,
- o the place where the sample was collected.

The samples shall be cleaned and surveyed. The released sample containers shall then be bagged and re-bagged. The outer bag will be tagged with a duplicate of the sample label. The samples will be placed in a cooler containing ice. The cooler shall become part of the sample packaging.

A logbook shall be maintained which contains information pertinent to the sampling. Entries are to contain the sample point, sample number, and container volumes.

G. SAMPLE HANDLING AND ANALYSIS

G.1. PROCESS CONTROL SAMPLES

Process control samples will be handled and analyzed in accordance with operations contractor procedures. Although there are currently no chain-of-custody requirements for process control samples, such requirements may be written into the procedures if desired by PUREX Operations or PUREX Engineering.

G.2. RECORD EFFLUENT SAMPLES

Record effluent samples will be handled and analyzed in accordance with operations contractor procedures. All changes to these procedures will require approval of Environmental Assurance.

Although there are currently no chain-of-custody requirements for record effluent samples, such requirements may be written into the procedures if desired by the Office of Sample Management (OSM).

G.3. PROTOCOL SAMPLES

A chain of custody form will be filled out at the time of sampling and will accompany each Protocol Sample. A sample may consist of several containers. The chain-of-custody will account for each container. Once a Protocol Sample has been drawn it must be in the physical control or view of the custodian, locked in an area where it can not be tampered with, or prepared for shipping with tamper-proof tape applied. Physical control includes being in the sight of the custodian, being in a room which will signal an alarm when entered, or locked in a cabinet. When more than one person is involved in sampling, one person shall be designated and only that person signs as sampler. This person is the custodian until the samples are transferred to another location or group and shall sign when releasing the samples to the designated receiver.

The approved laboratory shall designate a sample custodian and a designated alternate responsible for receiving all samples. The sample custodian or his alternate shall sign and date all appropriate receiving documents at the time of receipt and at the same time initiate an internal Chain of Custody form using documented procedures.

Analytical procedures for protocol samples shall meet the Quality Assurance requirements of SW-846. The Statement Of Work for completing the analysis shall require the approved laboratories to have existing standard operating procedures and to submit any changes in their procedures during the contract term to the Office of Sample Management for approval. The approved laboratory procedures shall describe data reduction, verification, and reporting.

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The data reported for each analysis will include all non-detects.

The reported data for volatile organic compound analyses (two samples and analyses for each protocol sample) will include all gas chromatograph traces and all mass spectra. Measured concentrations (or detection limits) will be included in the data reported for the background samples for every chemical reported in the VOC results for the stream sample.

Appendix II presents the required analyses and the rationale for their selection. The required chemical analyses are determined using the strategy described in chapter nine of SW-846. The QAPP⁸ lists the analytical methods.

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APPENDIX I.
CSL GENERATION

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The CSL is a mixture of effluents from many sources. This appendix describes the individual pipes which conduct liquids into the CSL and the sources of the effluents conducted by these pipes.

The Stream Specific Report⁹ contains calculated compositions of the effluents from the CSL processes. More reliable calculated compositions will require more complete data on the water feeds (raw water, sanitary water, steam condensate), which are not yet available.

Discontinuing the CWL and SCD streams will require re-routing certain effluents to the CSL. The following sections include descriptions of the re-routed tributaries and identify their original destinations. These effluents originate as water or steam feeds similar to the water tributaries of the CSL. They are not expected to contain significant concentrations of contaminants, and have low volumetric flow rates. These effluents consequently are unlikely to significantly affect the composition of the CSL, so that the characterization samples which have already been taken will continue to be representative of the CSL after these re-routings. (The Fourth Filter Heating Condensate, if routed through the SCD header to the retention basin, could contain significant quantities of radionuclides. If this tributary is diverted to the CSL in this way, samples will be taken from the retention basin before pumping the liquid to B Pond.)

I.1. RAW WATER RINSE LINE

A 3-inch raw water supply pipe made of wrought carbon steel attaches to the CSL at its origin. This line has an orifice plate to deliver a continuous flow, estimated at 50 gpm, used to flush solids (soil, rust, etc) through the CSL line.

Raw water also flows directly into many other processes which feed the CSL, and is the ultimate source of nearly all water in the CSL. The raw water has undergone some characterization.¹⁰

Raw water is pumped from the Columbia River and transported through carbon steel pipes to the 200 areas. At the 200 East powerhouse, the raw water flows into a large, open basin, from which it is pumped throughout the 200 East area. Although some solids might settle out of the water in this basin, additional airborne dust can also enter the raw water at this point. This dust can include both windblown soil and coal powder. The rusting of the carbon steel pipes introduces further contaminants to the raw water.

Rarely, usually less than once a year, an algae bloom in the raw water basin will require treatment with $\text{Ca}(\text{ClO})_2$. Such treatment will increase the concentrations of calcium and chloride in the raw water. This treatment can also be expected to produce trace quantities of organic chlorides (such as

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trichloromethane, or chloroform) and simple organic oxidation products such as acetic acid, acetone, and 2-butanone (methyl ethyl ketone).

I.2. Tk-2901A OVERFLOW

The emergency sanitary (potable) water tower, Tk-2901A, overflows continuously through a 6-inch pipe to the CSL. (This overflow, estimated at 50 gpm, ensures that the tank is full, and prevents the tank from freezing during cold weather.) The above-ground portion is carbon steel, but drawings state that it changes to vitrified clay below ground.

Sanitary water contributes directly to the P&O Gallery drains and the battery room effluent. Sanitary water also contributes to many other processes which feed the CSL.

The sanitary water process begins at the 200 East powerhouse, where alum ($Al_2(SO_4)_3$) is added to raw water as a flocculent which precipitates the suspended solids. In the next step, chlorine (added as Cl_2) oxidizes most of the organic chemicals in the raw water, destroying any harmful pathogens. The 200 East Powerhouse then pumps the sanitary water throughout the 200 East area. Carbon steel pipes convey the sanitary water to PUREX and through most of the PUREX facilities.

The alum addition leaves the clarified water saturated in aluminum. The chlorination step adds approximately 9 ppm of chlorine, leaving a residual of 1.5 ppm chlorine in the sanitary water. Some of the remaining 7.5 ppm of chloride is in the form of organic chlorides, such as trichloromethane (chloroform). Most is in the form of chloride ion.

I.3. VACUUM PUMP SEAL WATER

This effluent originally flowed to the CWL. Current schedules call for this effluent to be re-routed to the CSL by June, 1992.

The 2712-A building contains vacuum pumps used for air sampling and monitoring in the 202-A building. These pumps produce a seal water effluent. The effluent consists of water which has been exposed to air.

I.4. WEST END STORAGE ROOM CONDENSATE

Steam condensate from the heater in the storage room adjacent to the Canyon Lobby flows through this 2-inch black wrought iron pipe to the CSL.

Condensate contributes to the following tributaries: P&O Gallery Drains, Flash Tank Tk-618-1, Lab Ventilation Room Condensate, Lab Ventilation Room Floor Drains, Lab Water Still Condensate, Process Blower Room Condensate,

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Service Blower Room Condensate, Sanitary Water Heater, Car Unloading Spot #1 Sump, Manhole #2 Steam Trap, 203-A Area, Office Area Heater Condensate, Sanitary Pipe Trench Condensate, Locker and Shower Room Condensate, Service Area Heater Condensate #1, Service Area Heater Condensate #2, West End Storage Room Condensate, and Fourth Filter Heating Condensate. The flow of condensed steam is estimated at 63 gpm. This flow increases during cold weather.

The condensate effluents contain condensed steam which has heated air, sanitary water, or demineralized water, or has drained from a steam supply pipe. In addition to water, the condensate contains rust, and can contain copper. The total condensate flow is estimated to range from 0 to 130 gallons per minute, and to average 63 gallons per minute.

The condensate originates as steam in the 200 East and 200 West Power Houses. The power house steam process consists of purifying sanitary water (de-aerating it and removing the residual chlorine), mixing it with three additives (EDTA, Na_2SO_3 , and Dearborn Filmeen 14), and boiling the mixture. The EDTA complexes certain ions (particularly Ca and Mg), to keep them in solution in the boiler water. The Na_2SO_3 scavenges oxygen in the boiler water. The Filmeen 14, an amine with a molecular weight of approximately 270, protects the steam piping from corrosion. There is no significant carryover of liquid boiler water into the steam. Consequently, only the volatile Filmeen 14 becomes a part of the steam, at a concentration of about 13 ppm (13000 ppb). A blowdown removes the non-volatile components of the feed water from the boiler.

The steam, which is used for heating, condenses in various pipes and heat exchangers, which may be made of carbon steel, copper, or stainless steel. The resulting condensate can then pick up corrosion products, primarily iron and copper. In addition to dissolved rust, the condensate can contain up to 43 ppb iron or 98 ppb copper complexed with the Filmeen.

I.5. R-CELL EVAPORATIVE COOLING TOWER

This ventilation supply system once heated and cleaned air for R-Cell. Although it is no longer used, it may be restarted. The ventilation supply effluents flowed through a 3-inch 304L stainless steel pipe to the CSL.

Nine ventilation supply systems treat ventilation air before it is used in the 202-A building. The air supply systems include wet scrubbers, which remove atmospheric pollutants from the supply air, cool it, and increase its humidity. A float valve in each air supply system maintains sufficient flow of fresh sanitary water feed to ensure a continuous overflow of wash water into the CSL. Ventilation supply effluent flows into the Process Blower Room Floor Drains, the Service Blower Room Floor Drains, and the Lab Ventilation Room Floor Drains. The flow of ventilation scrub water is estimated to range from 0.05 to 0.8 gallons per minute, with an average of 0.2.

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In the wet scrubbing process, air passes through water which removes atmospheric pollutants from the air and adds humidity to the air. This effluent is therefore concentrated sanitary water with microbiocides, some airborne dust, and dissolved atmospheric gas added. Organic chlorides such as chloroform should evaporate slightly faster than the water. The water should become saturated with carbon dioxide, and should convert ambient nitrogen oxides to nitric acid, which could react with steel in the scrubber to produce ferric nitrate, as well as other nitrates. Ambient sulfur oxides could also produce sulfuric acid, sulfurous acid, and iron sulfates and sulfites.

Several microbiocides are added to the water in the air scrubbers: Dearthide* 730 (7 avoirdupois ounces/month/scrubber), Dearthide 722 (10 fluid ounces/month/scrubber), and Dearthide 717 (10 fluid ounces/month/scrubber). These additives increase the chloride concentration, and also add tin.

I.6. SERVICE AREA HEATER CONDENSATE #2

Steam condensate from the first floor service area heaters flows through this 3-inch 304L stainless steel pipe to the CSL.

I.7. INSTRUMENT AND MAINTENANCE SHOPS DRAINS

Seven floor drains, two sink drains, two water cooler drains, and one welding quench tank drain from the Instrument Shop and the Maintenance Shop drain through a 4-inch cast iron soil pipe to the CSL. This line has eight floor clean out ports. The effluent consists of water with trace amounts of oil and surfactants.

The Instrument and Maintenance Shops contain no chemical processing tanks, and personnel are instructed in the proper disposal of waste chemicals per procedures.

I.8. SERVICE AREA HEATER CONDENSATE #1

Steam condensate from the first floor service area heaters, as well as from air heaters in the Sample Gallery, Canyon Lobby, Storage Gallery, P. R. Vault, P. R. Room and the regulated shop flows through this 3-inch 304L stainless steel pipe to the CSL.

