0025160

START ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 144918

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Supersedure [ ] Discovery [ ] Cancel/Void [ ]	R. L. Hobart/17523/S6-19/3-2316		11/16/92
	5. Project Title/No./Work Order No. PUREX/A2D99	6. Bldg./Sys./Fac. No. M0273/D101/200E	7. Impact Level 3EQ
	8. Document Number Affected (include rev. and sheet no.) WHC-SD-CP-PLN-013, Revision ~~1~~ 0	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work	11b. Work Package Doc. No.	11c. Complete Installation Work	11d. Complete Restoration (Temp. ECN only)
[ ] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

Complete Revision.

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 samples which will be taken of the CSL flow. Sample types include process, environmental record and TPA characterization.

Modifications were incorporated from WHC, RL, Ecology and EPA.

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DEC 1992 RECEIVED EDMC

13a. Justification (mark one)	13b. Justification Details
Criteria Change [X] Design Improvement [ ] Environmental [ ] As-Found [ ] Facilitate Const. [ ] Const. Error/Omission [ ] Design Error/Omission [ ]	Revision 0 was updated to incorporate comments from WHC, RL, Washington State Ecology and EPA.

14. Distribution (include name, MSIN, and no. of copies)

Diediker, L. P.	T1-30	Midgett, J. C.	S6-15
Farwick, D. G.	H4-16	Morrison-Beyer, C. D.	S0-61
Flyckt, D. L.	R3-45	P'Pool, R. K.	T1-30
Hendrix, M. S.	T6-08	Speer, D. R.	R1-48
Hobart, R. L.	S6-19	Wollam, C. D.	S6-19

RELEASE STAMP

OFFICIAL RELEASE BY WHC 53
DATE DEC 08 1992
Station #1

A-7900-013 (11/88)

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 144918

15. Design Verification Required

- ☐ Yes
- ☒ No

16. Cost Impact

	ENGINEERING	CONSTRUCTION
Additional	☐ $	☐ $
Savings	☐ $	☐ $

17. Schedule Impact (days)

- Improvement ☐
- Delay ☐

18 Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

N/A

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☐	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐		☐
Environmental Report	☐	Inspection Plan	☐		☐
Environmental Permit	☐	Inventory Adjustment Request	☐		☐

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision
N/A		

20 Approvals

OPERATIONS AND ENGINEERING	Signature	Date
Cog. Project Engineer	[signature]	11-17-92
Cog. Project Engr. Mgr	[signature]	11/17/92
QA/ESQ	D. G. Farwick (Per telecon RHT 1303)	11/18/92
Safety		
Security		
Proj.Prog./Dept Mgr.	D. R. Speer [signature]	11/18/92
Def. React. Div		
Chem. Proc. Div.		
Def. Wst. Mgmt. Div.		
Adv. React. Dev. Div.		
Proj. Dept.		
Environ. Div.	L. P. Diediker [signature]	11/15/92
IRM Dept.		
Facility Rep. (Ops)	J. C. Midgett [signature]	11/17/92
Other	D. G. Harlow [signature] for	11/17/92

ARCHITECT-ENGINEER	Signature	Date
PE		
QA/ESQ	C. A. Colvin [signature]	11/17/92
Safety		
Design		
Liquid Effluent Process Engineering Other	D. L. Flyckt [signature]	11/18/92
Hanford Analytical Service Management	M. S. Hendrix [signature]	11/18/92
Sampling and Mobile Labs	C. D. Morrison-Beyer [signature] for CD Morrison-Beyer	11/18/92

DEPARTMENT OF ENERGY

ADDITIONAL

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SUPPORTING DOCUMENT

1. Total Pages 65

2. Title	3. Number	4. Rev No.
PUREX CSL Sampling and Analysis Plan	WHC-SD-CP-PLN-013	1

5. Key Words

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Sampling and Analysis Plan

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V. Birkland 11/25/92

6. Author

Name: R. L. Hobart

C.D. McClain for R.L.H.
Signature

Organization/Charge Code 17523/A2D99

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 for the processes and lines contributing to the CSL and discussions of the samples which will be taken of the CSL flow. Sample types include process, environmental record and TPA characterization.

Revision 1 incorporates comments from internal and regulatory sources.

9. Impact Level 3EQ

10. RELEASE STAMP

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Station #1

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pg a.

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RECORD OF REVISION	(1) Document Number WHC-SD-CP-PLN-013	Page i

(2) Title
PUREX CSL Sampling and Analysis Plan

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
RS 1	(7) Complete revision to incorporate comments to Revision 0 by WHC, Department of Energy-Richland Field Office, Environmental Protection Agency, Washington State Department of Ecology.	[signature]	C.D. [signature] 12/8/92

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CONTENTS

APPENDIX

LIST OF FIGURES

LIST OF TABLES

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A. SAMPLING OBJECTIVES

A.1 INTRODUCTION

The *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) was signed by the Washington State Department of Ecology (Ecology), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE) on May 15, 1989. Restrictions on the disposal of liquid effluents to the soil column at the Hanford Site are found in Tri-Party Agreement Milestone M-17-00 and corresponding interim milestones. Sampling and Analysis Plans (SAP) are required for the 33 Phase I and Phase II streams that are presently discharged to the soil column. These SAPs are subject to the approval of EPA and Ecology.

This SAP, the *Plutonium-Uranium Extraction Chemical Sewer Sampling and Analysis Plan*, WHC-SD-CP-PLN-013, was prepared for the Plutonium-Uranium Extraction (PUREX) Plant chemical sewer (CSL) and establishes the requirements and guidelines used by Westinghouse Hanford Company (WHC) in implementing an upgraded liquid effluent sampling program for the PUREX CSL. This is the only PUREX SAP because all other PUREX (non-sanitary) liquid effluent streams have been shut down and blanked off (see Section B.2.2). It also provides for representative sampling of the PUREX CSL stream and accounts for expected variations in volumes and contaminant concentrations due to facility operational conditions. Revision 0 of this SAP was submitted on September 30, 1991, to fulfill Tri-Party Agreement Milestone M-17-12. This document, Revision 1 incorporates comments from EPA and Ecology on Revision 0. Guidance from EPA and DOE-Headquarters on the establishment of data quality objectives has also been incorporated into this document.

This SAP was prepared in accordance with requirements specified in the *Liquid Effluent Sampling Quality Assurance Program Plan* (QAPP), WHC-SD-WM-QAPP-011 (Sommer 1992). The QAPP provides the Hanford Site guidelines and requirements for special high-quality liquid effluent sampling activities, which include the following: overall scope and direction to the sampling activities, control of samples, laboratory analyses, processing of data, control of data, quality assurance (QA) requirements, and corrective actions used in obtaining high-quality data for the liquid effluent sampling program. The high-quality data are obtained from controlled grab samples, called "liquid effluent characterization samples," that are used to characterize the distribution of analytes in the effluent and to determine which analytes will require further monitoring in the future by the facility's routine monitoring program.

The QAPP was written to allow each facility some flexibility in accommodating the Hanford Site requirements. One prime reason for flexibility is the differences in procedures for surveying radiation sources at each facility. The SAP identifies facility-specific exceptions to the QAPP, which include changes to the required list of analytes. The QAPP requirements for chain of custody, laboratory analysis, validation of data, control of records, and corrective actions shall not be modified by this SAP.

The SAP is a facility-specific document for describing how the requirements of the QAPP shall be implemented for activities occurring at the facility. The SAP provides a general description of the procedures that will be used to execute the work needed to implement the QAPP requirements. In addition, the SAP describes how the liquid effluent characterization samples and data will be integrated with the existing liquid effluent monitoring program (routine monitoring program).

The routine monitoring program was implemented to meet the requirements of the DOE Order 5400.1 (DOE 1990). The *Facility Effluent Monitoring Plan* (FEMP) *for the Plutonium-Uranium Extraction Facility*, WHC-EP-0468 (WHC 1991) was issued in September 1991 and provides a detailed description of the routine monitoring program. The routine monitoring program complies with the requirements in the *Quality Assurance Project Plan for Facility Effluent Monitoring Plan Activities*, WHC-EP-0446-1 (WHC 1992a). The existing routine monitoring program will not be altered unless the liquid effluent characterization sampling in this SAP identifies a significant discrepancy in analyte concentration data as compared with the data obtained from routine monitoring.

A.2 OBJECTIVES

This SAP provides information on how sampling and analysis of the PUREX CSL will be performed to accomplish the desired objectives.

The primary objectives of the SAP are to:

- Obtain several sets of known quality data to develop a long term sampling plan.
- Confirm the analyte concentration data reported in the stream specific reports and the conclusion that the stream does not contain dangerous waste as defined in Washington Administrative Code (WAC) 173-303, "Dangerous Waste Regulations," as amended.

The secondary objectives are to:

- Provide highly quality controlled data for the evaluation of routine process sampling methods so that existing data can be evaluated and utilized.
- Provide solid waste loading data to support development of waste water treatment projects and groundwater remediation studies.
- Provide historical data for the WAC 173-240 engineering reports and WAC 173-216 waste discharge permit applications.
- Collect data to support preparation of a groundwater impact assessment for continued discharge to the 216-B-3 pond to fulfill Tri-Party Agreement Milestone M-17-13.
- Collect data to support future remedial activities for the 216-B-3 pond.

Quality assurance objectives for the sampling activities are described in the QAPP (Sommer 1992).

A.3 APPROACH

This SAP has been prepared to describe a program for obtaining high quality sampling data that will identify the types of contaminants found in the CSL from the PUREX Plant. The data will come from liquid effluent characterization samples that have quality controlled and verifiable methods for collecting the sample media, transportation of the sample to the analytical laboratory, chain-of-custody documentation, analysis of the sample, statistical evaluation of the analytical results, and the storage of sample records. All liquid effluent characterization sampling work shall be performed according to approved written procedures. The procedures shall comply with the requirements of *Test Methods for Evaluating Solid Waste*, EPA SW-846 (EPA 1986).

All WHC personnel associated with collection of liquid effluent characterization samples, processing of the samples, processing of the data, and control of records shall comply with the procedures related to their responsibilities. The personnel shall sign a document verifying that they have read and understand the procedures. The signed documents shall become part of the training records.

The liquid effluent characterization samples are grab samples because some constituents (volatile organics, ammonia) are unstable with time. Grab samples are used to minimize the holding time from sample collection to laboratory analyses to prevent a significant loss of these unstable analytes.

Liquid effluent characterization samples shall be obtained at least twice during the twelve months following approval of this SAP. In addition, liquid effluent characterization samples shall be obtained on the raw water supply system. These samples are to be analyzed for chemical constituents selected from Appendix A of the QAPP (Sommer 1992) that are of concern for designating dangerous waste characteristics and for preparation of discharge permits. Chemical analytes that are not detected will be eliminated from the list of analytes in future liquid effluent characterization samples. Chemical analytes found in both the effluent and raw water at equivalent concentration levels will also be eliminated from the list of analytes. The amended list shall be a Class 3 change in accordance with the Tri-Party Agreement (Ecology et al. 1990) as stated in the QAPP. A Class 3 change does not impact interim milestones, and requires approval of the assigned DOE and lead regulatory agency unit managers. A more complete definition of a Class 3 change may be found in Section 12.2 of the Tri-Party Agreement. Chemical analytes found to be added by Plant operations with significant measurable quantities shall be included in the list of analytes for the existing routine monitoring sampling program. The document used for determining significance in amending the routine list of analytes is WAC 173-200, "Water Quality Standards for Ground Waters of the State of Washington."

The liquid effluent characterization samples shall also be used to provide a quality control check on the procedures and methods used in the existing routine monitoring sampling program. During the sampling for liquid effluent characterization samples, extra sample bottles shall be obtained and sent to the onsite process control laboratory for analysis. The process control laboratory shall run an analysis using the same list of analytes and procedures as for routine samples. The routine sampling results will be compared with the liquid effluent characterization sampling results for common analytes. Recurring significant differences in data will be used as a basis for preparing a plan of corrective action to improve the existing routine sampling program.

The past routine samples provide an important pool of historical data. The number of samples provide soil column and process equipment solids loading information for future remediation studies, treatment process design, and permitting documentation. The data from the samples will also be used to determine the causes of seasonal, climatic, and operational variations in the quality of the liquid effluent. The SAP includes the existing routine sampling program for the accumulation of historical information and to provide a baseline data pool for comparing the reliability and validity of past data.

B. SITE BACKGROUND

This section describes the processes that produce the PUREX CSL waste, the CSL waste properties, and the disposal site that receives the CSL waste.

B.1 PLANT FACILITY DESCRIPTION

The PUREX Plant is a collection of buildings and facilities located in the 200 East Area of the DOE's Hanford Site (Figure B-1). The main building, 202-A, is a heavily shielded reinforced concrete structure known as the canyon building. Other facilities include the 203-A Pumphouse and Uranium Product Storage Facility, the 211-A Pumphouse and Chemical Storage Facility, the 2714-A Chemical Storage Warehouse, the 206-A Acid Fractionator Building, the 291-A Ventilation Facility, the 295-AC Effluent Monitoring Building, the 2901-A High Tank, the 2712-A Building, and the 2711-A-1 Building. Figure B-2 is a plot plan for the PUREX Plant.

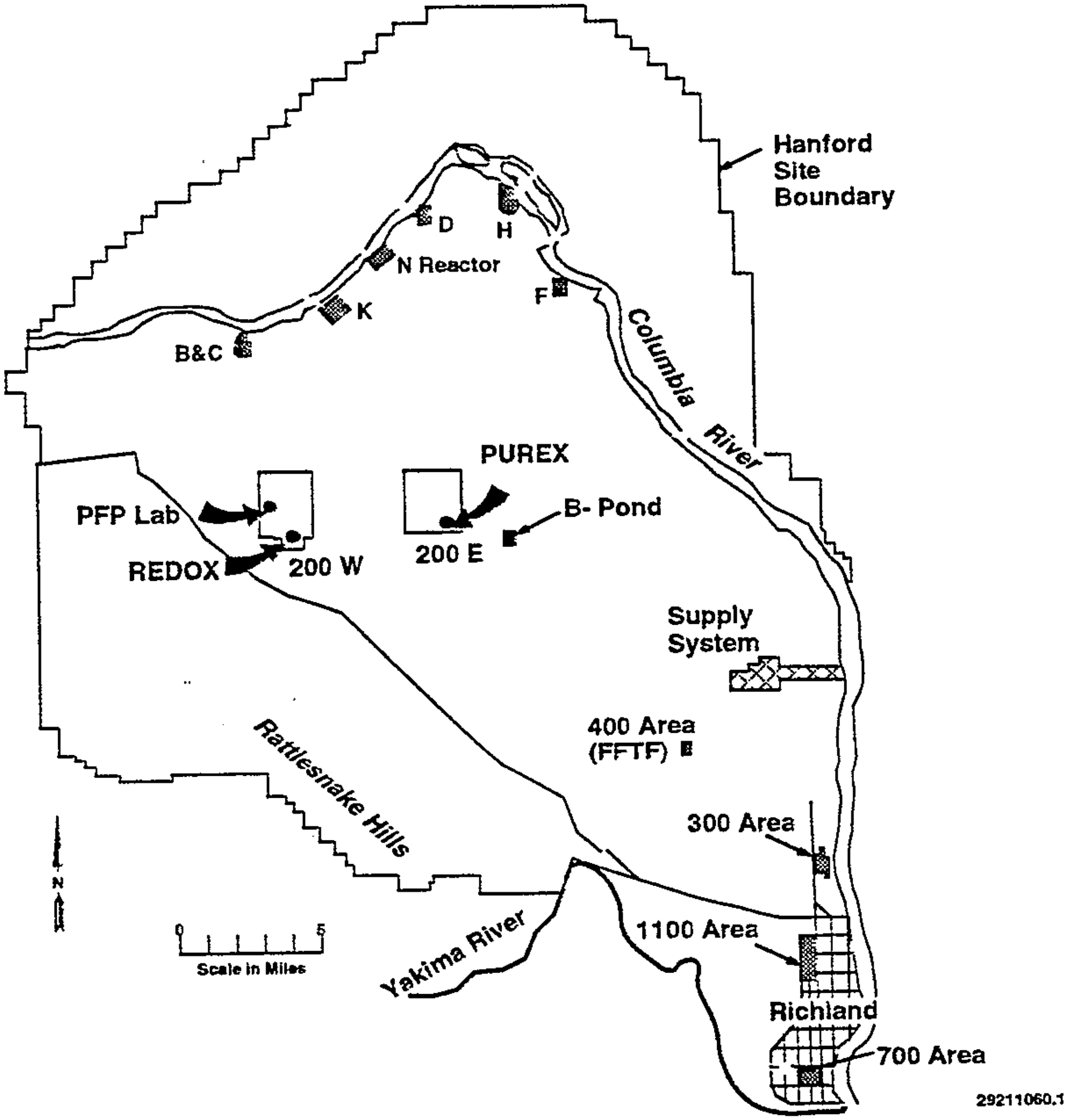
B.1.1 The 202-A Building

The 202-A Building is a reinforced concrete structure 306 m (1,005 ft) long, 36 m (119 ft) wide at its maximum, and 30 m (100 ft) high, with about 12 m (40 ft) 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 process cells, the ventilation air tunnel, the hot pipe trench, the canyon proper, and the crane cab gallery.

The process cells are rooms shielded with massive concrete 3 m (9 ft) thick near the base on the north side) designed to reduce the radiation field on the outside of the canyon to 0.01 milliSievert per hour (mSv/h). The process cells contain most of the process equipment. The floor of the canyon cells is a layer of reinforced concrete 1.7 m (5.5 ft) 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 1 mSv/h.

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 sampling and release of the air to the atmosphere. The ventilation exhaust system ensures that air flows from areas of lower potential contamination to areas of higher potential contamination, thereby helping to prevent the spread of radioactive contamination.

Figure B-1. Location of the Plutonium-Uranium Extraction Plant within the Hanford Site.



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1. 275-EA Warehouse
2. CSL Pit (Manhole #4)
3. 295-AC CSL Sample Bldg
4. 206-A Fractionator
5. Laboratory Sample Receiving Dock
6. 203-A UNH Pump House/Control Room
7. PR-Dock
8. 295-AB PDD (Process Distillate)
9. A-4 PIT/PDD Pit
10. 213-A Reg Maint. Workshop
11. 291-AB Sample Shack
12. Shielded Valve Pit
13. 291-AC Instr. Shack
14. 291-AG Instr. Shack
15. 291-AJ Instr. Shack
16. 291-AE #1 Filter Bldg
17. 295-AA SCD (Steam Condensate)
18. 291-AH Ammonia Off Gas Filter Bldg.
19. 291-AH Ammonia Off Gas Sampler Bldg.
20. 212-A Load Out
21. 294-A Instr. Shack
22. 293-A Dissolver Off Gas Bldg.
23. 292-AB Main Stack Bldg.
24. 295-A ASD (Ammonia Scrubber)
25. 201-A Pump Pit
26. 295-AD CWL (Cooling Water)
27. BT2 Exhauster Area
28. 252-A
29. 281-A Emergency Generators
30. MO-312
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. 84-15323
41. 202A-T-1
42. MO-023 Engineering Trailer
43. 2711-A-1
44. 2712-A
45. Hydrogen Peroxide Tanks
46. 291-A Exhaust Fans
47. 218-E-14 Storage Tunnel
48. 218-E-15 Storage Tunnel
49. 216-A-5
50. 2901-A Water Tank
51. 276-A R Cell