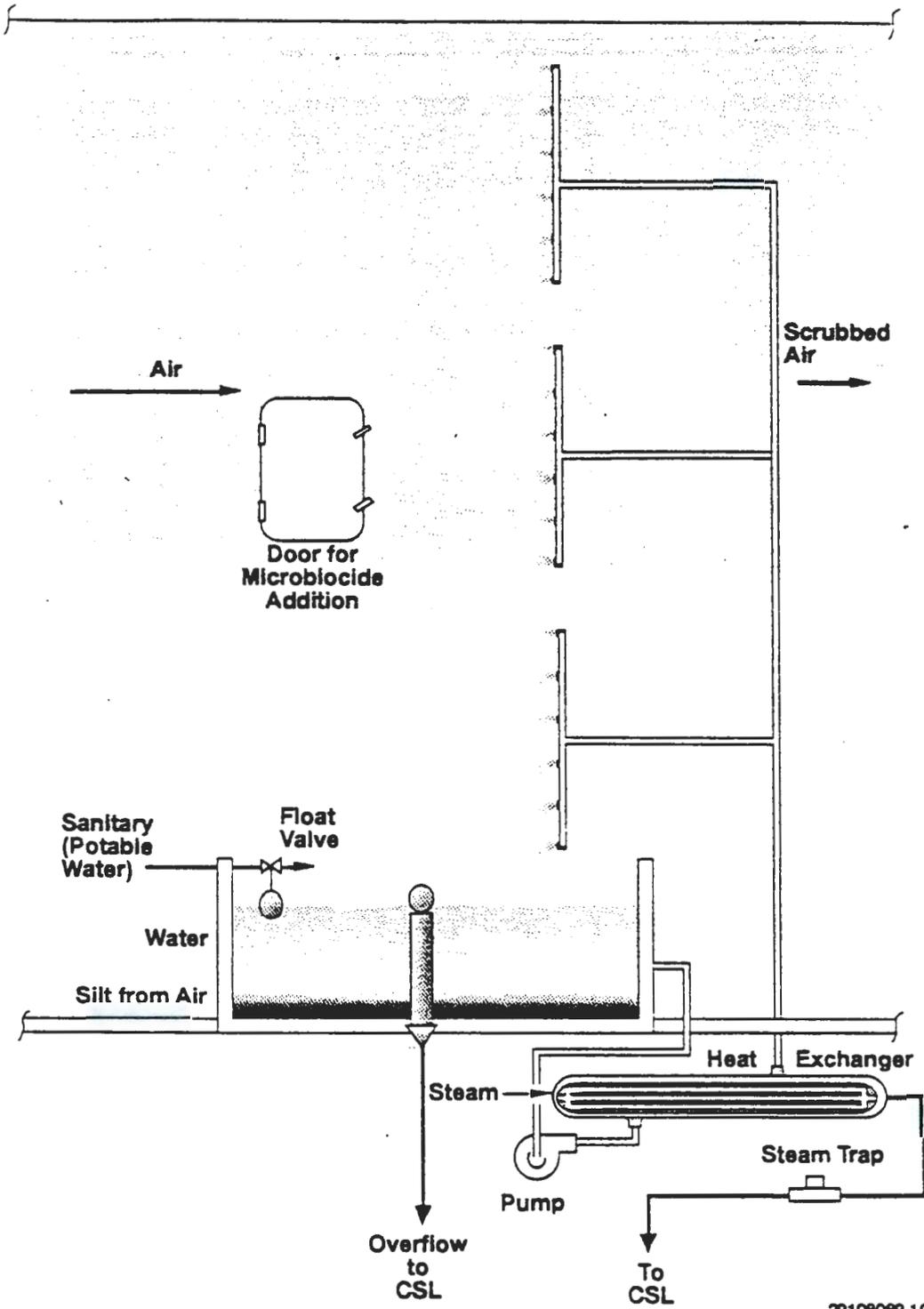
*Dearthide is a registered trademark of W.R. Grace & Company, New York, New York.

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Figure I-1. Air Scrubber Schematic



I.9. LOCKER AND SHOWER ROOM DRAINS

Drains from the locker and shower room area empty through a 4-inch cast iron soil pipe to the CSL. A total of four shower drains, two water coolers, and six floor drains flow into this header. The effluent contains water, surfactants, and dirt washed from personnel.

I.10. LOCKER AND SHOWER ROOM CONDENSATE

Condensed steam from ventilation air heaters in the locker and shower room area flows through a 3-inch 304L stainless steel pipe to the CSL.

I.11. SANITARY PIPE TRENCH CONDENSATE

A steam trace line follows many of the sanitary sewer lines outside of the 202-A Building. The steam condensate so produced flows through a 1.5-inch black wrought iron pipe to the CSL.

I.12. OFFICE AREA HEATER CONDENSATE

The steam condensate from the office heaters flows through a 3-inch 304L stainless steel pipe to the CSL. Only condensed steam can enter this line.

I.13. AMU AND P&O GALLERY WEST OF COLUMN 31

An 8-inch pipe made of 304L stainless steel runs from the north wall of the AMU basement and drains to the CSL. This header collects drainage from the west end of the P&O Gallery, Flash Tank Tk-618-2, the Aqueous Makeup (AMU) area, and the AMU Pipe Shaft Sump.

An 8 inch line from the P&O gallery collects all of the floor drains west of column 31, header drains, and overflow and drain lines from certain P&O Gallery and Sample Gallery tanks. The P&O Gallery floor drains collect water from safety showers and condensate, but, in the event of a pipe failure or tank overflow, any of the AMU chemicals listed in Table I-1 could reach these drains. For this reason, there is a diversion valve in this 8 inch line. From this diversion valve (located in the sample gallery), the floor drains and tank overflows from the P&O gallery can be routed to either the CSL or the F-Cell sump. The line is normally routed to the F-Cell sump. The drains are commonly routed to the CSL to dispose of water such as from safety shower testing or floor cleaning.

Atmospheric Flash Tank Tk-618-2 collects condensed steam and cooling water from several AMU tanks. Condensate lines leading from several steam traps installed on the P&O Gallery steam headers also feed Tk-618-2. Cooling

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water sprayed into the tank diminishes the vapor pressure of this tributary. This tank drains directly into the 8-inch header.

The AMU effluent comprises condensate and sanitary water from flash tank Tk-618-2, drainage from the two sinks and one water cooler in the Aqueous Make Up facility (AMU), overflow from the sugar tank and the demineralized water tank (both in the AMU), overflow from the AMU catch tanks (none of this is expected), the drainage from the lowest floor of the AMU, and drainage from the Storage Gallery. The effluent normally consists of an irregular mixture

Table I-1 List of PUREX Plant Chemicals

Aluminum nitrate	Ammonium fluoride/ammonium nitrate
Antifoam (DOW 110)	Cadmium nitrate
Ferric nitrate	Ferrous sulfamate
Hydrazine	Hydrogen peroxide
Hydroxylamine nitrate	Ion exchange resins
Nitric acid	Normal paraffin hydrocarbon
Oxalic acid	Potassium fluoride
Potassium hydroxide	Potassium permanganate
Silver nitrate	Sodium carbonate
Sodium nitrate	Sodium nitrite
Sodium thiosulfate	Sugar (sucrose)
Sulfamic acid	Sulfuric acid
Tartaric acid	Tributyl phosphate
Cleaning surfactants	

of steam condensate, sanitary water, and raw water. The flow is estimated to vary from 0 to 40 gallons per minute, with an average of 6. Expected contaminant levels are close to those of sanitary water.

The pipe shaft sump collects effluents from storage gallery sumps, leaks from pipes in the shaft, drainage from the floor drains and overflows in the AMU basement, drainage from the primary decontamination room, and drainage from the SWP room's electric water cooler, one shower drain, two floor drains and three sink drains. This sump is pumped directly into the 8 inch header inside the AMU Pipe Shaft.

Project CK0081, in 1987, installed an extensive chemical collection and re-use system in the AMU. Only the carbon steel sink drains, electric water cooler drain, and overflows and drains from the sugar tank and demineralized

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water tank feed directly into the CSL header. The floor drains can be valved in to the CSL header, but normally flow into a catch tank. The remaining overflows and drains flow into a system of catch tanks to collect and use the chemicals. (The overflow lines from the catch tanks system do, however, feed into the CSL header.)

I.14. 203-A AREA

A carbon steel pipe from the 203-A area can carry solution from Tk-P5 to the CSL. Tk-P5 collects wastes from the 203-A area, mostly rainwater and condensed steam which has collected in the sumps surrounding the uranium product storage tanks. This transfer line is normally valved out. With the current emphasis on double shell tank waste minimization, this waste will probably be routed to the CSL on a routine batch basis, but only after sample analyses show that samples meet release limits.

I.15. MANHOLE #2 STEAM TRAP

A steam trap drains condensed steam from a steam supply header through a 1-inch carbon steel pipe into Manhole #2 via a hole in the manhole cover.

I.16. CAR UNLOADING SPOT #1 SUMP

A 3-inch schedule 40 carbon steel pipe conducts sump liquid into Manhole #2. The sump can collect rain, windblown dust, steam condensate, and spills associated with unloading chemical tank cars. There is normally no effluent associated with this drain, and no way to collect protocol samples of any effluent.

I.17. 211-A BUILDING

A 6-inch vitrified clay pipe routes the 211-A building effluents to the CSL via Manhole #2. This line collects effluents from pipe trenches, spills caused by pump leaks, seal water from the chemical pumps, and the effluent from demineralizer regeneration. Possible contaminants introduced from PUREX include NH_4F , NH_4NO_3 , HNO_3 , NaOH , KOH , and H_2SO_4 . In addition to cations and anions removed from the sanitary water (the demineralizer feed), the regenerant contains (at different times) Na^+ , OH^- , H^+ , SO_4^{2-} , and HSO_4^- . The regenerant can also contain other contaminants from the sanitary water and resin degradation products. When the plant is not operating, the major portion of this effluent consists of sanitary water from the sink and emergency shower test.

PUREX produces its own demineralized water from sanitary water provided by the 200 East Power Plant. Three cation columns, connected in parallel,

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contain the ion-exchange resin used to remove positively charged ions from the sanitary water feed. Three anion columns, connected in parallel with each other and in series with the cation columns, remove negatively charged ions. Normally, one anion and one cation column are used at a time. (Figure I-2 is a schematic of an ion exchange column.) The demineralization process removes ions and may also remove some highly polar molecules such as trichloromethane, but with less efficiency. Degradation of the ion exchange resins (oxidation by the 1.5 ppm residual chlorine in the sanitary water, for example) can also contaminate the demineralized water with volatile organic compounds such as acetone. The product demineralized water is therefore quite pure, but may still contain traces of volatile organic compounds and organic halides.

Two aluminum tanks, Tk-30 and Tk-223, store the demineralized water before it is used in the process. Both of these tanks have overflow lines which drain to the CSL. Tk-30 has a nominal volume of 50,000 gallons and is located in the 211-A Tank Farm. Tk-223 has a nominal volume of 5000 gallons and is located in the AMU. Demineralized water contributes to the vacuum fractionator effluent and constitutes the Tk-30 overflow in its entirety. The regenerant from demineralizer regeneration constitutes the bulk of the 211-A effluent.

Each demineralizer is regenerated after producing approximately 190,000 gallons of demineralized water. Regeneration uses sulfuric acid and sodium hydroxide, and releases the contaminants which the demineralizer had removed from its sanitary water feed. The regenerant volume averages 16,000 gallons, with an estimated range of from 15,000 to 17,000 gallons. Regeneration consists of pumping a regeneration solution through each column, followed by a sanitary water flush. The regeneration solutions replace the cations in the cation column with hydrogen ions provided by H_2SO_4 , and replaces the anions in the anion column with hydroxide ions, provided by NaOH. The replaced ions enter the regenerant solutions in much higher concentrations than were present in the sanitary water feed. Regeneration can also contaminate the regenerant with highly polar organic molecules and resin degradation products. When the plant is processing fuel, there is about one demineralizer regeneration per week. Assuming a stream factor of 75%, the average contribution to the CSL from the regenerant is about 1 gallon per minute. The maximum flow during regeneration is approximately 150 gallons per minute. When the plant is not processing fuel, there are very few demineralizer regenerations (fewer than one per year).

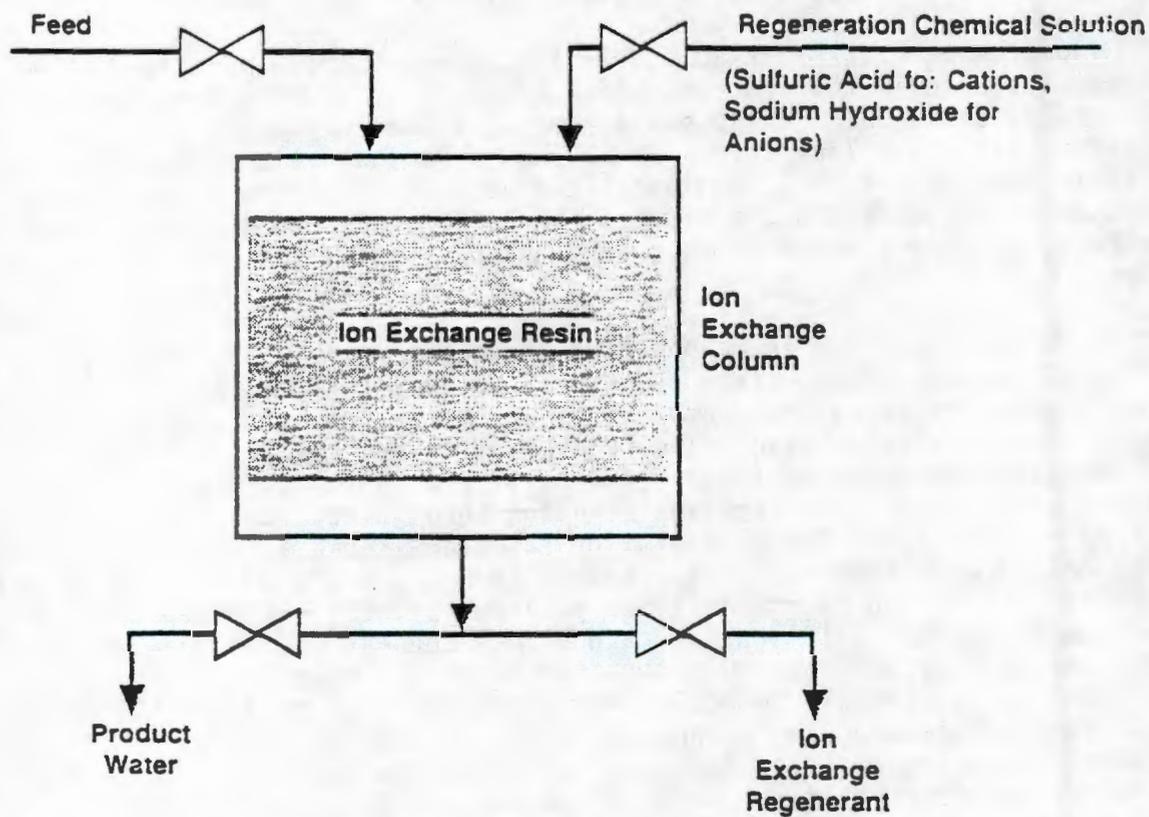
Project B-669 provided a three-chamber pH control system for the effluent from the 211-A Building, primarily the demineralizer regenerant. The system achieves pH control by the addition of H_2SO_4 (to lower the pH) and KOH or NaOH (to increase the pH).

The 211-A effluent is quite discontinuous, and normally would not contribute constituents of concern to the CSL. There is therefore no need to collect routine individual samples of this tributary.

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Figure I-2. Demineralizer Schematic



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Note: A demineralizer consists of two ion exchangers in series: an anion exchanger and a cation exchanger.

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The demineralizer regenerant effluent should be sampled because it:

- o constitutes a significant discharge which has been shown to significantly affect the composition of the CSL during regeneration,
- o can be reliably sampled despite its highly discontinuous nature because it is always planned in advance,
- o contains deliberately added chemicals,
- o usually exhibits a corrosive pH,
- o exhibits greatly elevated concentrations of contaminants normally present in the Columbia River,

Furthermore, a sump in the 211-A building provides access to this effluent for sampling. Section 4.2.3 (Demineralizer Regenerant) describes the plans for characterization sampling of this tributary.

I.18. Tk-30 OVERFLOW

The overflow pipe from Tk-30 (which contains demineralized water) empties through a 6-inch vitrified clay pipe into the CSL. Under normal conditions, there is no flow in this pipe.

I.19. SANITARY WATER HEATER

Steam condensate from the Sanitary Water Heater and from the ventilation air heaters located in the Service Blower Room flow to the CSL through a 3-inch pipe.

I.20. SERVICE BLOWER ROOM CONDENSATE

Steam condensate from the #3 Ventilation Air supply system heaters in the Service Blower Room flows through a 6-inch pipe of 304L stainless steel to the CSL.

I.21. SERVICE BLOWER ROOM FLOOR DRAINS

Two floor drains and three funnel drains empty through a 4-inch header to the CSL. The header is made of cast iron soil pipe. Two funnel drains accept overflow and drainage from the #3 Ventilation Air supply washers. The other funnel drain collects steam condensate and cooling water (raw water) from the Process Water Still, distillation bottoms purged from the Process Water Still, steam blowdown from the Sanitary Water Heater, overflow from the Process

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Distilled Water Tank (Tk-V84-1), and water purge from the Sanitary Water Heater service piping.

Distilled water is used when processing fuel and by the PUREX Laboratory. The distilled water is produced by boiling demineralized water or sanitary water in a heat exchanger, and condensing the vapors in a second heat exchanger. Steam provides the heating service. Raw water provides the cooling service.

This effluent consists primarily of raw water with some steam condensate. There is an additional discontinuous flow from the boiler section of distillation bottoms, i. e., demineralized water which has been boiled, increasing the concentrations of nonvolatile contaminants above those found in the feed. The flow is estimated to range from 0-20 gallons/minute, with an average of 3. This effluent does not usually exist when PUREX is not processing fuel.

Heating sanitary water contributes to the following effluents: Lab Ventilation Room Floor Drains, Service Blower Room Floor Drains, and Sanitary Water Heater Condensate. The hot sanitary water also contributes to the shower room effluent..

Steam to water heat exchangers in the service blower room and lab vent room provide hot water for domestic purposes. The condensed steam from these heat exchangers flows into the CSL. Some of the heated water also flows into the CSL via the shower room drains.

I.22. PROCESS BLOWER ROOM CONDENSATE

Condensed steam from #1 and #2 Ventilation Air supply system heaters in the Process Blower Room flows through a 6-inch 304L stainless steel pipe to the CSL.

I.23. PROCESS BLOWER ROOM FLOOR DRAINS

Five floor drains, four funnel drains, and one water cooler empty through a 4-inch cast iron soil pipe to the CSL. The funnel drains are fed by the overflow from the #1 and #2 Ventilation Air supply system washers. The floor drains can conduct water with trace amounts of surfactants and lubricating oil. (An additional floor drain has been blanked off.)

I.24. COMPRESSOR ROOM FLOOR DRAINS

Five floor drains and five funnel drains from the Compressor Room empty through a 6-inch wrought carbon steel pipe to the CSL. This effluent consists mostly of sanitary water or raw water used for cooling. The effluent also contains trace amounts of lubrication oil and condensed atmospheric water from

the compressors. The effluent may also contain trace amounts of surfactants from cleaning.

Compressed air is used at PUREX by the instrumentation which controls the ventilation systems, by most of the instrumentation used for fuel processing, to prevent radioactive process solutions from entering the jet gang valves in the P&O Gallery, to prevent radioactive process solutions from leaking into the SCD header, as a jet motive force for sampling and ventilation, for mixing solutions in annular tanks, and as a reagent in nitric acid recovery. The air compressors generate two liquid effluents, which are usually combined inside each compressor. The first and largest component of the air compressor effluent is sanitary water (raw water can also be used) which has been used as a coolant for the compressed air and compressor. The second component consists of the liquids removed from the compressed air. These liquids include water (condensate) with dissolved atmospheric gasses, and traces of compressor oil. This effluent exits the 202-A building through the Compressor Room Floor Drains tributary. The compressor effluent flow is estimated at 150 gpm.

I.25. LAB WATER STILL CONDENSATE

Condensed steam and distillation bottoms from the two lab water stills flow through a 3-inch pipe of 304L stainless steel to the CSL.

I.26. LAB VENTILATION ROOM FLOOR DRAINS

One floor drain and four funnel drains from the Lab Ventilation Room empty through a 3-inch stainless steel header to the CSL. These drains collect purge water from the ventilation air supply systems, traces of lubrication oil from the lab vacuum pumps, and steam condensate from the lab ventilation heaters and sanitary water heater.

I.27. LAB VENTILATION ROOM CONDENSATE

The ventilation steam condensate from the first floor lab area and the second floor Lab Ventilation Room flows to the CSL via a 4-inch pipe of 304L stainless steel.

I.28. LAB COLD CHANGE ROOMS

Drains from the Lab Cold Change Rooms lead through a 4-inch cast iron soil pipe to the CSL. The drain system comprises three drinking fountain drains, four shower drains, and ten floor drains. These drains collect sanitary water with trace amounts of surfactants.

I.29. BATTERY ROOM

The floor drain and sink drain from the battery room empty to CSL man hole #3 via a 4-inch duriron pipe of hub and spigot construction caulked with impregnated asbestos rope packing set in lead. The sink drain collects sanitary water with trace amounts of surfactants (soap). Sulfuric acid could enter the battery room floor drain in the event of a spill or ruptured battery.

The battery room process consists of applying surfactant dissolved in sanitary water to the skin of personnel, and then rinsing it off with more sanitary water.

The batter room drain effluent is quite discontinuous. There are no provisions in the pipe system to allow sampling of this effluent. (The pipe is buried underneath concrete floors.) Furthermore, under most conditions, this tributary is not likely to contribute constituents of concern to the CSL. Spills will be responded to per procedure.

I.30. VACUUM FRACTIONATOR

Cooling water from the three fractionator condensers and reboiler steam condensate enter the CSL via a 12-inch pipe made of TP304L stainless steel. The reboiler steam condensate is unusual in that demineralized water added to the steam supply ensures that the steam is not superheated. Leaks in the reboiler could introduce both nitric acid and radionuclides into the CSL.

The vacuum fractionator can contribute two effluent to the CSL: cooling water and steam condensate. During normal processing, the condensate flow is estimated at 30 gallons per minute, and the cooling water flow at 750 gallons per minute, with a maximum of 900 gallons per minute. During standby, these flows are both valved off.

In the vacuum fractionator on the cooling water side of the process, raw water is routed through three stainless steel condensers. The slightly warmed raw water then flows through the vacuum fractionator effluent header into the CSL.

In the vacuum fractionator condensate process, steam and demineralized water flows through a stainless steel heat exchanger, where the mixture condenses, and the heat boils the recovered nitric acid (typically 50% by weight, or $11.5M$ HNO_3). The condensate flows into a trap tank (to ensure that all of the steam condenses), and then enters the CSL via the vacuum fractionator effluent header.

A leak in the steam or raw water systems could result in contamination of the CSL with nitric acid and uranium, as well as traces of fission products. Because pH and radiation instruments monitor the CSL, a significant leak would result in diversion of the CSL to the retention basin.

At one time, direct contact condensers were used in the vacuum fractionator. After the installation of shell and tube condensers, the slightly acidic overheads from the Vacuum fractionator could still flow to the CSL until 1986, when the overflow line was blanked.

The vacuum fractionator is not used except when PUREX is processing. Both the steam and the raw water supplies have been valved off. There is, however, some leakage of raw water through the gate valves into the condensers.

I.31. FLASH TANK Tk-618-1

A 3-inch carbon steel pipe routes cooled, depressurized steam condensate from the 618-1 Flash Tank (located outside the 202-A Building east of U-Cell) to the CSL. This effluent consists of steam condensate from steam supply pipes and heating coils located in the P&O Gallery west of F cell and raw water added to reduce the vapor pressure.

I.32. P&O GALLERY EAST OF COLUMN 30

A series of ten P&O gallery floor drains east of column 30 flows to a 6-inch pipe of 304L stainless steel which empties either to the CSL or to Tk-U3. (A diversion valve located in the Sample Gallery is used to determine the effluent destination.) Effluents entering these drains include sanitary water from the safety showers, header drains and overflows, and drains from certain P&O gallery tanks. It is conceivable that any chemical which flows through the P&O Gallery east of column 31 could enter the floor drains in the event of a leak, spill, or overflow. In order to prevent chemical releases, this tributary is normally routed directly to Tk-U3.

Under certain circumstances, procedures allow the disposal of water (with possible traces of surfactants and/or soil) to the CSL via this drain system. This water may be raw water, sanitary water, or condensed steam, and may contain slightly elevated concentrations of rust.

I.33. DRY AIR SUPPLY COOLING WATER

This effluent originally flowed to the CWL. During most of standby, the dry air supply will be off. However, occasional operation is anticipated to maintain the equipment. This tributary may be routed directly into the CSL header, or it may flow via the CWL header to the 216-A-42 retention basin and then be pumped out to B Pond.

The effluent consists of water which has flowed through a heat exchanger.

I.34. FOURTH FILTER HEATING CONDENSATE

The 291-AE Building houses several stages of high efficiency particulate air (HEPA) filters which decrease the concentration of radionuclides in the Number 1 ventilation system exhaust. These filters can fail if they get wet. Steam heats the building to prevent condensate from the ventilation air from getting the filters wet. The condensed steam has flowed to the SCD, but must be re-routed to the CSL by June, 1992. It currently seems likely that this tributary (flow estimated at 1000 gallons per day) will flow through the SCD header to the 216-A-42 retention basin, and be pumped out periodically to B Pond.

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APPENDIX II.
CONSTITUENTS OF INTEREST

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A discussion of constituents of interest falls naturally into three sections. The first of these is a discussion of the constituents of historical interest, the radionuclides. The second is a discussion of the routine protocol sampling needs of the whole CSL. The third is a discussion of the characterization needs for the demineralizer regenerant.

II.1. RADIONUCLIDES

The Hanford site has a long-standing program for monitoring the quantities and annual average concentrations of radionuclides released into the environment. The *Waste Stream Characterization Report*¹¹ published CSL data from this program dating back to the beginning of 1976. This program focuses on determining whether streams meet DOE standards for radionuclides, and combines flow measurements with the analyses of flow-proportional samples and grab samples. Environmental Assurance oversees this program, and may change the analysis requirements at any time.

II.2. ROUTINE PROTOCOL SAMPLING

The stream specific report compared the concentration of each chemical species and radionuclide in the CSL during routine operation to the maximum contaminant levels (MCL). The comparison in the stream specific report identified only one analyte, aluminum, which exceeded its MCL.