K = Kaiser Related Facilities

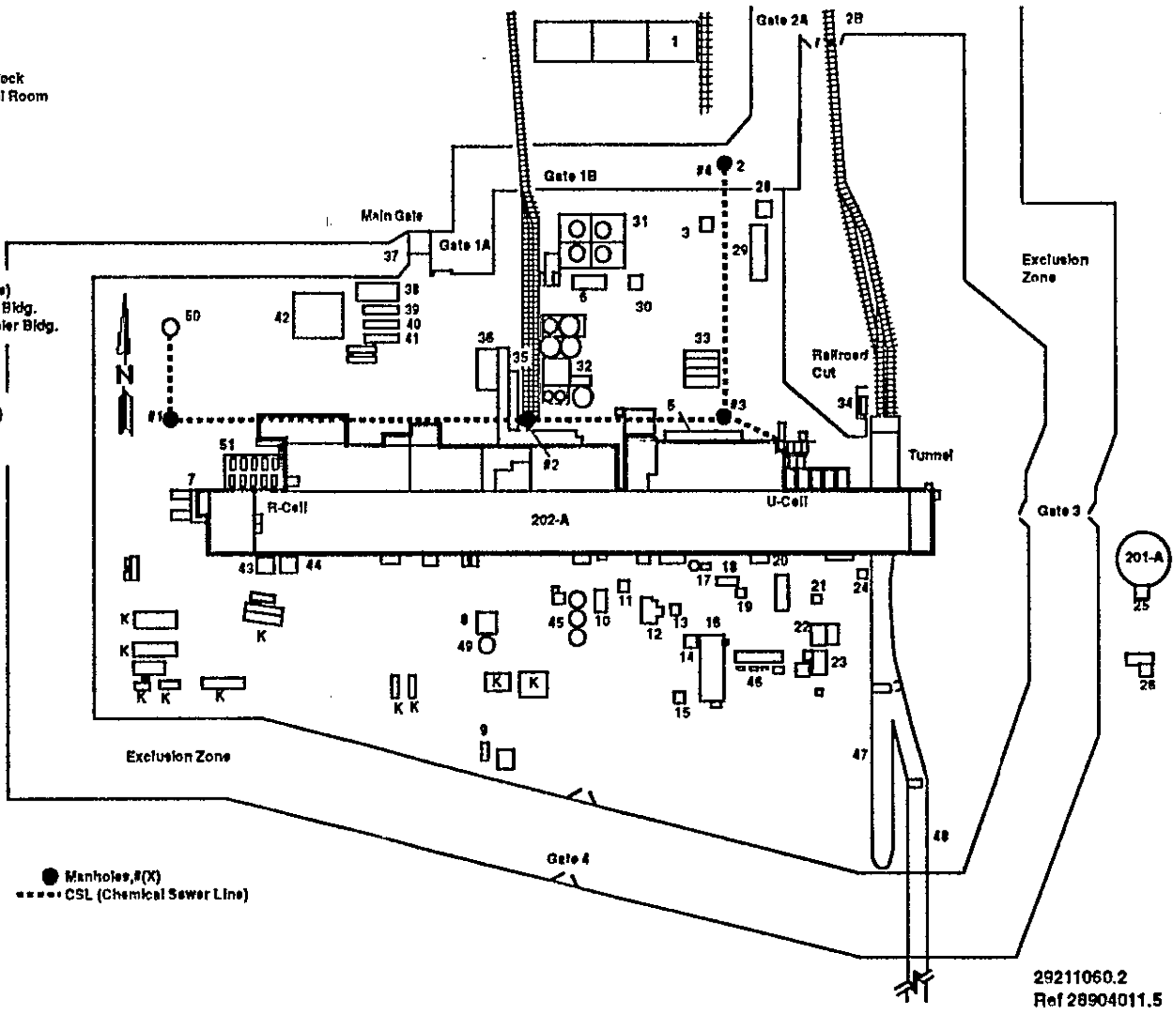

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Figure B-2. Plutonium-Uranium Extraction Plant Plot Plan.

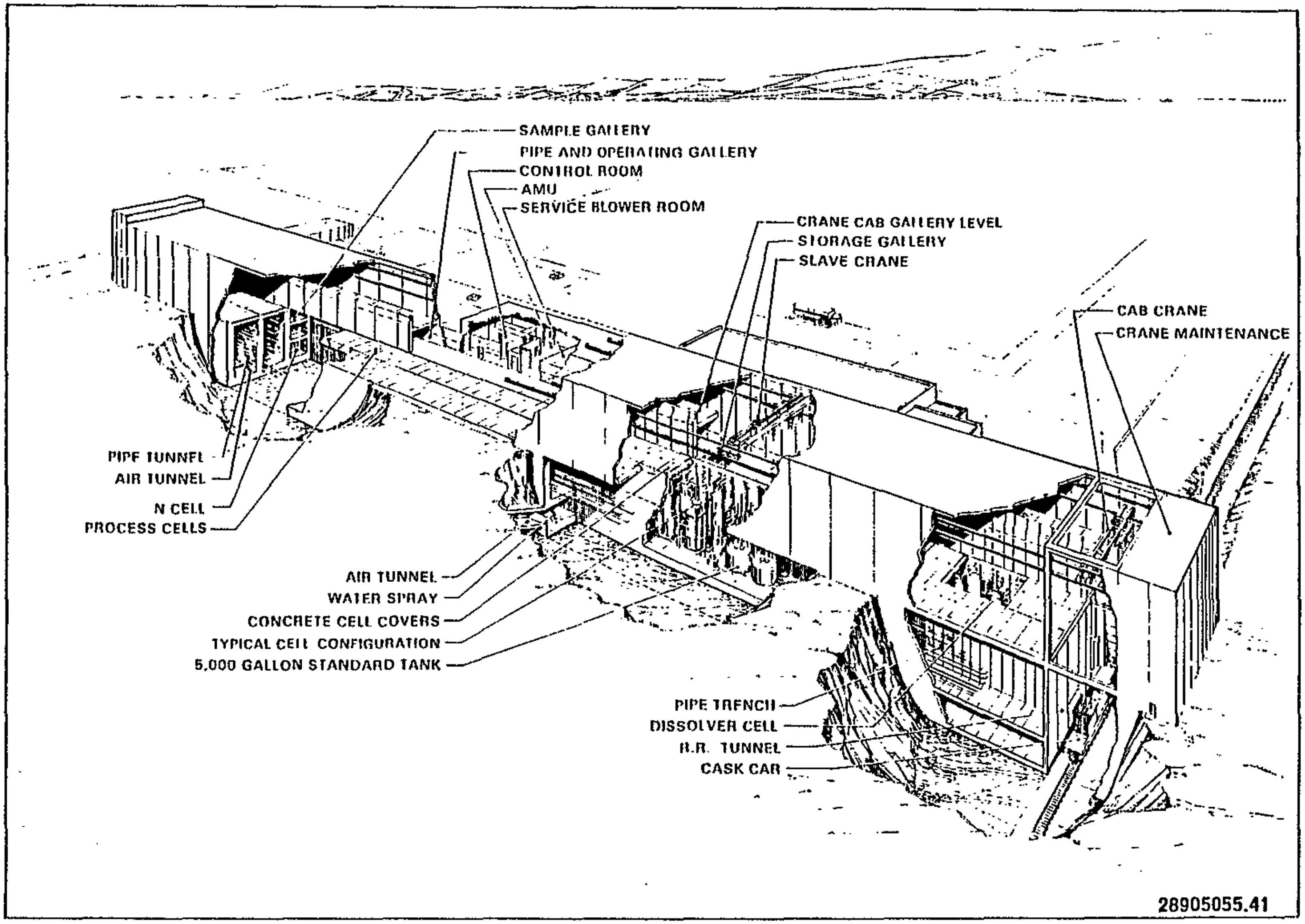


Figure B-3. Sketch of the 202-A Building.

The hot pipe trench, located above the ventilation air tunnel, contains pipes that 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 canyon deck is the floor of the main part of the canyon proper. The process cells, ventilation air tunnel, and hot pipe trench are all located below grade.

The canyon proper is a large, long room that 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. The railroad tunnel is 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 that run nearly the length of the building: the pipe and operating (P&O) gallery, which contains cold side (or nonradioactive service) 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 a source of some of the CSL waste.

Service annexes, located north of the galleries, contain control rooms, offices, rest rooms, change rooms, lunch rooms, the PUREX Laboratory, the aqueous makeup (AMU) area, 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.

B.1.2 203-A Pumphouse and Uranium Product Storage Facility

The 203-A Pumphouse and Uranium Product Storage Facility receives and stores the aqueous uranium nitrate product from the PUREX Plant, together with recycled nitric acid from the Uranium Trioxide (UO_3) Plant and contaminated or off-specification uranium nitrate solution. The 203-A Uranium Product Storage Facility (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 solutions contained in the storage tanks, and pumps and piping to receive, transfer, and sample the solutions.

*Transite is a trademark of J-M A/C Pipe Corporation.

B.1.3 211-A Pumphouse and Chemical Storage Facility

The 211-A Pumphouse and Chemical Storage Facility receives and stores bulk liquid chemicals for use in the PUREX process. The 211-A Chemical Storage Facility (tank farm) stores bulk chemicals including 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. Efforts to remove the chemicals are underway. The 211-A Pumphouse, located in the midst of the 211-A Chemical Storage Facility, contains pumps, piping, controls, and samplers used to receive, store and transfer the chemicals in the facility, and houses the water demineralizers.

B.1.4 2714-A Chemical Storage Warehouse

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

B.1.5 206-A Acid Fractionator Building

The 206-A Acid Fractionator 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 the PUREX Plant is processing fuel, the heat transfer piping in the vacuum fractionator is a major source of the CSL waste. The nitric acid recovery made possible by the vacuum fractionator substantially decreases the quantity of mixed waste produced by the PUREX Plant. This recovery also decreases the quantity of chemicals that must be purchased for processing.