Table II-1 lists those analytes for which the concentrations listed in the stream specific report exceed or approach the treatment targets for the Treated Effluent Disposal Facility (TEDF).

Species	Reported CSL Concentration (ppb)	TEDF Treatment Target (ppb)
Aluminum	230	50
Iron	220	300
Chloroform (Trichloromethane)	8.8	1

The sanitary water system supplies much of the water which enters the CSL. The sanitary water is a source of chloroform. The concentration of chloroform in the CSL appears to exceed the TEDF acceptance criterion. Chlorinated potable water is also known to frequently contain other trihalomethanes. Analyses for these substances should therefore be performed on the protocol samples.

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The contract laboratories used for protocol sampling have reported significantly lower detection limits for radionuclides than the Hanford laboratories have. In the case of ^{241}Am , the detection limit from the Hanford laboratories was higher than the acceptance criterion for the TEF. Because of the known contamination of the CSL pipe with plutonium, which is also usually undetected in Hanford laboratory analyses, protocol sampling should also include $^{239,240}\text{Pu}$.

Table II-2 lists the analytes for the routine CSL protocol samples, including any Fourth Filter condensate samples. The following sections discuss the analytes in more detail.

Table II-2 Analysis Requirements for Routine CSL Protocol Samples

Analyte

Aluminum

Iron

Chloroform (Trichloromethane)

Bromodichloromethane

Chlorodibromomethane

Bromoform (Tribromomethane)

^{241}Am

$^{239,240}\text{Pu}$

Total Alpha

Total Beta

^{90}Sr

^{137}Cs

^3H (Tritium)

II.2.1. Ionic Species

Five of the six aluminum results reported in the stream specific report were non-detects. The detection limit for aluminum was three times the proposed secondary MCL, which is also the TEF acceptance criterion. Further sampling and analysis, with a lower detection limit, is therefore needed to clarify whether there is an aluminum problem in the CSL.

The concentration of iron in the CSL is slightly less than, but nevertheless close to, the TEF acceptance criterion of not more than 300 ppb.

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Corrosion of piping is expected to provide this iron. Further sampling should help to determine whether treatment will be needed for iron.

II.2.2. Trihalomethanes

Chloroform (trichloromethane) has been reported in the CSL at concentrations exceeding the TEF acceptance criterion. This chloroform is believed to come from the sanitary water supply. Potable water supplies often also contain bromodichloromethane, chlorodibromomethane, and bromoform (tribromomethane). Further analyses of the CSL and the sanitary water will help to clarify this point.

II.2.3. Radionuclides

Historical radionuclide data tell little about $^{239,240}\text{Pu}$, and even less about ^{241}Am . The results are mostly less than detectable, with a rather high detection limit (approximately 10 pCi/l for $^{239,240}\text{Pu}$ and 60 pCi/l for ^{241}Am). In particular, the historical detection limit for ^{241}Am is higher than the TEF acceptance criterion of 1.2 pCi/l. The contract laboratory which analyzed previous protocol samples of the CSL achieved a much lower detection limit (less than 0.01 pCi/l for ^{241}Am) and found an average of 0.3 pCi/l $^{239,240}\text{Pu}$ and 0.1 pCi/l ^{241}Am . It is therefore worthwhile to collect more meaningful data for these nuclides by including them in the list of protocol sample analytes.

Most americium is produced as a decay product of certain plutonium isotopes. Plutonium is quite insoluble in water under the neutral or slightly basic conditions normally found in the CSL transport system. Moreover, plutonium binds tightly to soil particles, and is expected to bind equally tightly to the CSL pipe. Americium, however, has a much higher solubility if complexed with carbonate, a plentiful ion in local waters.

In the first few years of PUREX operation, an accident contaminated the CSL piping downstream of manhole 3. It is therefore to be expected that measurable concentrations of ^{241}Am may be desorbing from the pipe into the CSL. This is an added reason to seek additional data on this analyte.

The Hanford site has a long history of measuring radionuclides in effluents. However, the presence of on-site radioactive contamination frequently interferes with the detection of the low concentrations found in some streams. Therefore, the radiological analyses for the CSL protocol samples will include all the nuclides which Environmental Assurance requested for the CSL in 1988.

II.3. DEMINERALIZER REGENERANT

Table II-5 presents the analysis requirements for the regenerant characterization protocol samples. The following sections explain the rationale for these choices.

II.3.1. Target Exceeding Analytes

The *Waste Stream Characterization Report*¹² contains analytical data for grab samples of the CSL, both during regeneration and during routine operation. These data can form the basis for estimating possible concentrations in the regenerant.

Table II-3 presents the average measured concentrations in the CSL during routine operation, the lower 90% confidence limit for routine operation (or zero), the maximum reported concentration during regeneration, and the apparent maximum excess concentration attributable to regeneration for every analyte which has been found in the CSL during regeneration.

Table II-4 compares the apparent maximum concentration in the regenerant with either the MCL, as reported in the stream specific report, or the TEDF treatment target. Table II-4 also identifies with an asterisk those analytes which appear to exceed either the TEDF treatment target or the MCL in the demineralizer regenerant. With the exception of beta emitting radionuclides, all of the detected analytes for which targets exist require analysis.

II.3.2. Trihalomethanes

Chloroform (trichloromethane) has been detected at elevated concentrations in the CSL during regeneration. Sanitary water, the feed to the demineralizers, is chlorinated water which can be expected to contain chloroform. It is not surprising that an ion exchange resin would bind such a highly polar molecule as chloroform. It is also likely that the resin binds the three other trihalomethanes which usually accompany chloroform: bromodichloromethane, chlorodibromomethane, and bromoform (tribromomethane). These three additional chemicals therefore belong on the list of required analytes.

II.3.3. Radionuclides

The demineralizer regenerant appears to exhibit elevated alpha activity. It would be useful to know which radionuclides are responsible for this elevated activity. The list of required analyses therefore includes plutonium, uranium, and radium activity. Protocol samples of the entire CSL will be analyzed for all the radionuclides requested by Environmental Assurance in 1988. For consistency, these nuclides are included in the list of analyses for the regenerant.

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Table II-3 Regenerant Contribution Calculation²

Analyte	Routine Average ¹	Routine Lower 90% Confidence Limit ¹	Regeneration Maximum	Apparent Regenerant Contribution
Alpha (pCi/l)	1.06E+00	0.00E+00	7.24E+00	7.24E+00
Beta (pCi/l)	7.92E+00	2.27E+00	1.38E+01	1.15E+01
Acetone	5.64E+01	0.00E+00	1.50E+02	1.50E+02
Aluminum	9.96E+01	0.00E+00	6.08E+02	6.08E+02
Ammonium	1.30E+02	0.00E+00	7.00E+01	7.00E+01
Barium	2.78E+01	2.47E+01	1.48E+02	1.23E+02
Cadmium	2.20E+00	0.00E+00	1.30E+01	1.30E+01
Calcium	1.86E+04	1.69E+04	9.09E+04	7.40E+04
Chloride	9.76E+02	5.86E+02	2.54E+04	2.48E+04
Chloroform	0.00E+00	0.00E+00	1.71E+02	1.71E+02
Chromium	6.80E+00	0.00E+00	1.10E+01	1.10E+01
Conductivity (μS)	1.18E+02	7.49E+01	4.83E+03	4.76E+03
Copper	9.60E+00	0.00E+00	1.19E+03	1.19E+03
Cyanide	0.00E+00	0.00E+00	1.19E+01	1.19E+01
Fluoride (IC)	0.00E+00	0.00E+00	3.39E+03	3.39E+03
Iron	9.60E+01	4.71E+01	9.37E+02	8.90E+02
Lead	0.00E+00	0.00E+00	2.30E+01	2.30E+01
Magnesium	4.22E+03	3.82E+03	1.86E+04	1.48E+04
Manganese	6.60E+00	0.00E+00	9.70E+01	9.70E+01
Mercury	7.00E-02	0.00E+00	2.52E+00	2.52E+00
Methylene Chloride	0.00E+00	0.00E+00	1.50E+01	1.50E+01
Nickel	8.20E+00	0.00E+00	1.30E+01	1.30E+01
Nitrate	4.92E+02	2.15E+01	5.00E+04	5.00E+04
pH	8.01E+00	7.60E+00	9.98E+00	2.38E+00
Potassium	1.43E+03	6.38E+02	4.09E+03	3.45E+03
Silver	0.00E+00	0.00E+00	1.70E+01	1.70E+01
Sodium	4.55E+03	1.79E+03	7.05E+05	7.03E+05
Strontium	0.00E+00	0.00E+00	3.53E+02	3.53E+02
Sulfate	1.07E+04	9.51E+03	2.53E+06	2.52E+06
TOC	1.62E+03	1.28E+03	6.58E+03	5.30E+03
TOX	2.03E+01	0.00E+00	3.07E+02	3.07E+02
Uranium	4.06E-01	3.60E-01	1.94E+00	1.58E+00
Zinc	1.64E+01	4.49E+00	4.88E+02	4.84E+02

Notes:

¹Both the average and standard errors for routine operation were calculated by replacing all non-detects with numbers from 0 to the detection limit, and with an average of one-half the detection limit. Negative lower confidence limits were replaced with zero. In the case of all non-detects, the value zero was used.

²Units are ppb unless otherwise specified

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Table II-4 Comparison of Regenerant and Target Concentrations

Analyte	Estimated Regenerant Concentration ¹	Target Concentration ²	Source of Target ²	Analysis Needed
Alpha (pCi/l)	1.11E+02	1.50E+01	S	*
Beta (pCi/l)	1.76E+02	1.00E+03	S	*
Acetone	2.29E+03	5.00E+01	T	*
Aluminum	9.29E+03	5.00E+01	T	*
Barium	1.88E+03	1.00E+03	T	*
Cadmium	1.99E+02	1.00E-02	T	*
Chloride	3.79E+05	2.50E+05	T	*
Chloroform	2.61E+03	1.00E+00	T	*
Chromium	1.68E+02	2.00E-03	T	*
Copper	1.82E+04	1.00E+03	T	*
Cyanide	1.82E+02	1.00E+02	T	*
Fluoride	5.18E+04	2.00E+03	T	*
Iron	1.36E+04	3.00E+02	T	*
Lead	3.52E+02	4.00E+01	T	*
Manganese	1.48E+03	5.00E+01	T	*
Mercury	3.85E+01	2.00E+00	T	*
Methylene Chloride	2.29E+02	1.20E+01	T	*
Nickel	1.99E+02	4.40E+01	T	*
Nitrate	7.64E+05	4.50E+04	T	*
Silver	2.60E+02	5.00E+01	T	*
Sulfate	3.85E+07	2.50E+05	T	*
Zinc	7.39E+03	5.00E+03	T	*

Notes:

¹During regeneration, the regenerant flow is estimated at 70 gpm, and the entire flow of the CSL is estimated at 1070 gpm. This yields a dilution factor of 1070/70 = 15.28571. Multiplying the apparent regenerant contribution by 15.28571 yields the estimated regenerant concentration.

²These concentration targets do not represent a commitment under the TPA. The sources of the targets are

S MCL listed in stream specific report
 T TEDF Treatment Goal

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Table II-5 Analysis Requirements for Regenerant
Characterization

Analyte _____

Acetone
Aluminum
Barium
Bromoform
Bromodichloromethane
Cadmium
Chloride
Chlorodibromomethane
Chloroform
Chromium
Copper
Cyanide
Fluoride
Iron
Lead
Manganese
Mercury
Methylene Chloride
Nickel
Nitrate
Silver
Sulfate
Zinc
Total Alpha
Total Beta
²⁴¹Am
^{239,240}Pu
Uranium (Activity)
Radium (Activity)
⁹⁰Sr
¹³⁷Cs
³H (Tritium)

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6. Department of Energy, *Hanford Site Annual Dangerous Waste Report*, DOE/RL-90-10, Volume 4. Richland, Washington. 1990.
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PERFORM SUMP HANDLING AND TK-F18 DISPOSAL

I. SYSTEM DESCRIPTION

This procedure provides instructions for handling waste through the waste receiver tank TK-F18. TK-F18 is used for routine accumulation of PUREX sump waste, with the exception of SLL sump and sometimes SLK sump. It collects drainage from the condenser vent, vessel vent, sampler drain headers and other sources. Flow of waste through this tank provides a central point for analysis and transfer routing based on contents. Factors having a bearing upon the routing are concentration of plutonium, concentration of fission products and presence of fire protection Light Water.

Generally, waste falling within certain specifications will be disposed of through predetermined routing. Batches in which the fission product heat generation rate is less than 0.10 BTU/hr-gal are routed to designated nonboiling underground storage (UGS) tanks. Batches in which the generation rate is greater than 0.37 BTU/hr-gal are sent to designated UGS boiling waste tanks. Concentrations falling between the above may be routed to UGS at the discretion of the Operations supervision, Tank Farms supervision, and the Process Control engineer.

Sumps that are handled in TK-F18 are part of two different Material Balance Areas (MBA). Sumps for A, B, C, D, and E Cells are part of the Head End MBA while the remainder of the PUREX sumps are part of the SX MBA. Since TK-F18 can receive material from either MBA, it becomes important to account for all material sent from each MBA to TK-F18. To ensure this, TK-F18 will be operated in either the Head End or SX mode. While in either mode, only solution from the same MBA may be transferred without pretransfer samples.

Tank Farms Operations must be informed when any waste contains fire protection Light Water. This will be diverted to the appropriate UGS tank. Contents having fissile material equal to or greater than 0.013 g/L may go to waste rework tank TK-F8. Waste may also be transferred to organic recovery tank TK-F13.

Since waste from TK-F18 is transferred to tank farms it falls under the authority of Land Disposal Restriction (LDR) regulations. In addition to filling out standard transfer forms, a LAND DISPOSAL RESTRICTION NOTIFICATION FORM must be filled out and transmitted to tank farms for each transfer. A further discussion of LDR concerns for PUREX may be found in Appendix A, LDR Requirements for PUREX.

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I. SYSTEM DESCRIPTION

The PUREX plant is permitted by the Part A Permit to treat but not store dangerous waste. According to WAC 173-303-200, a generator may accumulate (store) dangerous waste on-site, without a permit for 90 days or less after the date of generation. Therefore, once dangerous waste starts accumulating in TK-F18, it must be sent to Tank Farms before the 90 days have expired to meet regulatory requirements. Unless samples prove that the accumulation is not hazardous waste, the accumulation will be considered hazardous waste.

Equipment involved:

- F Cell, Waste Receiver (TK-F18).

II. PRESTART CONDITION

Supervision has given permission for transferring, disposing of, or neutralizing TK-F18 material.

III. SAFETY

Criticality - Whenever the Pu concentration in vessels above SJ and/or SK sumps is greater than 3.1 g/L, transfer the sump contents to TK-F18 as soon as is practical.

The criticality prevention specification limit for neutralized solution in TK-F18 is 500 g Pu. The concentration of fissile material in solutions shipped to UGS tanks shall be less than 0.013 g/L Pu but no more than 200 g Pu total.

Continuous agitation of solution is desirable when there is greater than 500 g Pu in TK-F18. If agitation is stopped, tank conditions must be assessed by shift supervision and process engineer to verify the absence of Pu precipitation or polymerization before restarting agitator. This assessment must be documented in the shift log.

The maximum Pu content for TK-F18 is 12,400 g. The minimum nitric acid concentration with equal to or greater than 200 g Pu in TK-F18 is 0.25M. If TK-F18 sample results or known inputs to the tank indicate greater than 500 g Pu, chemical addition line valves will be closed, locked, and tagged.

Warning - Spilled or leaked waste must be removed from the D, E, and F Cell sumps within twenty-four hours, or in as timely a manner as is possible, to prevent harm to human health and the environment. This will ensure full compliance with the regulatory requirements.

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III. SAFETY (Cont.)

OSR REQUIREMENTS

To control solvent flammability:

- Do not heat TK-F18 to greater than 70° C when organic is present (OSR requirement, see LCS 5.6.2)
- Maintain the bottom blade of TK-F18 agitator submerged 6 in. (14WF) below liquid surface whenever operating (OSR requirement, LCO 5.6.7)
- Do not heat TK-F18 unless coils are completely submerged (18.5 WF) (OSR requirement, see LCO 5.6.3)
- When adding NaOH or KOH to ammonia bearing solutions, steam at 60 lb/hr is to be bled into TK-F18 (OSR requirement, see LCO 2.6.7)
- When NH₄OH solution at greater than 3.3 wt% is present, steam at 60 lb/hr is to be bled into TK-F18
- The following instruments are required operable for PCM compliance:

	<u>PRIMARY</u>	<u>ALT</u>
TEMPERATURE	TR-F18	---
STEAM BLEED	PI-F18-1 PI-F18-2	TI-F18-1

- As an alternate to TK-F18 steam sparge, TK-F18 is to be heated to greater than or equal to 45° C when ammonium bearing solutions are being neutralized or when TK-F18 contains greater than 3.3% wt% NH₄OH solution.

Whenever TK-F18 is suspected of containing ammonia solutions, and the steam bleed is not on, heat and maintain temperature at 45-70° C to control ammonia flammability.

This will require supervision approval to remove locks and tags from valves F04-03 and F04-04, steam isolation to TK-F18 coil. Once ammonia solution has been transferred to UGS, valves F04-03 and F04-04 must be closed, locked, and tagged. Temperature control with ammonia bearing solutions present is an OSR requirement. (LCS 2.6.7)

Be aware that an extreme high weight factor alarm for a process sump has potential solvent flammability and criticality implications. Supervision must be notified whenever an extreme high weight factor alarm is activated for determining the cause of the alarm. This is an OSR requirement and the limiting conditions for processing operations (LCO 5.6.12 and LCO 5.6.13) require that leaks into process sumps be monitored and investigated.

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III. SAFETY (Cont.)

OSR REQUIREMENT

Stop transfer of TK-F18 contents to UGS if either of the following conditions occurs:

- Liquid levels fails to decrease for 3 min or tank is empty.
- SpG breaks during decanting (the SpG indicates less than 15% of chart on SGR-F18) indicating the presence of organic.

The sending tank WF must be continuously monitored during jet transfers to UGS. Do not allow jet to operate if flow stops. The transfer line could be damaged by thermal expansion if steam is allowed to blow into the line. (OSR Requirement, see LCO 8.6.3)

Caution - Do not make transfers from TK-F18 to UGS tanks unless the contents meet Tank Farm specifications before being transferred from the plant. Leave adequate volume in TK-F18 for neutralization.

Do not make transfer of TK-F18 solution to boiling waste tanks unless required temporary jumper change has been made to route the waste through the same route currently used for TK-F16 waste transfers.

Applicable Safety Documents - Provisions of Radiation Work Requirements and Permits Manual, WHC-CM-4-15, Radiation Work Permits A-KEH-12 and A-KEH-24 and Radiation Protection Manual, WHC-CM-4-12 apply to all work performed under this procedure. Observe all Master and PUREX Safety Rules and Industrial Safety Manual, WHC-CM-4-3, Vols. 1-3.

OSR requirements are discussed in WHC-CM-5-24, PUREX PROCESS CONTROL MANUAL, Addendum I.

IV. TOOLS AND SUPPLIES

SAMPLE TAGS

INPUTS TO TK-F18 DATA SHEET - HEAD END

INPUTS TO TK-F18 DATA SHEET - MISCELLANEOUS AND SX

SOLVENT EXTRACTION ACCOUNTABILITY TANK-TO-TANK TRANSFER
DATA SHEET

LAND DISPOSAL RESTRICTION NOTIFICATION FORM

TK-F3 ACID ADDITION TO TK-F18 GRAPHS

PO-040-301, TK-302-A GENERAL SURVEILLANCE AND LIQUID LEVEL
MEASUREMENT

PO-320-008, PERFORM TK-F13 ORGANIC RECOVERY

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VI. PROCEDURE

A. PERFORM PRESTART CHECKS

DATE: _____

OPERATOR

1. Check goldenrod master copy to ensure that correct rev/mod is being used. _____
2. Supervision has given permission to process solution through tank TK-F18 _____
3. List tasks within this procedure not applicable and why. Also, list any other comments. _____

NOTE - Return completed copy of procedure to supervision.

B. HANDLE INPUTS AND SAMPLING FOR TK-F18

NOTE - Once dangerous waste starts accumulating in TK-F18, it must be sent to Tank Farms within 90 days to meet regulatory requirements.

- All transfers from Head End sumps to TK-F18 cross a material balance area. The Head End shift support manager may waive the requirement of Before Transfer and After Transfer TK-F18 samples. The waiver must document that no appreciable quantities of Pu and/or U have crossed the MBA201/202 boundary.

- A package containing all data for a single TK-F18 batch to Underground Storage will be used to track the solution. This package will be kept in the Head End Control Room when TK-F18 is in Head End mode and in the Central Control Room when TK-F18 is in Solvent Extraction mode and must be returned to supervision when handling of the batch is complete. The package will contain the following DATA SHEETS:

- INPUTS TO TK-F18 DATA SHEET - HEAD END SUMPS TO TK-F18 TRANSFER
- INPUTS TO TK-F18 DATA SHEET - SIX SUMPS AND MISCELLANEOUS TRANSFER TO TK-F18
- SOLVENT EXTRACTION ACCOUNTABILITY TANK-TO-TANK TRANSFER DATA SHEET.

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

CAUTION

Be aware that an extreme high weight factor alarm for a process sump has potential solvent flammability and criticality implications and supervision must be notified whenever an extreme high weight factor alarm is activated for determining the cause of the alarm. This is an OSR requirement and the limiting conditions for processing operations (LCO 5.6.12 and LCO 5.6.13) require that leaks into process sumps be monitored and investigated.

1. If an extreme high weight factor alarm has been activated, notify supervision so as to allow prompt investigation into the cause of the alarm.
2. Notify supervision before transferring sump(s) to waste receiver tank TK-F18 to determine if sampling is to be performed. If requested, sample sump(s).
3. Mark TK-F18 strip chart with the following for all transfers in and out of TK-F18:
 - Source
 - Date
 - Time.

CRITICALITY

WHENEVER THE Pu CONCENTRATION IN VESSELS ABOVE SJ AND/OR SK SUMPS IS GREATER THAN 3.1 g/L, TRANSFER THE SUMP CONTENTS TO TK-F18 AS SOON AS IS PRACTICAL.

4. Before transferring any sump material into TK-F18, ensure that heel in TK-F18 has been acidified to greater than 0.25M.

NOTE - If the previous batch from TK-F18 was sent to TK-F8 or TK-F13, the heel should already be acidified.

- a. If batch was sent to UGS, check INPUTS TO TK-F18 DATA SHEET to see if any acid was added after the transfer.
- b. If TK-F18 heel does not need to be acidified, continue with Step 5.

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

DATE: _____

OPERATOR

4. c. Determine the amount of recovered acid to be transferred from TK-F3 to TK-F18 or fresh acid from TK-222.

NOTE - Refer to the TK-F3 ACID ADDITION TO TK-F18 GRAPH, Figure 1, to determine the amount of acid.

- d. If fresh HNO_3 is used via the P&O Gallery 7001 nitric acid header, add 15-30 gal of 12M HNO_3 (per supervision instructions) by opening valves F02-01 and F02-03. Monitor amount on FM-F18-1 in P&O Gallery.

- e. If TK-F3 will be used to acidify F18, turn on jet controller JC-F3-3. Turn off jet controller when amount of acid required has been transferred.

- f. Record amount of acid added on INPUTS DATA SHEET. _____

NOTE - TK-F18 is very hard to sample with WF less than 20 WF and will need to use analyses from last batch to UGS.

- Data must be recorded on INPUTS DATA SHEET, either for Head End or SX.

- g. Ensure that TK-F18 heel solution contains greater than 0.25M HNO_3 . _____

NOTE - HNO_3 concentration can be verified by tank sampling or verification of additions to tank.

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

CRITICALITY

WHENEVER THE Pu CONCENTRATION IN VESSELS ABOVE SJ AND/OR SK SUMPS IS GREATER THAN 3.1 g/L, TRANSFER THE SUMP CONTENTS TO TK-F18 AS SOON AS IS PRACTICAL.

5. Transfer sumps to TK-F18.

OSR REQUIREMENT

To control solvent flammability:

- Do not heat TK-F18 to greater than 70° C when organic is present (OSR requirement, see LCS 5.6.2)
- Maintain the bottom blade of TK-F18 agitator submerged 6 in. (14 WF) below liquid surface whenever operating (OSR requirement, see LCO 5.6.7).
- Do not heat TK-F18 unless coils are completely submerged (18 WF) (OSR requirement, see LCO 5.6.3).
- When adding NaOH or KOH to ammonia bearing solutions, steam at 60 lb/hr is to be bled into TK-F18 (OSR requirement, see LCO 2.6.7)
- When NH₄OH solution at greater than 3.3 wt.% is present, steam at 60 lb/hr is to be bled into TK-F18.
- The following instruments are required operable for PCM compliance:

	PRIMARY	ALT
TEMPERATURE TR-F18		---
STEAM BLEED PI-F18-1		TI-F18-1
	PI-F18-2	

- As an alternate to TK-F18 steam sparge, TK-F18 is to be heated to greater than or equal to 45° C when ammonium bearing solutions are being neutralized or when TK-F18 contains greater than 3.3 wt% NH₄OH solution.

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

OSR REQUIREMENTS (Cont.)