B.1.6 291-A Ventilation Facility

The 291-A Ventilation Facility includes filters, plenums, a fan house, a 61-m-tall (200-ft) concrete stack, a fiber reinforced resin stack, and sampling/monitoring equipment for the ventilation exhaust from the 202-A Building canyon and process vessels. Of particular interest is the fourth filter building, 291-AE. This building contains multiple stages of high-efficiency particulate air (HEPA) filtration for the canyon exhaust system. The heating system for this building produces a steam condensate, which has been rerouted to the CSL.

B.1.7 295-AC Effluent Monitoring Building

The 295-AC Effluent Monitoring Building houses sampling and monitoring equipment for the CSL. Several small buildings and other enclosures contain equipment for monitoring the liquid and gaseous effluent streams that are not in current use because all process liquid effluents except for the CSL have been shut down.

B.1.8 2901-A High Tank

The 2901-A High Tank is a water tank that provides an emergency supply of sanitary water to the PUREX Plant primarily for fire protection. 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 throughout the 202-A Building and is used for air sampling and monitoring. These vacuum pumps produce a seal water effluent that flows to the CSL.

B.1.10 The 2711-A-1 Building

The 2711-A-1 Building contains a dry air supply system. The dry air supply system operates intermittently, and produces a cooling water stream that flows to the CSL via the 216-A-42 retention basin.

B.2 PROCESS DESCRIPTION

The PUREX Plant is not currently operating. Nevertheless, past operations are responsible for some of the current liquid effluent releases to the PUREX CSL. Consequently, the discussion of the PUREX Plant processing begins with an overview of the PUREX Plant process, and then discusses conditions during transition and standby modes.

B.2.1 Plutonium-Uranium Extraction Process Overview

The PUREX Plant for nuclear fuel processing is located in the 200 East Area of the Hanford Site, and 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 are the CSL (chemical sewer), SCD (steam condensate), PDD (process distillate), ASD (ammonia scrubber condensate), and CWL (cooling water).

B.2.2 Standby and Transition to Standby

In late 1990, DOE determined that the plutonium contained in the irradiated fuel stored at the Hanford Site 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 viable alternatives. Processing of irradiated fuel at the PUREX Plant, which is one alternative, has been discontinued pending the outcome of the review of disposition alternatives for the irradiated fuel. In the interim, the PUREX Plant is 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 DOE may specify in the future. During this period, there will be no SCD, PDD, ASD, or CWL. The PDD and ASD discharge lines have been blanked and the SCD and CWL streams have been eliminated by blanking most potential tributaries to the streams. The others are intermittent tributaries that have been rerouted to the CSL.

B.3 CHEMICAL SEWER STREAM DESCRIPTION

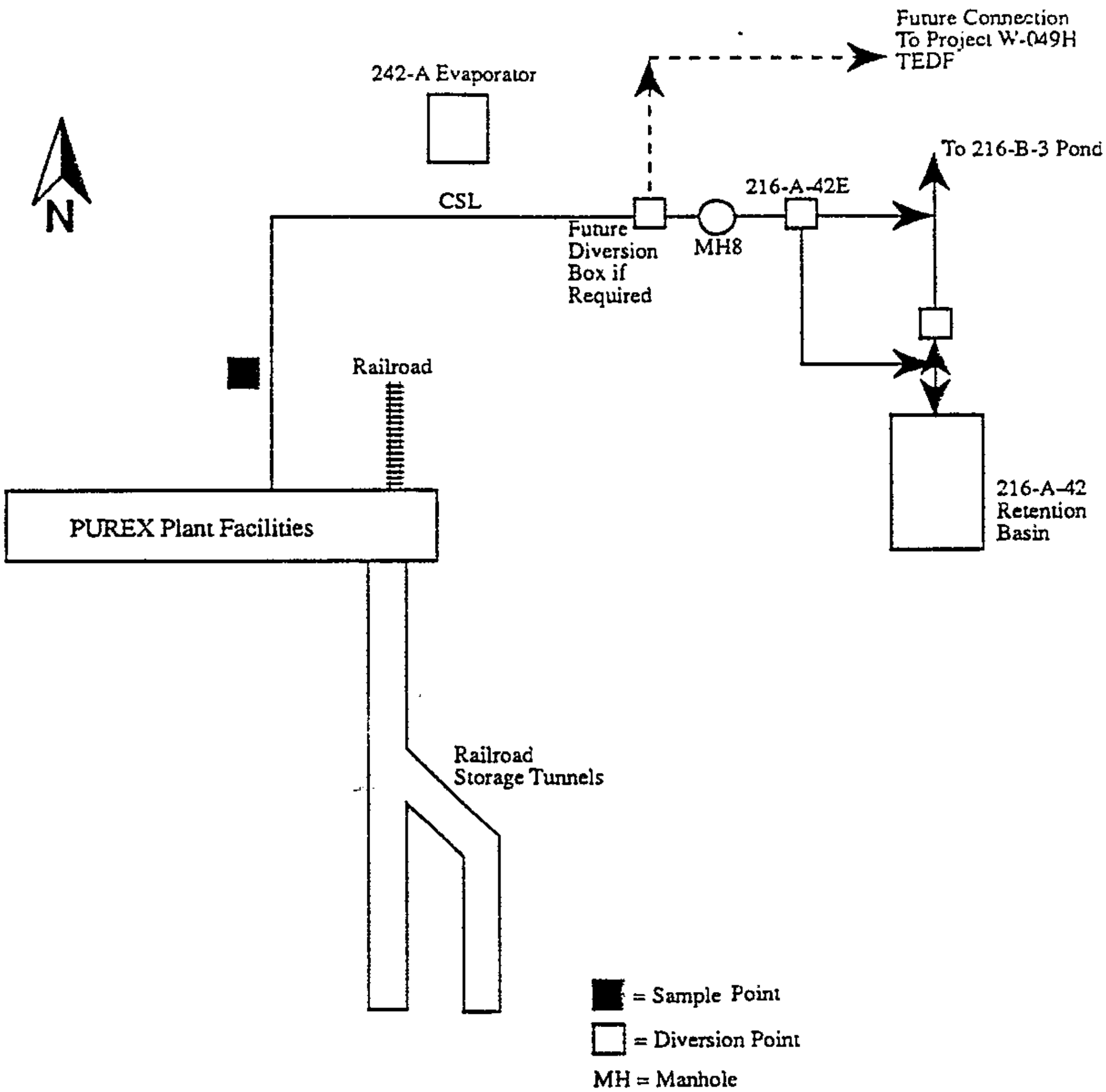
The CSL stream consists of nonprocess building services waste water and noncontact nonradioactive process heating and cooling effluent. See Figure B-4 for a simplified CSL flow schematic. During fuel processing, noncontact heating and cooling effluent from the vacuum factionator typically accounted for the majority of the stream. During fuel processing, the CSL flow averaged about 3,800 L/min (1,000 gal/min). When a demineralizer was regenerated during fuel processing, the CSL flow increased to about 4,600 L/min (1,200 gal/min). During standby, the CSL flow rate is expected to average 1,100 to 1,500 L/min (300 to 400 gal/min), but may exceed 1,900 L/min (500 gal/min) during extreme temperatures. Neither the fractionator nor demineralizer will be operated during standby.

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, residual of which might be expected to leach into the stream. Recent samples 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 ^{3}H) of less than 5 pCi/L.

Chemically, the CSL is quite similar to the raw water pumped from the Columbia River. During previous plant operation, the CSL differed from the raw water by containing about twice the concentration of chloride and manganese, and about three times the concentration of copper and iron. During demineralizer regeneration, the CSL contained higher concentrations of the solutes found in raw water, as well as additional sodium and sulfate used in the regenerant. These operations have ceased during standby mode.

Based on data and process knowledge presented in the stream-specific reports, the PUREX Plant (WHC) personnel believe that the PUREX CSL stream is not hazardous per WAC 173-303 "Dangerous Waste Regulations." The stream-specific reports do identify certain analytes and contributions that deserve further investigation. Therefore, this PUREX Plant CSL SAP includes samples and analyses to specifically support this investigation as well as support the general purposes of the plan.

Figure B-4. Simplified Chemical Sewer Flow Schematic.



Note: Not to scale

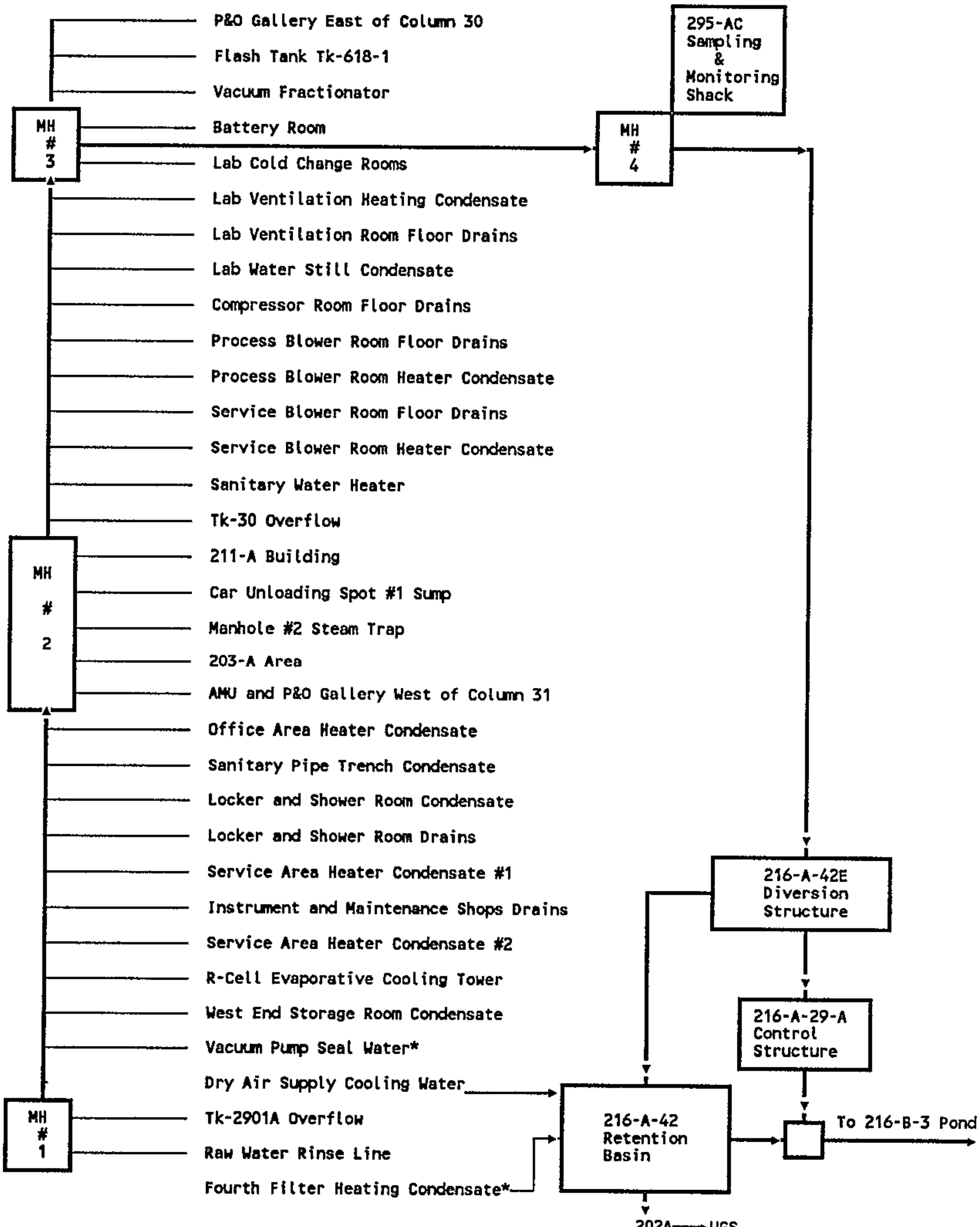
The CSL is a complex stream fed by many tributaries. The following discussion describes the two major trunks of the CSL collection system and the routing of the effluent. Appendix I describes in detail the tributaries and the processes that combine to form the CSL. The following paragraphs discuss the Chemical Sewer Collection, Characterization, and Transport System.

The PUREX CSL collects waste water from the service areas of the PUREX Plant (202-A Building and supporting facilities), as well as steam condensate and cooling water from the vacuum fractionator. Most of these effluents are relatively 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 area, and 211-A Building (pumphouse), have a potential for chemical contamination. Figure B-5 is a schematic of the CSL collection, characterization, and transport system. Details of stream sources are given in the Appendix.

Input lines to the CSL connect to two vitrified clay headers, one running 25 m (80 ft) east of manhole number 3, and one running west for 240 m (790 ft) 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 TK-618-1. Between manholes number 2 and number 3, the 30-cm (12-in.) west leg collects steam condensate from several sources: 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. Six lines enter manhole number 2: a 15-cm (6-in.) line from the 211-A Building which collects floor drain and demineralizer regeneration effluents; a 3-cm (1-in.) steam condensate line; an 8-cm (3-in.) line from the pump under car unloading spot number 1; a line from tank Tk-P5 in the 203-A Storage area, and a 20-cm (8-in.) line from the P&O gallery floor drains west of column 31 and from the AMU area. The 20-cm (8-in.) header between manholes number 1 and number 2 collects several heater condensates and floor drains. Two lines, a 15-cm (6-in.) drain and overflow line from the 2901-A High Tank and an 8-cm (3-in.) raw water supply line, feed manhole number 1.

The CSL leaves the 202-A Building from manhole number 3 via a 30-cm (12-in.) vitrified clay pipe. The 30-cm (12-in.) pipe is used to connect manholes 3 through 8. At manhole number 8 the line becomes 940-cm (15-in.) vitrified clay pipe. The 40-cm (15-in.) 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 basin is made of concrete, including the lid, and has a capacity of 6.8 million L (1.8 million gal). Holdup time in the basin varies from a few days to a few months depending on the volume in the basin. The basin was not designed for long term storage of hazardous material, and therefore no leak detection equipment is installed. The disposition of water in the basin is based on sample analyses. Basin water is either released to the CSL or recycled to the plant. From the 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

Figure B-5. Chemical Sewer Collection, Characterization, and Transport System.



*Originally flowed to SCD or CWL.

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polyethylene pipe into the old CWL pipe. The CWL pipe is a 91-cm (36-in.) corrugated metal pipe, which receives discharges from several 200 East Area facilities. The CWL pipe conducts the effluent to the 216-B-3 pond complex, either via the 216-B-3-3 ditch or via a new pipe system that leads directly to the expansion lobes.

B.4 216-B-3 POND 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 a 91-cm (36-in.) corrugated metal pipe. Decommissioning of the 216-A-29 ditch, which had become radiologically contaminated from earlier operations at the PUREX Plant, was subsequently initiated. Figure B-5, the CSL schematic flow diagram, shows the configuration after this diversion, accomplished at the 216-A-29-A control structure.

The 216-B-3 pond system consists of a series of four earthen, unlined, interconnected ponds and the 216-B-3-3 ditch. This network of ditches and ponds receives miscellaneous wastewater effluents from several of processing facilities on the Hanford Site, including the 242-A Evaporator Facility.

All of the wastewater effluents being discharged to the 216-B-3 pond system travel through the 216-B-3-3 ditch. The 242-A cooling water wastestream is hardpiped to the head end of the 216-B-3-3 ditch, where it is discharged to the ditch along with the other streams from the various facilities. This ditch is approximately 3,700 feet long, 30 ft wide at ground level, 6 ft wide at the bottom, and 6 to 12 ft deep.

Water discharged to the 216-B-3-3 ditch flows directly into the 216-B-3 pond system. The first pond, or lobe, is the 216-B-3 pond. It was placed into service in 1945, and covers a surface area of approximately 35 acres, anywhere from 2 to 20 ft deep. Overflow from the first lobe runs into the second lobe, 216-B-3A, or A lobe. This lobe covers approximately 11 acres and is about 2.0 ft deep. Overflow from A lobe runs into the C lobe, which has a designed surface area of 41 acres. This lobe has eight, parallel trenches,, approximately 8 to 14 ft wide and 4 ft deep, cut into the bottom of it to increase percolation into the soil. At the present time, water covers about 1/3 the trench area within the lobe.

Flow between the ponds is via galvanized, corrugated, steel pipes, and is controlled by downward-opening slide gates. A network of groundwater monitoring wells has been established around the 216-B-3 pond system to measure water levels, obtain groundwater samples, and evaluate aquifer properties. Liquid levels within the ponds are measured with staff gages, and the flowrate in the 216-B-3-3 ditch is measured with a flume and flowmeter and recorded on a stripchart. The pond liquid levels, gate settings, and cumulative flowmeter readings are recorded daily. When the 242-A Evaporator Facility is processing waste, the cooling water waste stream is the largest wastewater contributor to the 216-B-3 pond system.

C. RESPONSIBILITIES

The responsibility descriptions below are related to CSL sampling activities occurring at the PUREX Plant as described in this SAP. Overall responsibilities for other components of the sampling program are described in the QAPP (Sommer 1992).

Effluent Treatment Programs (ETP) has the following responsibilities:

- Coordinate the overall program.
- Act as the liaison between facilities and the U.S. Department of Energy, Richland Field Office (RL).
- Prepare the QAPP.
- Provide a qualified person to serve as the program manager.
- Manage input of validated data into the Liquid Effluent Monitoring Information System (LEMIS).
- Issue the Liquid Effluent Characterization Annual Report to EPA and Ecology.

PUREX Effluent Systems has the following responsibilities:

- Prepare the *PUREX Plant Chemical Sewer Sampling and Analysis Plan*, WHC-SD-CP-PLN-013.
- Ensure that procedures are updated to support the sampling activities.
- Provide a qualified person to serve as the sampling task leader (effluents engineer).
- Initiate scheduling of personnel required for sampling.
- Provide technical support for sampling activities.
- Review data logs and sampling activities.
- Surveil chain-of-custody activities at the facility.
- Review liquid effluent characterization sampling data for completeness and consistency.
- Provide flow data to ETP.
- File routine monitoring program sample data for PUREX CSL at the Environmental Data Management Center EDMC.

- Transmit copies of validated data, from the liquid effluent characterization sampling, to EDMC and ETP for inclusion in the annual report of environmental releases, if requested.

- Review the Liquid Effluent Characterization Annual Report.

The Office of Sample Management has the following responsibilities:

- Forward the file copy of chain-of-custody documentation to EDMC for storage.

- Validate the data for a Level C validation per "Data Validation for the RCRA Analysis," WHC-CM-5-3, Section 2.0.

- Select a laboratory for liquid effluent characterization samples.

- Transmit validated data packages to the EDMC.

The PUREX Plant Operations has the following responsibilities:

- Provide a trained operator for escort during liquid effluent characterization sampling.

- Provide sampling and transportation of routine monitoring program samples.

- Complete sample log sheets for routine monitoring program samples.

- Assist in moving liquid effluent characterization samples through radiation zone barriers.

The PUREX Plant Health and Safety Organization has the following responsibilities:

- Provide a health physics technician (HPT) for radiation surveying of liquid effluent characterization sample packages.

- Provide the Radiation Work Permit (RWP) instructions for zone entry.

- Verify radiation worker training requirements of sampling personnel.

- Stop work if there is undue risk to health or safety.

The Sampling and Mobile Laboratory (SML) has the following responsibilities:

- Prepare the PUREX CSL liquid effluent characterization sampling procedure.

- Provide trained samplers for liquid effluent characterization sampling activities.

- Provide at least one sampler who shall have a WHC Certificate of Qualification from the SML Group.