Whenever TK-F18 is suspected of containing ammonia solutions and the steam bleed is not on, heat and maintain temperature at 45-70° C to control ammonia flammability. This will require supervision approval to remove locks and tags from valves F04-03 and F04-04, steam isolation to TK-F18 coil. Once ammonia solution has been transferred to UGS, valves F04-03 and F04-04 must be closed, locked, and tagged. Temperature control with ammonia bearing solutions present is an OSR requirement. (LCS 2.6.7)

Be aware that an extreme high weight factor alarm for a process sump has potential solvent flammability and criticality implications and supervision must be notified whenever an extreme high weight factor alarm is activated for determining the cause of the alarm. This is an OSR requirement and the limiting conditions for processing operations (LCO 5.6.12 and LCO 5.6.13) require that leaks into process sumps be monitored and investigated.

NOTE - TK-F18 must be sampled before slurping sumps from a different MBA than that from which the previous sumps were slurped. After TK-F18 is sampled, the next sumps slurped to TK-F18 determine which mode TK-F18 is in. If Head End sumps are slurped, then TK-F18 will be in Head End mode, the TK-F18 DATA SHEET package will be kept in the Head End Control Room, and no Central sumps may be slurped to TK-F18 until post-Head End sumps samples are obtained. If Central sumps are slurped, then TK-F18 DATA SHEET package will be kept in the Central Control Room, and no Head End sumps may be slurped to TK-F18 until post-Central sumps (pre-Head End sumps) samples of TK-F18 are obtained.

- If TK-F18 contains only acid, it is not in HE or SK mode.

5. a. If tank contains only acid, be aware that samples are not needed to start in either Head End or SX mode.
- b. If Head End sumps are to be slurped, ensure that TK-F18 is in Head End mode or place it in Head End mode by obtaining a pre-Head End sumps sample (post SX sample) from TK-F18 or a waiver by supervision. Go to Step 5.d.

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

DATE: _____

OPERATOR

5. c. If Central sumps are to be slurped, ensure that TK-F18 is in Solvent Extraction mode or place it in Solvent Extraction mode by obtaining a post-Head End sumps sample from TK-F18 or waiver by supervision.
- d. Complete TK-F18 before transferring data on appropriate INPUTS DATA SHEET.
- e. If sump to be transferred is known to contain caustic material and TK-F18 contains potential Pu bearing material, dispose of TK-F18 solution per Step 7 before transferring sump solution.

NOTE - There is an accountability requirement that the receiving custodian be notified of MBA inputs.

- f. Obtain supervision's approval before transferring any sumps to TK-F18. If transferring Head End sump material, notify the Solvent Extraction Shift Support Manager or request the Head End Shift Support Manager to notify the Solvent Extraction Shift Support Manager prior to transfer.
- g. Transfer sump to TK-F18 using appropriate sump jet controller. _____
- h. For the first sump transferred to TK-F18, start TK-F18 agitator when WFR-F18 reading exceeds 10 WF. _____

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

DATE: _____

OPERATOR

CRITICALITY

CONTINUOUS AGITATION OF SOLUTION IS DESIRABLE WHEN THERE IS GREATER THAN 500 g Pu IN TK-F18. IF AGITATION IS STOPPED, TANK CONDITIONS MUST BE ASSESSED BY SHIFT SUPERVISION AND PROCESS ENGINEER TO VERIFY THE ABSENCE OF Pu PRECIPITATION OR POLYMERIZATION BEFORE RESTARTING AGITATOR. THIS ASSESSMENT MUST BE DOCUMENTED IN THE SHIFT LOG.

THE MAXIMUM Pu CONTENT FOR TK-F18 IS 12,400 g. THE MINIMUM NITRIC ACID CONCENTRATION WITH EQUAL TO OR GREATER THAN 200 g Pu IN TK-F18 IS 0.25M. IF TK-F18 SAMPLE RESULTS OR KNOWN INPUTS TO THE TANK INDICATE GREATER THAN 500 g Pu, CHEMICAL ADDITION LINE VALVES WILL BE CLOSED, LOCKED, AND TAGGED.

5. i. If agitator is not on, request supervision approval for starting agitator. If approval is received, start agitator.

Supervision Approval _____

- j. As directed by supervision, start TK-F18 steam bleed for transfer of NH_4OH solution by opening valves F18-1 and F18-2 until PI-F18-1 minus PI-F18-2 is greater than or equal to 17 psi.

P Reading _____

NOTE - This is an alternate for TK-F18 steam bleed.

- k. If directed by supervision for ammonium hydroxide solutions transferred to TK-F18, heat TK-F18 solution to greater than 45° C but less than 70° C before butting and transfer.

- 1) Close valve F04-01 (raw water to TK-F18 coil).
- 2) Close DOV-F18-1 using VC-F18-1.
- 3) Open F04-06 and air blow for 3-4 Min.
- 4) Close valve F04-06.
- 5) Remove locks on valves F04-03 and F04-04.
- 6) Open F04-03 and F04-04 and heat solution to 45-70° C.

- l. Complete sumps transfers to TK-F18 and record them on the appropriate INPUTS DATA SHEET. _____

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

DATE: _____

OPERATOR

6. Repeat Step 5 as needed to accumulate a batch in TK-F18.
7. When a batch has accumulated in TK-F18 (approximately 60% maximum on WFR-F18-1), verify that all DATA SHEETS and strip charts are filled out as needed, notify supervision, and record the following initial information on the TRANSFER DATA SHEET:
 - WF
 - SpG
 - Volume
 - Temperature.

CRITICALITY

CONTINUOUS AGITATION OF SOLUTION IS DESIRABLE WHEN THERE IS GREATER THAN 500 g Pu IN TK-F18. IF AGITATION IS STOPPED, TANK CONDITIONS MUST BE ASSESSED BY SHIFT SUPERVISION AND PROCESS ENGINEER TO VERIFY THE ABSENCE OF Pu PRECIPITATION OR POLYMERIZATION BEFORE RESTARTING AGITATOR. THIS ASSESSMENT MUST BE DOCUMENTED IN THE SHIFT LOG.

OSR REQUIREMENT

Maintain bottom blade of TK-F18 agitator submerged 6 in. below liquid surface whenever operating, to control solvent flammability. (LCO 5.6.7)

8. If not on, obtain supervision approval to start agitator. If approval is received, start agitator.

Supervision Approval _____

9. If agitator is on, agitate contents of TK-F18 for at least 30 min after the last addition. _____

NOTE - Samples need to include 2 accountability and 1 characterization samples (normally routine sets 1,2, & 4).

10. When TK-F18 is ready to be sampled, place SAMPLE tag on the inside face of WF recorders, WFR-F18-1 in HECR and WFR-F18 in CCR, so that it is plainly visible and request samples. _____
11. Record sample results from Lab on the TRANSFER DATA SHEET and report results to supervision.

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B. HANDLE INPUTS AND SAMPLING FOR TK-F18 (Cont.)

DATE: _____

OPERATOR _____

CRITICALITY

THE MAXIMUM Pu CONTENT FOR TK-F18 IS 12,400 g. THE MINIMUM NITRIC ACID CONCENTRATION WITH EQUAL TO OR GREATER THAN 200 g Pu IN TK-F18 IS 0.25M. IF TK-F18 SAMPLE RESULTS OR KNOWN INPUTS TO THE TANK INDICATE GREATER THAN 500 g Pu, CHEMICAL ADDITION LINE VALVES WILL BE CLOSED, LOCKED, AND TAGGED.

12. If sample results indicate greater than 500 g Pu in TK-F18, notify supervision and lock and tag valves F15-12, F02-02 and F15-04 closed (caustic and water addition lines).
13. Request supervision and shift engineer to review sample results against INPUTS DATA SHEET, verify that sample results appear to reflect TK-F18 contents, and sign TRANSFER DATA SHEET.

C. DETERMINE DISPOSAL FOR TK-F18

CRITICALITY

MAINTAIN SOLUTION WITHIN THE SPECIFICATION LIMITS FOR TANK FARMS OF TK-F18 SOLUTION TRANSFERS TO UGS AS FOLLOWS:

- Pu CONCENTRATION MUST BE LESS THAN 0.013 g/L
- TOTAL Pu IN BATCH MUST BE LESS THAN 200 g.

NOTE - If TK-F18 contains Light Water, Process Engineering will make recommendations and coordinate its disposal in accordance with special procedures by Process Engineering. In that instance, further use of this procedure is not required.

- Before transfer of TK-F18 solution heat load must be less than 0.10 BTU/hr-gal. For heat loads between 0.10 BTU/hr-gal and 0.37 BTU/hr-gal, TK-F18 contents may be transferred only with approval by Operations supervision, Tank Farm supervision and Process Engineering. Transfers greater than 0.37 BTU/hr-gal must be transferred to boiling waste tanks, per Steps 17-28 of Task E.

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C. DETERMINE DISPOSAL FOR TK-F18 (Cont.)

DATE: _____

OPERATOR

1. Request supervision to determine where to dispose of waste material. _____
 - a. If tank contents meet specifications for UGS, continue with Task D. If not, notify supervision.
 - b. If tank content exceeds 0.013 g/L Pu or contain organic, go to Task F to transfer solution to TK-F13 or TK-F8.
 - c. If tank contains greater than 0.1 BTU/hr-gal, request supervision to specify handling tanks.

D. PREPARE TK-F18 FOR TRANSFER TO UGS

1. Obtain TK-F18 sample results and record on TRANSFER DATA SHEET. _____
2. Request supervision to determine the kind and amount of neutralization chemicals needed.
 - a. Specify on TRANSFER DATA SHEET kind and amount of chemicals needed for neutralization of TK-F18. _____
 - b. Obtain approval on TRANSFER DATA SHEET to add neutralization chemicals determined above to TK-F18. _____

OSR REQUIREMENT

To control solvent flammability:

- Do not heat TK-F18 to greater than 70° C when organic is present (OSR requirement, see LCS 5.6.2).
- Maintain bottom blade of TK-F18 agitator submerged 6 in. below liquid surface whenever operating (OSR requirement, see LCO 5.6.3).
- Do not heat TK-F18 unless coils are completely submerged (OSR requirement, see LCO 5.6.3).
- Temperature control or steam bleed with ammonia bearing solutions present is an OSR requirement (LCS 2.6.7).

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D. PREPARE TK-F18 FOR TRANSFER TO UGS (Cont.)

DATE: _____

OPERATOR

3. Whenever any sump waste from A, B, C, or E Cells will be neutralized in TK-F18, heat TK-F18 to 45-70° C per Step B.5.k or start steam bleed per Step B.5.j.

_____ Δ P Reading _____

NOTE - Heating TK-F18 contents will require supervision approval to remove locks and tags from valves F04-03 and F04-04, steam isolation to TK-F18 coil. Once ammonia solution has been transferred to UGS, valves F04-03 and F04-04 must be closed, locked, and tagged.

CRITICALITY

ENSURE TK-F18 SOLUTION CONTAINS LESS THAN 200 g Pu BEFORE ADDITION OF NaOH. THIS IS TO AVOID A CPS VIOLATION BY TANK FARMS UPON TRANSFER.

4. Neutralize TK-F18 by adding NaOH.
- a. Ensure the TK-F18 agitator is on.
 - b. Reset flow totalizer (Badgermeter) to 0.
 - c. Close valves F15-04 and F15-09. _____
 - d. If caustic will be supplied from Sample Gallery tanks, go to step g below.
 - e. Prepare caustic add from 7006 header by opening valves F15-02, F15-11 and F15-12 and closing valve F15-03. _____
 - f. Open valve F15-10 until specified amount of caustic has been added. Close valves F15-10, F15-11, F15-12, and F15-02. Record amount of caustic added on INPUTS DATA SHEET and go to Step 5. _____

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D. PREPARE TK-F18 FOR TRANSFER TO UGS (Cont.)

DATE: _____

OPERATOR

4. g. Prepare caustic add from Sample Gallery by positioning the following valves:

VALVE	POSITION	
F15-02	CLOSED	_____
F15-20	OPEN	_____
F15-03	OPEN	_____
F15-11	OPEN	_____
F15-10	OPEN	_____
F15-12	OPEN	_____

- h. Position selector switch in Head End Control Room, SS 26-1 to position 1.

NOTE - The Sample Gallery tanks will normally be left valved in to eliminate need to go to Sample Gallery for valving.

- i. If necessary have tanks 26, 27 and 28 valved in by opening the following valves in the Sample Gallery:

VALVE	FUNCTION	
MV 26-1	Tank 26 Outlet	
MV 27-1	Tank 27 Outlet	
MV 28-1	Tank 28 Outlet	
MV 26-5	Pump P-26 Outlet	
MV 26-6	Pump P-26 Outlet	_____

- j. Ensure MCC 13 for pump P-26 is on.