- Ensure that the certified sampler directs liquid effluent characterization sampling, packaging, and shipping.
- Document sampling activities in a log book.
- Transport liquid effluent characterization samples to laboratory or shipping center.
- Initiate "chain-of-custody" documentation for liquid effluent characterization samples.
- Package liquid effluent characterization samples for shipping.
- Ensure that copies of field logs and other sampling data sheets are filed with the PUREX Plant Effluents cognizant engineer.

The PUREX Plant QA organization has the following responsibilities:

- Conduct surveillances on steps of the liquid effluent characterization sampling program.

The laboratory chosen by the Office of Sample Management performs the analytical work and provides documentation in accordance with the QAPP.

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D. SAMPLING LOCATION AND FREQUENCY

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

D.1 ROUTINE MONITORING

Sample fluid originates in manhole number 4, which is 120 m (400 ft) north of the CSL collection header and 202-A Building. The sample stream is pumped to the 295-AC Effluent Monitoring Building (at grade level), 12 m (40 ft) southeast of the manhole. Routine monitoring consists of an in-line process pH instrument and a continuous gamma scintillator monitor in a shielded flow cell. The sample stream then passes through a flow-proportional composite sampler (record sampler).

The effluent release record 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 effluent release record samples originate in the flow-proportional sampler located in the 295-AC Effluent Monitoring Building. 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. These analyses, which are typically completed within 24 to 48 hours, provide intermediate coverage between the on-line instrumentation and the long turn-around record analyses. 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 Laboratory. Personnel at the 222-S 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. (See Section H. for references on environmental release documents.)

When a stream is diverted to the 216-A-42 retention basin, it is normally not 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 the disposition of the material within DOE orders. Extra grab sample material is sent to the 222-S Laboratory, together with an estimate of the volume of liquid and is used in preparing the monthly composite.

D.2 CHARACTERIZATION SAMPLES

Characterization samples will be taken in the 295-AC Effluent Monitoring Building from valve-213 on the continuous monitoring apparatus. Samples flow continuously in the stainless steel apparatus and are representative of the manhole number 4 CSL stream.

Characterization samples are planned Resource Conservation and Recovery Act (RCRA) samples for routine discharges. These samples fall naturally into two groups. The first includes routinely collected samples (at least one set per year) of the entire CSL and background. The second includes 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 in standby. Consequently, annual testing of the first CSL group 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 quality of the CSL. Achievement of this goal will require concurrent or nearly concurrent sampling of the streams that feed the CSL: raw water, sanitary water, and condensed steam. The first such samples will be taken after the transition to standby configuration is complete.

Table D-1. Chemical Sewer Characterization Samples.[a]

Description	Location	Timing	Additional data
CSL verification	295-AC Effluent Monitoring Building	Once each year. Twice the first two years.	--
Raw water background	202-A Building 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 the PUREX Plant	Same day as CSL verification sample	--
Fourth filter condensate[b]	216-A-42 retention basin	Once a year. Batch must be isolated and recirculated before sampling.	Primary level reading and volume of liquid, any information on other liquids added to section.

[a]The DOE and their contractors reserve the right to take additional samples not covered by the Tri-Party Agreement (Ecology et al. 1990).

[b]A condensed steam background sample is required same day (or it may be sampled on the same day as CSL verification sampling).

The CSL verification samples will be taken at the 295-AC Effluent Monitoring Building because it is a continuously flowing accessible sample location downstream of all the tributaries of the CSL. The raw water background sample will be collected in the 202-A Building P&O gallery, because it is an accessible location that is representative of the raw water. The sanitary water background samples will be collected from different locations within the PUREX Plant. Possible locations include lunch room and rest room 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, which drains into a "french drain" at the northwest corner of the PUREX Plant exclusion area.

The second group of samples are from tributaries routed to the CSL and the 216-B-3 pond complex via the 216-A-42 retention basin. These include the fourth filter condensate and other former tributaries of the CWL and SCD. In this case, at least one characterization sample will be taken of this material each year. The sample will be collected at the 216-A-42 retention basin or the old SCD catch tank TK 202-A-417. 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:

- Most of the volume in the CSL comes from tributaries, which merely pass through plant heat exchangers. Because 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 determining which pipes contribute which analytes is negligible.)

- The tributaries that 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 characterization sample. 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 sufficient data are 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 as discussed in Section A.3.

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E. SAMPLE IDENTIFICATION

E.1 ROUTINE MONITORING

Routine effluent samples include: (1) composite samples for effluent release records, (2) composite samples for process control, and (3) grab samples for process control. Routine effluent samples are assigned serial numbers 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 routine samples analyzed by the PUREX Laboratory. Each sample point has a unique identification number (code number) within the Data Processing System. Additional sample numbers may be generated by the 222-S 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.

E.2 CHARACTERIZATION SAMPLES

Sample labels for liquid effluent characterization samples shall be furnished by the sampling team from the Sampling and Mobile Laboratory. The labels will require the following information to be recorded by a member from the sampling team: identification of the person in charge of collecting the sample; unique sample identification number; date and time the sample was collected; the place the sample was collected; the stream identification; and the analysis to be performed on the sample. The unique sample number shall be obtained from the Hanford Environmental Information System (HEIS). In addition, each bottle shall be identified with a bar code sticker attached to the bottle by the bottle manufacturer. The bar code shall identify the bottle lot number and individual bottle number.

In addition to identification numbers, the samples will require labeling to indicate potential hazards. Any preneutralized solution sample container must bear a dangerous waste designation number D002.

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F. SAMPLING EQUIPMENT AND PROCEDURES

F.1 ROUTINE MONITORING

The 295-AC Effluent Monitoring Building and manhole number 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, a gamma radiation 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 come from laboratory analyses of the composite effluent release record samples.)

A magnetic flowmeter measures the volumetric flow rate of the CSL into manhole number 4 and sends an analog signal to a strip chart recorder, a flow totalizer, and a flow counter. The flow totals allow laboratory personnel to prepare the monthly composite effluent release record sample from several weekly composite samples. Flow monitoring equipment is calibrated twice annually.

A sample pump located in manhole number 4 pushes a continuous side stream of the CSL through the 295-AC Effluent Monitoring Building. This stream provides the sample for the pH monitor, and the gamma radiation monitor, and the flow-proportional composite sampler.

A continuously operating pH monitor sends a 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 Effluent Monitoring Building exceeds the range of 5 to 11. An operator then diverts the CSL stream to the 216-A-42 retention basin if the pH appears likely to exceed the range of 2.5 to 12.

A process radiation monitor alarms if the gamma radiation reading on the CSL sample stream in the 295-AC Effluent Monitoring Building exceeds the current setpoint, which is adjusted to be as low as practicable without causing excessive false alarms, in accordance with *Environmental Compliance*, WHC-CM-7-5. The alarm setpoint for the CSL gamma monitor is approximately 7,500 counts per minute, which corresponds to approximately 50 pCi/mL. The gamma alarm automatically diverts the stream to the 216-A-42 retention basin.

Prior to disposition of liquid contained in the 216-A-42 retention basin, the liquid will be recirculated and sampled as a batch in accordance with operations contractor procedures. Changes to these procedures require approval of Environmental Assurance.

The flow-proportional composite sampler located in the 295-AC Effluent Monitoring Building responds to 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 3 L (1 gal) of composite (record) sample per week. This sampler can also be adjusted to collect samples on a time-proportional basis. If the sampler fails, the samples can be collected by a commercially available time-proportional portable sampler. Routine process control and record effluent samples will be collected from the CSL flow-proportional composite sampler once every week. The sample will consist of three 1-L plastic bottles of composite CSL, collected in accordance with operations contractor procedures.

The process control and record effluent samples are collected in bottles that 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 222-S Laboratory). Both laboratories operate with documented procedures.

F.2 CHARACTERIZATION SAMPLES

The PUREX Plant CSL characterization samples will be taken at a valved branch line (V213) attached to the continuous flow sample apparatus located in the 295-AC Effluent Monitoring Building. Sample collection, chain of custody, sample equipment, spare parts, buffers, decontamination solutions, and personnel protection will be specified or referenced in a site-specific procedure (LO-080-435) performed by Sampling and Mobile Laboratory personnel. Sampling will be surveilled at random by a cognizant quality assurance person.

Sample volumes, number of bottles, preservatives, storage, sample custody, cap sealing, packaging and shipping are defined by procedures and standard methods referenced in the QAPP (Sommer 1992). Sample collection will follow guidelines in SW-846, *Test Methods for Evaluating Solid Waste: Physical Chemical Methods* EPA 1986, and EPA-600/4-82-029, *Handbook for Sampling and Sample Preservation of Water and Wastewater*, EPA 1982.

The WHC procedures for sample chain of custody and preservation actions are LO-150-443, "Chain of Custody of RCRA/CERCLA Protocol Samples" and LO-080-441, "Bottle preservation for RCRA/CERCLA Protocol Sampling." Field logbook actions are defined by WHC-CM 7-7, EII 1.5 and ultimately become record documents. Sample packaging and shipping are defined by WHC-CM-7-7, EII 5.11.

Characterization samples are taken in certified precleaned controlled bottles. The sample volumes and number of containers are prescribed by the analytical laboratory performing the analysis and are subject to change. Field and Trip blanks will be used to check for environmental, reagent, and container contamination and will be utilized according to the analytical method. Approved labels will be attached to the bottle prior to sampling and will be marked at the time of sampling. A unique sample number obtained from HEIS will be included on the label along with other information. Bottle exterior surfaces will be cleaned as needed and surveyed for release. The HPT released bottles will be sealed with tamper-evident tape, double bagged and packaged for shipment. If samples are to be shipped offsite, preliminary activity measurements will be done at the onsite lab and will accompany samples to the laboratory.

Sampling documentation accompanies the sample to the laboratory. The record copies are returned with the data package. After validation, the data package and Chain-of-Custody are transmitted to EDMC and become part of the permanent administrative record.