- k. Start pump using switch HS 26-2 located on P&O Gallery north wall near TK-F16 position. When required amount has been added, turn off pump. Record amount added on INPUTS DATA SHEET.

- l. Close the following valves:

- F15-03 _____
- F15-10 _____
- F15-11 _____
- F15-12 _____
- F15-20 _____

- m. If requested by supervisor, valve out tanks 26, 27, and 28 by closing valves opened in Step g above.

Valved in / out _____

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D. PREPARE TK-F18 FOR TRANSFER TO UGS (Cont.)

DATE: _____

OPERATOR

5. Add sodium nitrite to TK-F18 from TK-212 (via 7004 HDR).
 - a. If no sodium nitrite is to be added, go to Step 6.
 - b. Close valves F15-04 and F15-11. _____
 - c. Reset batch totalizer to 0.
 - d. Open valves F15-08, F15-09, F15-10 and F15-12 to add nitrite. _____
 - e. When specified amount has been added close valves F15-08, F15-09, F15-10 and F15-12. _____
6. Record the amount of NaNO_2 added on the INPUTS DATA SHEET and on TRANSFER DATA SHEET. _____
7. Agitate contents of TK-F18 for 30 min before obtaining sample. _____

NOTE - Post-neutralization samples will also be used for making LDR waste determinations.

8. Request duplicate samples for pH and NaNO_2 per PO-080-032. Record results on the TRANSFER DATA SHEET. _____
9. Request supervision or engineer to determine additional amounts needed to neutralize TK-F18 solution. _____

OSR REQUIREMENT

Solutions (excluding water flushes) discharged directly to mild-steel storage tanks or through mild steel lines must have pH and chemical composition adjusted to meet tank limits. (pH greater than 12 and NO_2 greater than 0.011M) (LCS 8.6.1).

10. Repeat Steps 2-9 until waste is within specification for transfer to Tank Farms. _____

NOTE - Verification of LDR considerations must be documented by attaching a copy of DATA SHEET to the LAND DISPOSAL RESTRICTION NOTIFICATION FORM.

11. Make LDR determination per Task G. Ensure that a copy of the DATA SHEET containing the sample results is attached to FORM.

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D. PREPARE TK-F18 FOR TRANSFER TO UGS (Cont.)

DATE: _____

OPERATOR

12. Cool contents of TK-F18 below 35° C before disposal. _____
- a. If necessary, close and lock valves F04-04 and F04-03.
 - b. Perform airblow of coil for 3-4 min using valve F04-06.
 - c. Open valve F04-01.
13. After all appropriate paperwork has been completed, inform supervision that TK-F18 is ready for transfer to UGS. _____

E. TRANSFER TK-F18 TO UGS

DATE: _____

OPERATOR

Prepare for Transfer

OSR REQUIREMENT

Do not make transfers from TK-F18 to UGS tanks unless the contents meet Tank Farm specifications.

1. Record the following on the TRANSFER DATA SHEET:
- WF
 - SpG
 - Volume
 - Temperature. _____
2. a. Request the Operations manager to contact Tank Farms management and obtain approval to transfer this batch of waste to UGS. Ensure that Notification Form has been faxed to Tank Farms. _____
- b. Request Operations manager and cognizant engineer to contact Tank Farms management and cognizant engineer to determine flush requirements. If flushing is not required, N/A will be placed in flush volume block and initialed by cognizant engineer and manager.

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E. TRANSFER TK-F18 TO UGS (Cont.)

DATE: _____

OPERATOR

NOTE - The Operations manager must sign the SUPERVISION NOTIFICATION OF TANK FARMS MANAGEMENT BEFORE TRANSFER block before proceeding with this task.

3. Request that the Operations manager and the shift engineer sign the TRANSFER DATA SHEET authorizing transfer to Tank Farms when other procedural requirements are met. _____

NOTE - TK-302-A level may be obtained from Tank Farm Operations or per PO-040-301.

- Supervision will coordinate with Tank Farm supervision to start transfer and check that valving is complete, ensuring proper routing of the solution.
4. If organic is present in the tank as determined by sample results, turn off the TK-F18 agitator.

Transfer TK-F18 To Nonboiling Waste Tank

5. Ensure that airblow valve F09-04 and supply to jet wall nozzle valve F01-01 are open, then valve in steam to jet J-F18-1 by opening valve F09-01. _____

NOTE - There is an interlock system on the 241-AW valve pit. In the event of a leak into this valve pit, a leak detector alarm will sound in Head End Control Room, the alarm indicating light will come on and the transfer jet will shut off.

- 242-A Evaporator Control Room operator of Tank Farms must be notified whenever a leak detection interlock shuts down the transfer.
6. Notify the 242-A Evaporator Control Room operator of the intent to transfer and obtain approval based upon the transfer line leak detector system operability. Provide pre-transfer data to Evaporator Operator and obtain TK-302-A level. Record level on TRANSFER DATA SHEET. _____

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E. TRANSFER TK-F18 TO UGS (Cont.)

DATE: _____

OPERATOR

OSR REQUIREMENT

The sending tank WF must be continuously monitored during jet transfers to UGS.

Do not allow jet to operate if flow stops. The transfer line could be damaged by thermal expansion if steam is allowed to blow into the line. (OSR requirement, see LCO 8.6.3)

7. Jet TK-F18 contents to UGS using JC-F18-1. Continually monitor liquid level on WFR-F18-1 and SpG on SGR-F18. _____
- a. Record transfer start time on the TRANSFER DATA SHEET.
 - b. If any of the following conditions occurs, stop transfer:
 - Liquid level fails to decrease for 3 min or tank is empty.
 - SpG breaks during transfer (the SpG indicates less than 15% of chart on SGR-F18) indicating the presence of organic.
 - c. If agitator is on (i.e., no organic is present in tank as determined by sample results), turn off agitator at 15 WF and jet until TK-F18 is empty.
 - d. If agitator is off (i.e., organic is present in tank as determined by sample results), jet solution until a SpG break is reached or until 7 WF is reached.
 - e. When TK-F18 WF as indicated on WFR-F18-1 has reached a minimum WF, shut off jet controller JC-F18-1.
 - f. If necessary, close steam bleed valves F18-1 and F18-2.
 - g. If tank flush has been completed, go to Step 9.

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E. TRANSFER TK-F18 TO UGS (Cont.)

DATE: _____

OPERATOR

8. Flush Tank Farm transfer lines. If flush is not required, go to step 9.

a. Add 500 gal of flush water by opening valves F15-04 and F15-06.

b. Close valves F15-04 and F15-06.

c. Jet TK-F18 contents to UGS per Step 7.

9. Determine total amount transferred and record on the TRANSFER DATA SHEET. _____

10. Complete remaining After Transfer data on the TRANSFER DATA SHEET. _____

11. Contact 242-A Evaporator Control Room operator and provide ending volume data. Obtain TK-302-A reading and record on TRANSFER DATA SHEET. _____

12. Request the Operations manager to notify Tank Farms management that the transfer is complete. _____

NOTE - The PUREX Operations manager must sign the SUPERVISION NOTIFICATION OF TANK FARMS MANAGEMENT AFTER TRANSFER block on the DATA SHEET.

- There is a 20 min airblow after JC-F18-1 is shut off.

13. Close steam valve F09-01 and nozzle valve F01-01 after 20 min airblow is completed. _____

NOTE - Level may be obtained from Tank Farms Operations or per PO-040-301.

14. Return completed DATA SHEET package to supervision.

NOTE - Supervision will review data and distribute to appropriate people.

- When transfer to UGS is complete, the remainder of this procedure is not required.

9 2 1 2 7 9 3 3 6

E. TRANSFER TK-F18 TO UGS (Cont.)

DATE: _____

OPERATOR

Transfer TK-F18 To Boiling Waste Tank

CAUTION

Do not make transfer of TK-F18 solution to boiling waste tanks unless required temporary jumper change has been made to route the waste through the same route currently used for TK-F16 waste transfers. Verify that all of the following steps are completed to avoid misroutings.

NOTE - Tank F18 waste solutions with heat loads exceeding 0.10 BTU/hr-gal, which cannot be accepted by Tank Farms in nonboiling tanks, will be transferred to a boiling waste tank.

15. Request supervision to ensure that the appropriate canyon route changes have been completed to allow transfer of TK-F18 contents to boiling waste.

NOTE - Tank F16 flex jet route to UGS will be disconnected. Jet controller JC-F16-1 and valve F44-01 must be locked and tagged to prevent TK-F16 transfers.

- Rigid jet jumper or portable jet jumper from TK-F18 nozzle M to F-T39a is installed.

- Steam supply from JC-F18-1 nozzle F-G1 jet side is relocated only to new jet jumper.

16. Open valves F09-01 and F01-01 to valve in steam to jet J-F18-1 and ensure airblow valve F09-04 is open. _____

NOTE - There is an interlock system on the 241-AW valve pit. In the event of a leak into this valve pit, a leak detector alarm will sound in Head End Control Room, the alarm-indicating light will come on and the transfer jet will shut off.

- 242-A Evaporator Control Room operator of Tank Farms must be notified whenever a leak detection interlock shuts down the transfer.

17. Notify the 242-A Evaporator Control Room operator of the intent to transfer and obtain approval based upon the transfer line leak detector system operability. Provide pre-transfer volume data to Evaporator operator. Obtain TK-302-A level and record on TRANSFER DATA SHEET. _____

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E. TRANSFER TK-F18 TO UGS (Cont.)

DATE: _____

OPERATOR

OSR REQUIREMENT

The sending tank WF must be continuously monitored during jet transfers to UGS.

Do not allow jet to operate if flow stops. The transfer line could be damaged by thermal expansion if steam is allowed to blow into the line. (OSR requirement, see LCO 8.6.3)

18. Jet TK-F18 contents to UGS using JC-F18-1. Continually monitor liquid level on WFR-F18-1 and SpG on SGR-F18.
- a. Record transfer start time on the TRANSFER DATA SHEET.
 - b. If either of the following conditions occurs, stop transfer:
 - Liquid level fails to decrease for 3 min or tank is empty.
 - SpG breaks during transfer (the SpG indicates less than 15% of chart on SGR-F18) indicating the presence of organic.
 - c. If agitator is on (i.e., no organic is present in tank as determined by sample results), turn off agitator at 15 WF and jet until TK-F18 is empty. _____
 - d. If agitator is off (i.e., organic is present in tank as determined by sample results), jet solution until a SpG break is reached or until 7 WF is reached. _____
 - e. When TK-F18 WF as indicated on WFR-F18-1 has reached the minimum WF, shut off jet controller JC-F18-1. _____
 - f. If TK-F18 flush has been completed, go to Step 20.

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E. TRANSFER TK-F18 TO UGS (Cont.)

DATE: _____

OPERATOR

19. Flush Tank Farm transfer lines. _____

a. Add 500 gal of flush water by opening valves F15-04 and F15-06.

b. Close valves F15-04 and F15-06.

c. Jet TK-F18 contents to UGS per Step 18.

20. Complete remaining After Transfer data on the TRANSFER DATA SHEET. _____

21. Contact 242-A Evaporator Control Room operator and provide ending volume data. _____

22. Request the Operations manager to notify Tank Farms management that the transfer is complete. _____

NOTE - The PUREX Operations manager must sign the SUPERVISION NOTIFICATION OF TANK FARMS MANAGEMENT AFTER TRANSFER block on the DATA SHEET.

23. Close steam valves F09-01 and F01-01. _____

NOTE - There is a 20. min airblow after JC-F18-1 is shut off.

24. Record TK-302-A liquid level.

NOTE - Level may be obtained from Tank Farm operations or per PO-040-301.

25. Request supervision to have TK-F16 and TK-F18 transfer routes to UGS reinstalled in original configuration. _____

26. Return completed DATA SHEET package to supervision. _____

NOTE - Supervision will review data and distribute to appropriate people.

- When transfer to UGS is complete, the remainder of this procedure is not required.

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F. TRANSFER TK-F18 TO TK-F8 OR TK-F13

1. Request supervision to have route installed from TK-F18 to TK-F8 or TK-F13. _____
2. Check JC-F18-2 for CAUTION tag to verify that the proper route has been installed. If CAUTION tag is not properly identified, notify supervision. _____
3. Ensure that TK-F18 volume to be transferred will not exceed TK-F8 or TK-F13 capacity. If it does, notify supervision. _____

CRITICALITY

ENSURE THAT TRANSFERS TO TK-F8 OR TK-F13 MEET CPS LIMITS FOR THAT TANK WHILE RECEIVING SOLUTION.