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G. SAMPLE HANDLING AND ANALYSIS

G.1 ROUTINE MONITORING

Process control samples include grab samples and diversion samples taken in the 295-AC Effluent Monitoring Building and 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. Process control samples are currently analyzed by the PUREX Laboratory.

Record effluent samples (flow-proportional composite) will be handled and analyzed in accordance with operations contractor procedures. All changes to these procedures will require approval of Environmental Assurance. Presently, a 3 L composite sample is taken weekly and 2 L are delivered to the 222-S Laboratory. Routine analysis results on annual environmental releases are referenced in Section H.

Chain-of-custody requirements for record effluent samples are being implemented. Custody records will be forwarded to the PUREX Plant record holding area every 30 days.

G.2 CHARACTERIZATION SAMPLES

The Purex Plant operations organization will transmit a request for characterization samples to the Office of Sample Management with a copy to the SML. The SML personnel will obtain the characterization samples and will prepare and maintain the sample custodian records. The handling and preparation of samples will comply with the procedures found in the *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7. The chain of custody and preservative actions are described in LO-150-443, "Chain of Custody of RCRA/CERCLA Protocol Samples" and LO-080-441, "Bottle Preservation for RCRA/CERCLA Protocol Sampling." A chain of custody form will be filled out at the time of sampling and will accompany each liquid effluent characterization sample. A sample may consist of several containers. The chain of custody will account for each container. The preparation of either a single or a group of samples for shipment to a laboratory shall comply with the procedure EII 5.11 "Sample Packaging and Shipping".

Once a liquid effluent characterization 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. A continuous chain of custody will be maintained from the time of sampling until final disposition of all samples.

Analytical procedures for liquid effluent characterization samples shall meet the QA guidelines of SW-846, Appendix Nine (EPA 1986). The required chemical analyses are determined by methods described in SW-846, latest edition. Radionuclides are analyzed by methods that meet or exceed EPA or U.S. Regulatory Commission (NRC) guidelines. Table G-1 gives the analyses to be performed on the PUREX Plant CSL which are obtained from Table 8-1 of the QAPP (Sommer 1992).

Liquid effluent characterization samples will be collected in commercially available, individually certified, precleaned glass or plastic bottles. The certification of the precleaned condition shall accompany the bottle. Container types, volumes, and preservatives for the above tests will be as noted in the QAPP (Sommer 1992).

The samples will be routed to an approved participant contractor or subcontractor laboratory for analysis. The data will be considered representative so long as at least 90 percent of the data points meet the established requirements in the laboratory contract for precision and accuracy. Data which do not meet this objective will be reviewed to determine whether the data can be used or whether corrective action should be taken. If necessary, corrective action will consist of repeating the sampling and analysis activity. Data precision, accuracy, corrective action, and records are covered and/or referenced in the QAPP (Sommer 1992).

Data and record information that has been validated will be transferred to Work Control and Data Management for inclusion in the EDMC files and to an approved computer data file (LEMIS) when it becomes available.

G.2.1 Rationale for Characterization Sample Analyte Selection

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*, WHC-EP-0287 (WHC 1989a), 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.

Analytes in Table G-1 were selected based on EPA and Ecology requirements, and on constituents known or suspected to be associated with the PUREX CSL. They were chosen after review of data from past characterization activities, as noted in the *PUREX Chemical Sewer Stream-Specific Report*, WHC-EP-0342, Addendum 2 (WHC 1990a).

Table G-1. Analytical Requirements of the Liquid Effluent Sampling Quality Assurance Program Plan.[a] (sheet 1 of 2)

Suggested method number	Method title
6010	Inductively Coupled Plasma Atomic Emission Spectroscopy
7060	Atomic Absorption for Arsenic (Furnace Technique)
7421	Atomic Absorption for Lead (Furnace Technique)
7470	Atomic Absorption for Mercury (Cold Vapor Technique)
7740	Atomic Absorption for Selenium
7870	Atomic Absorption for Tin
335.2[b]	Cyanide (Titrimetric; Spectrophotometric)
9030	Sulfides
8080	Organochlorine Pesticides and PCBs (GC Analysis)
8140	Organophosphorus Pesticides (GC Analysis)
8150	Chlorinated Herbicides (GC Analysis)
8240	GCMS for Volatile Organics
8270	GCMS for Semivolatile Organics (Capillary Column Techniques)
9020	Total Organic Halides (TOX)
9065, 9066, 9067, 420.1[b]	Phenolics, Total Recoverable
9060, 415.2[b]	Total Organic Carbon (TOC)
9070, 9071, 413.2[b]	Oil and Grease, total, recoverable (Spectrophotometric, Inrated)
353.3[b]	Nitrogen, Nitrate, Nitrite (Spectrophotometric, Cadmium Reduction)
350.1[b]	Ammonia (as N) (Automated Phenate)
300.0[b]	Fluoride (Ion Chromatography)
300.0[b]	Chloride (Ion Chromatography)
9040	pH
9050	Specific Conductance
160.1[b]	Total dissolved solids (TDS)
410.1[b]	Chemical Oxygen Demand (COD) (Titrimetric)
310.1[b]	Alkalinity (Titrimetric, pH 4.5)

Table G-1. Analytical Requirements of the Liquid Effluent Sampling Quality Assurance Program Plan.[a] (sheet 2 of 2)

Suggested method number	Method title
--[c]	Total Alpha, Total Beta
--[c]	Gamma Scan
--[c]	Tritium
--[c]	Carbon 14
--[c]	Cesium 137
--[c]	Americium 241
--[c]	Uranium Isotopes
--[c]	Strontium 89/90
--[c]	Total Uranium
--[c]	Plutonium 238/239/240/242
--[c]	Radium Total

[a]Source: WHC-SD-WM-QAPP, Rev. 2 (Sommer 1992).

[b]*Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, U.S. Environmental Protection Agency/Environmental Monitoring and Support Laboratory, Cincinnati, Ohio.

[c]Radionuclides will be analyzed by methods that meet or exceed EPA or Nuclear Regulatory Commission guidelines. Methods and requirements shall be defined by the laboratory prior to analysis.

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 G-2 lists those analytes for which the concentrations listed in the stream-specific report (WHC 1990a) exceed or approach the treatment targets for the TEDF.

Table G-2. Chemical Sewer Analyte Concentrations Near Treated Effluent Disposal Facility Treatment Targets.

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

CSL = Chemical Sewer.
ppb = Parts per billion (1,000 million).
TEDF = Treated Effluent Disposal Facility.

The sanitary water system, which supplies much of the water that enters the CSL, is known to be 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 characterization samples.

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

G.2.2 Additional Analyte Details

G.2.2.1 Ionic Species. Five of the six aluminum results reported in the stream-specific report (WHC 1990a) were nondetects. The detection limit for aluminum was three times the proposed secondary MCL, which is also the TEDF 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 less than, but close to, the TEDF acceptance criterion of not more than 300 ppb. Corrosion of piping is expected to provide this iron concentration. Further sampling should help to determine whether treatment will be needed for iron.

G.2.2.2 Trihalomethanes. Chloroform (trichloromethane) has been reported in the CSL at concentrations exceeding the TEDF 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.

G.2.2.3 Organic Compounds. Analysis for polychlorinated biphenyls (PCB), pesticides, and herbicides was directed by EPA and Ecology to provide complete characterization of the waste water in accordance with Title 40 Code of Federal Regulations (CFR) Part 264, Appendix IX. Analysis for total dissolved solids (TDS), total oil and grease, chemical oxygen demand (COD), and alkalinity, were added to provide data necessary for the WAC 173-216 permit process for the TEDF.

Analyses for biological oxygen demand (BOD) will be performed on the liquid effluent characterization samples. The PUREX CSL does include sources of locker and shower drain waste water. Acidity analysis will be performed as the pH of this stream could be altered by influents.

G.2.2.4 Radionuclides. Historical data on ^{239,240}Pu and ^{241}Am are mostly recorded as less than detectable, with detection limits of approximately 10 pCi/L for ^{239,240}Pu, and 60 pCi/L for ^{241}Am. The historical detection limit for ^{241}Am is higher than the TEDF acceptance criterion of 1.2 pCi/L. The contract laboratory that analyzed previous characterization 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}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 characterization 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 the PUREX Plant operation, an accident contaminated the CSL piping downstream of manhole number 3 with plutonium. Therefore, it is expected that measurable concentrations of ^{241}Am may be desorbing from the pipe into the CSL. Note: A comparison of CSL release data during 1988, the last full production year, versus 1991 shows very little difference. (1988: $^{239/240}$Pu - <27 pCi/l, ^{241}Am - <62 pCi/l 1991: $^{239/240}$Pu - 23 pCi/L, ^{241}Am - 32 pCi/l). This lends further credibility to the theory that radioactive contamination in the CSL is from an old incident and not recent operation. 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 onsite radioactive contamination frequently interferes with the detection of the low concentrations found in some streams. Therefore, the initial radiological analyses for the CSL characterization samples will include all the nuclides which Environmental Assurance requested for the CSL in 1988.

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Section EII 1.5 "Field Log Books"
Section EII 5.11 "Sample Packaging and Shipping"

APPENDIX

CHEMICAL SEWER GENERATION

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CONTENTS

LIST OF TERMS

CSL	chemical sewer
CWL	cooling water
HEPA	high-efficiency particulate air (filter)
P&O	piping and operating (gallery)
ppb	parts per billion (1,000,000 million)
ppm	parts per million
PUREX	Plutonium-Uranium Extraction (Plant)
SCD	steam condensate
WHC	Westinghouse Hanford Company

APPENDIX

I. CHEMICAL SEWER GENERATION

The Plutonium-Uranium Extraction (PUREX) Plant Chemical Sewer (CSL) is a mixture of effluents from many sources. This appendix describes the individual pipes that conduct liquids into the CSL and the sources of the effluents conducted by these pipes.