4. Check receiving tank HNO₃ concentration.
 - a. Check sending and receiving tank sample analysis for HNO₃. Request samples as necessary.
 - b. Ensure receiving tank HNO₃ concentration follows CPS limits. If receiving tank does not meet CPS limits, request acid addition instructions from supervision. _____
 - c. Ensure combined contents of sending and receiving tank will follow CPS limits. If not, request supervision instruction for nitric acid addition to sending or receiving tank to ensure acid molarity during transfer. _____
5. Transfer contents of TK-F18 using JC-F18-2 as directed by supervision (transfer to TK-F8 per PO-320-008). _____
6. Monitor sump levels during transfer. If leaks are detected, shut down transfer and notify supervision for further instructions. _____

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G. PERFORM LDR NOTIFICATION

1. Enter data as requested on the LAND DISPOSAL RESTRICTION NOTIFICATION FORM.
2. Enter tank number and Batch ID number on FORM.
3. Using waste code designations, enter the appropriate waste code(s) information as listed in the section labeled Waste Code.
 - a. If the pH is greater than 12.5, enter the D002 waste code on the FORM and enter DEACT in the TREATMENT STANDARD column as shown on Figure 1. Enter other codes and enter N/A where shown in figure.
 - b. If the pH is less than 12.5, fill out NOTIFICATION FORM as shown in Figure 2. Enter N/A where shown in figure.
4. Have supervision or authorized delegate sign FORM.
5. Ensure that a copy of the DATA SHEET containing sample results for solution after final neutralization is attached to FORM.
6. FAX the FORM to the Tank Farms Shift manager on 3-3404 before making transfer.
7. Make a copy of the FORMS for retention.
8. Mail the FORM original to the appropriate Tank Farms Receiving cognizant engineer at MSIN R1-51.

NOTE - A list of the cognizant engineers and phone numbers is listed in Table 2.

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TK-F3 ACID ADDITION TO TK-F18(.3M HEEL)

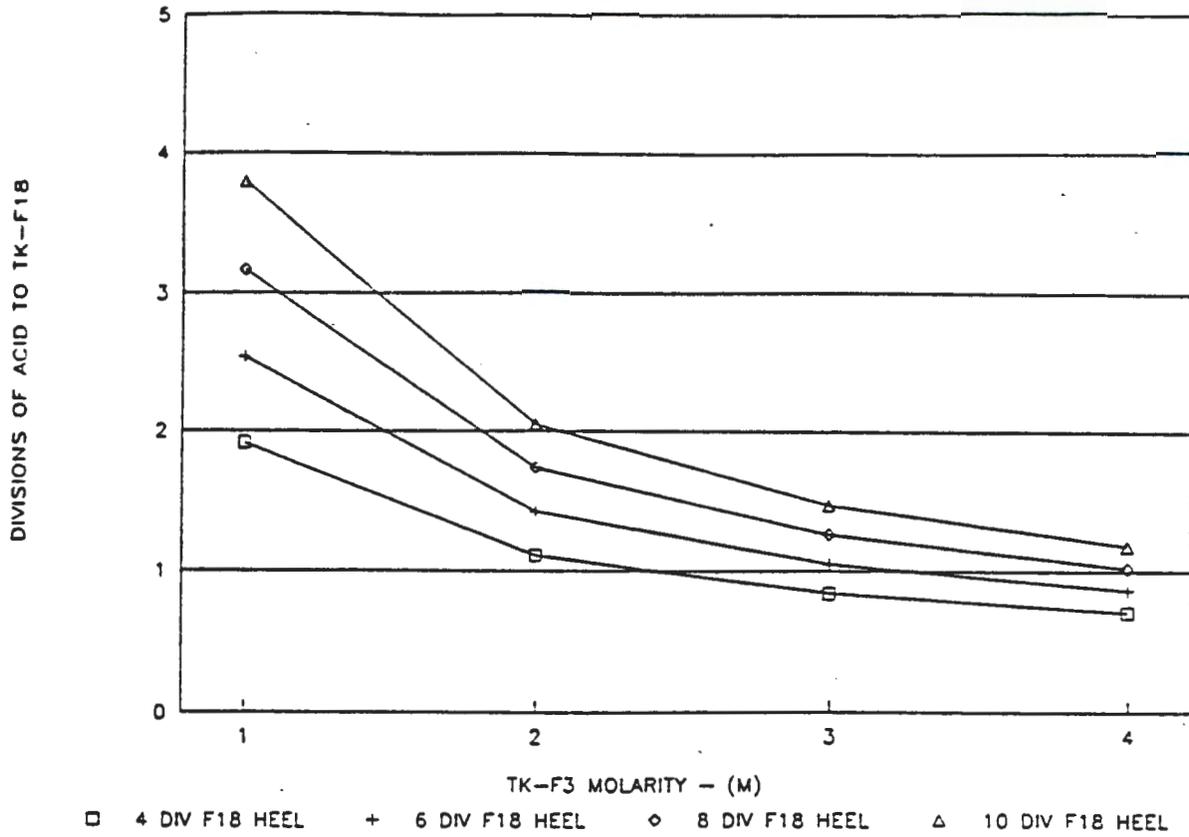


FIGURE 1

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FIGURE 1

LAND DISPOSAL RESTRICTION NOTIFICATION FORM

Facility PUREX

October 8, 1990

Source TK-F15/F16

EXAMPLE ONLY

Batch No. 12347

The following restricted waste does not meet the treatment standards for the following constituents:

<u>WASTE CODE</u>	<u>TREATMENT STANDARD</u>	<u>PROHIBITION</u>
D002	DEACT	N/A
D006	1 mg/l	N/A
D007	5 mg/l	N/A
D008	5 mg/l	N/A

The following restricted waste meets the treatment standards for the following constituents:

<u>WASTE CODE</u>	<u>TREATMENT STANDARD</u>	<u>PROHIBITION</u>
N/A	N/A	N/A

Waste analysis or process knowledge of these constituents is attached.

(Signature)

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FIGURE 2

LAND DISPOSAL RESTRICTION NOTIFICATION FORM

Facility PUREX

Date October 8, 1990

Source TK-F15/F16

EXAMPLE ONLY

Batch No. 12347

The following restricted waste does not meet the treatment standards for the following constituents:

<u>WASTE CODE</u>	<u>TREATMENT STANDARD</u>	<u>PROHIBITION</u>
D006	1 mg/l	N/A
D007	5 mg/l	N/A
D008	5 mg/l	N/A

The following restricted waste meets the treatment standards for the following constituents:

<u>WASTE CODE</u>	<u>TREATMENT STANDARD</u>	<u>PROHIBITION</u>
N/A	N/A	N/A

Waste analysis or process knowledge of these constituents is attached.

(Signature)

921279344

APPENDIX A

LDR REQUIREMENTS FOR PUREX

Notification requirements for waste falling under Land Disposal Restriction (LDR) regulations are stated in 40CFR 268.7. Application of the requirements for PUREX means that every shipment or transfer of waste to Double Shell Tanks (DSTs) must be accompanied by the appropriate notification.

PUREX waste constituents are checked for LDR determination by monitoring characteristics such as corrosivity, reactivity, ignitability and Toxicity Characteristic (TC). (Lead and mercury are examples of TC wastes.) Monitoring of constituents can be by sampling or by process knowledge. Since most of the constituents are not routinely sampled for, PUREX process knowledge dictates that certain constituents appear in specific waste streams (Refer to Table 2). PUREX waste volumes become LDR when the following limits are exceeded:

<u>CONSTITUENT</u>	<u>WASTE CODE</u>	<u>LIMIT</u>
Ignitability	D001	Deact*
Corrosivity	D002	pH ≤ 2 or ≥ 12.5
Reactivity	D003	Deact*
Arsenic	D004	5 mg/L
Barium	D005	5 mg/L
Cadmium	D006	1 mg/L
Chromium	D007	5 mg/L
Lead	D008	5 mg/L
Mercury	D009	0.2 mg/L
Selenium	D010	1 mg/L
Silver	D011	5 mg/L

* Deact means to make amenable to treatment standards by a wide variation of means. Tanks TK-U3 and TK-U4 are the only tanks concerned with ignitability and reactivity as a result of past waste dumping practices.

In addition to Pu and U, the PUREX sample schedule requires a pH analysis for each batch of waste transferred to DSTs. This is to insure that the Tank Farms's specification of pH > 2 or < 12.5 is met. Waste with a pH between 12 and 12.5 is a special case as it is transferrable and not LDR waste. Routine analysis for other metals (TC wastes) is not performed and process knowledge used to determine the presence of those constituents. Streams containing those constituents are considered LDR even though the levels may be below the limits.

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TABLE 1

<u>TANK FARMS COGNIZANT ENGINEERS</u>		<u>PHONE</u>
AW/AN Farms	John Harris	3-3515
DCRTs/AP Farm	Don Scully	3-2408
SY Farm	Ken Engelhardt	3-1148
AY/AZ	Ryan Dodd	3-5629
204AR	Paul Johnson	3-1970

<u>TANK FARMS ENVIRONMENTAL ENGINEERING</u>		<u>PHONE</u>
Joel Eacker, Manager		3-5090
Dale Halgren		3-4987

2150E FAX

3-2908 or 3-4095

921 : 79 346

LAND DISPOSAL RESTRICTION NOTIFICATION FORM

Facility PUREX

Source _____

DATE _____

Batch No# _____

The following restricted waste does not meet the treatment standards for the following constituents:

<u>WASTE CODE</u>	<u>TREATMENT STANDARD</u>	<u>PROHIBITION</u>
		N/A

The following restricted waste meets the treatment standards for the following constituents:

<u>WASTE CODE</u>	<u>TREATMENT STANDARD</u>	<u>PROHIBITION</u>
N/A	N/A	N/A

Waste analysis or process knowledge of these constituents is attached.

(Signature)

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INPUTS TO TK-F18 DATA SHEET SX SUMPS AND MISCELLANEOUS TRANSFER TO TK-F18

OSR REQUIREMENT: Steam must be bled into TK-F18 at $\geq 60\text{lb/hr}$ or the Solution in TK F-18 is to be greater than $45\text{ }^\circ\text{C}$ whenever NaOH is added to A, B, C or E Cell Sump Solutions, OR Alkaline, Ammoniacal Solutions are transferred into TK-F18.

Date	Time	Oper.	Source	Volume	TK F-18				Acid Add. (gal.)	Nitrate Add. (gal.)	NaOH Add. (gal.)	Supervisor Approval (or waived)	Remarks
					Initial		Final						
					WF	SpG	WF	SpG					

NOTE: Ensure that PUREX ACCOUNTABILITY TANK-TO-TANK TRANSFER DATA SHEET and HEADEND INPUTS TO TK-F18 DATA SHEET are completed in addition to this DATA SHEET.

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9 2 1 2 7 9 0 3 4 9

TANK TO UGS TRANSFER DATA SHEET
F18/R8/G8/U3/U4

SHIPPING TANK	DATE	CATCH TANK 302-A	BEFORE-TRANSFER	AFTER-TRANSFER
RECEIVING TANK	BATCH #	TAPE READING (in)		
BOARD READINGS				
TANK	PRE-NEUTRALIZATION	PRE-TRANSFER	POST TRANSFER	FLUSH VOLUME
WF				
SpG				
TEMP				
GALLONS				
PRE-NEUTRALIZATION SAMPLE RESULTS		TRANSFERRED		
SAMPLE NUMBERS		DATE/TIME		/
SpG		TRANSFER DATE/TIME		/
U(g/L)		HEAT LOAD(BTU'S)		FUEL AGE
Pu(g/L) CRITICALITY LIMIT <.013 g/L		TOTAL Pu IN BATCH _____=[Pu(g/L) X (a) X 3.785] (Criticality limit less than 200 g Pu)		
Np(g/L)		All transfers: pH >12, NO ₂ >.011M, F18 transfers to boiling waste only: OH >.8m		CORRECTIVE ACTION: Add caustic or sodium nitrite as necessary to bring pH and NO ₂ conc. within spec.
pH(LAB)		NaOH Calculations: (if using KOH, multiply NaOH calc. by 1.42)		
CAUSTIC RATIO (d)		1st addition=(a) x (d) / (12.92)		
MGR/ENGR VERIFY		2nd addition=(e)*(a+f+g)/(12.92)		
POST NEUTRALIZATION CHEMICAL ADDITION DATA:				
TANK ADDITIONS	1st ADD	2nd ADD	OTHER ADD	TOTAL
CAUSTIC		(f)		
NaNO ₂		(g)		
SUPV PERMISSION				
ENGR PERMISSION				
POST NEUTRALIZATION SAMPLE RESULTS				
LAB RESULTS	1ST NEUTRALIZATION	2ND NEUTRALIZATION	SUPERVISION NOTIFICATION OF TANK FARMS MANAGEMENT	
SAMPLE NUMBERS			BEFOR TRANSFER	
pH(LAB)*			PUREX/TF INIT	
NaNO ₂ *			AFTER TRANSFER	
CAUSTIC RATIO	(e)			
MGR VERIFY				
ENGR VERIFY				

Reference Only

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PERMISSION TO TRANSFER: OPERATIONS SUPERVISOR _____
 ENGINEER _____