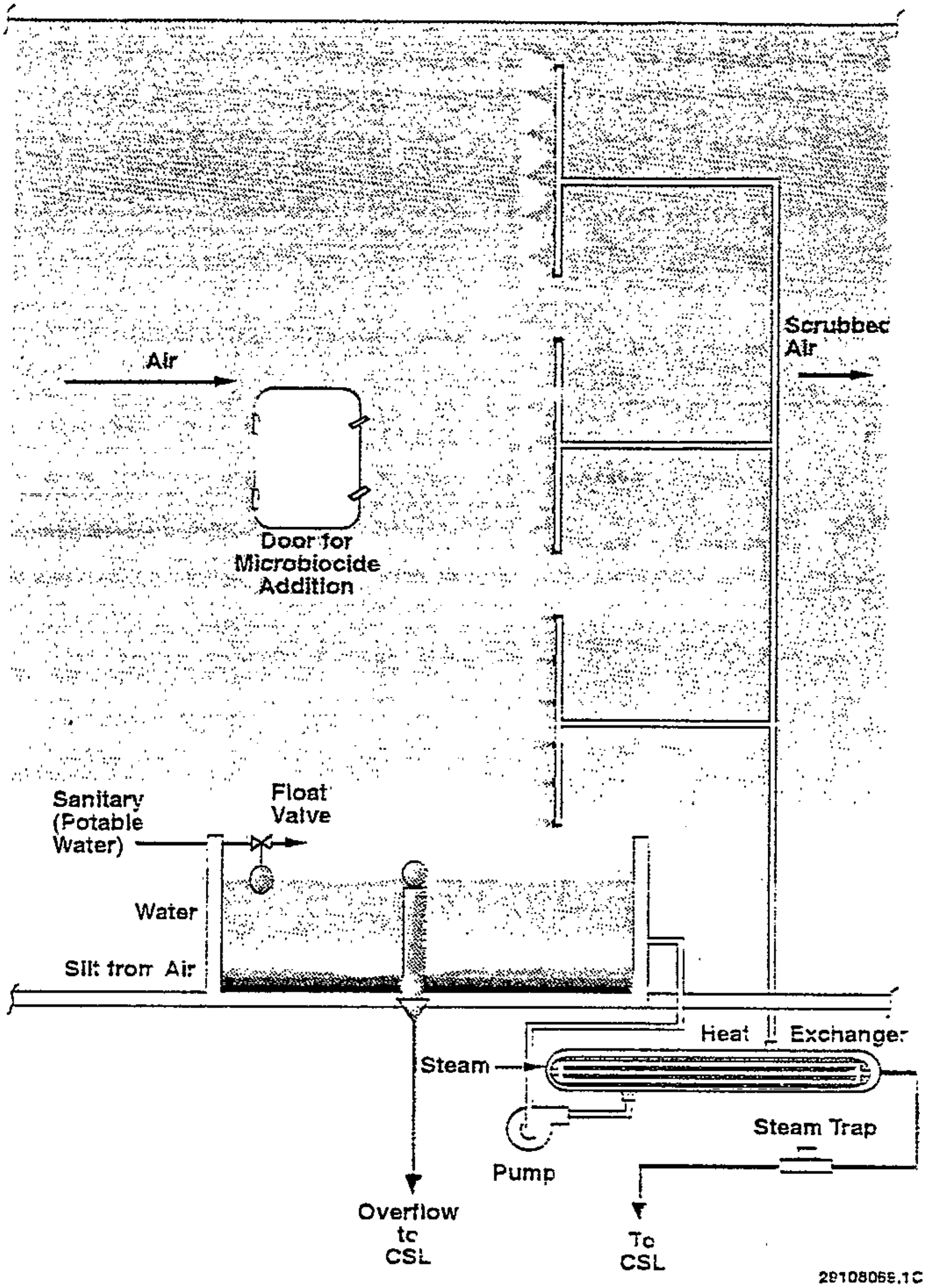
The *PUREX Plant Chemical Sewer Stream-Specific Report*, WHC-EP-0342, Addendum 2 (WHC 1990), contains calculated compositions of the effluents from the CSL processes. More reliable calculated compositions will require more complete data on the water background (raw water, sanitary water, steam condensate), which are not yet available.

Discontinuing the PUREX Plant's cooling water (CWL) and steam condensate (SCD) streams required rerouting 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 sources 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. The fourth filter heating condensate, routed through the SCD header to the 216-A-42 retention basin, could become contaminated by radionuclides. Therefore, samples will be taken from the retention basin to determine disposition before pumping the liquid to 216-B-3 Pond.

Ventilation Supply Scrubber Effluent Overview. Nine ventilation supply systems treat ventilation air before it is used in the 202-A Building. The air supply systems include wet scrubbers (see Figure I-1), 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 service blower room, process blower room, and lab ventilation room floor drains. The flow of ventilation scrub water is estimated to range from 0.2 to 3.0 L/min (0.05 to 0.8 gal/min), with an average flow of 0.8 L/min (0.2 gal/min).

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.

Figure I-1. Air Scrubber Schematic.



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

Heating Condensate Overview. Condensate contributes to the following tributaries:

- West end storage room condensate
- Service area heater condensate number 2
- Service area heater condensate number 1
- Locker and shower room condensate
- Sanitary pipe trench condensate
- Office area heater condensate
- 203-A Pumphouse and Uranium Product Storage Facility
- Manhole number 2 steam trap
- Car unloading spot number 1 sump
- Sanitary water heater
- Service blower room condensate
- Process blower room condensate
- Lab water still condensate
- Lab ventilation heating condensate
- Lab ventilation room condensate
- Flash tank TK-618-1
- Piping and operating (P&O) gallery drains
- Fourth filter heating condensate.

The flow of condensed steam is estimated at 230 L/min (60 gal/min) during warm weather and increases during cold weather.

The condensate effluents contain condensed steam that 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 condensate originates as steam in the 200 East and 200 West Powerhouses. The powerhouse 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 Super 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 Super Filmeen 14, an amine with a molecular weight of approximately 270, protects the steam piping from corrosion. There is only limited carryover of liquid boiler water into the steam. Consequently, only the volatile Super Filmeen 14 becomes a part of the steam, at a concentration of about 13 ppm (13,000 ppb). A blowdown removes the nonvolatile components of the feed water from the boiler.

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

**Super Filmeen 14 is a trademark of W.R. Grace & Company.

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 Super Filmeen 14.

I.1 RAW WATER RINSE LINE

An 8-cm (3-in.) 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 190 L/min (50 gal/min), and is used to flush solids (dust, rust, etc.) through the CSL line.

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

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 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 $Ca(ClO)_2$. 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 trichloromethane, or chloroform) and simple organic oxidation products such as acetic acid, acetone, and 2-butanone (methylethylketone).

I.2 HIGH TANK 2901-A OVERFLOW

High Tank 2901-A provides the PUREX Plant with emergency backup fire protection per DOE Order 6430.1A, *General Design Criteria* (DOE 1989). The tank overflow, which is composed of sanitary water, goes to the CSL stream. The tank continually overflows to prevent freezing and ensure that the water in the tank remains potable. All water that can enter the sanitary water system must be potable.

The source contributes about 150 L/min (40 gal/min), or less than 10% of the total maximum CSL stream flow, 2,300 L/min (600 gal/min). Thus it is not a major source of dilution water. Sanitary water enters the stream via several contributors and is believed to be the primary source of two major contaminants in the stream, aluminum and chlorinated hydrocarbons. Both of these contaminants are introduced into the water during the process, which turns raw river water into potable water. Aluminum enters as alum for settling the solids and chlorinated hydrocarbons are produced when organic matter is chlorinated.

Westinghouse Hanford Company (WHC) does not consider this dilution water because a nonhazardous contributor is being added to other nonhazardous contributors.

This contributor is scheduled to be eliminated in 1994 when Project B-604 comes on line to provide a new source of backup fire protection.

I.3 VACUUM PUMP SEAL WATER

The vacuum pump seal water effluent originally flowed to the CWL. This effluent was rerouted to the CSL in June 1992.

The 2712-A Building contains vacuum pumps used for air sampling and radiation monitoring in the 202-A Building. These pumps require a seal water, which results in an effluent that has been exposed to the pump suction air. Flow is about 7 gal/min.

I.4 WEST END STORAGE ROOM CONDENSATE

Steam condensate from the heater in the storage room adjacent to the canyon lobby flows through a dedicated 5-cm (2-in.) black wrought-iron pipe to the CSL.

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 an 8-cm (3-in.) 304L stainless-steel pipe to the CSL.

I.6 SERVICE AREA HEATER CONDENSATE NUMBER 2

Steam condensate from the first-floor service area heaters flows through this 8-cm (3-in.) 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 10-cm (4-in.) cast-iron soil pipe to the CSL. This line has eight floor cleanout ports. The effluent consists of water with trace amounts of oil and surfactants. Flow is estimated to average less than 4 L/min (1 gal/min).

The instrument and maintenance shops contain no chemical processing tanks and personnel are trained in the proper disposal of waste chemicals.

I.8 SERVICE AREA HEATER CONDENSATE NUMBER 1

Steam condensate from the first floor service area heaters, as well as from air heaters in the sample gallery, canyon lobby, storage gallery, product removal vault, product removal room, and the regulated shop flows through this 8-cm (3-in.) 304L stainless-steel pipe to the CSL.

I.9 LOCKER AND SHOWER ROOM DRAINS

Drains from the locker and shower room area empty through a 10-cm (4-in.) 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. Flow is highly variable and is estimated to be from 0 to 150 L/min (0 to 40 gal/min).

I.10 LOCKER AND SHOWER ROOM CONDENSATE

Condensed steam from ventilation air heaters in the locker and shower room area flows through an 8-cm (3-in.) 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 3.8-cm (1.5-in.) black wrought-iron pipe to the CSL.

I.12 OFFICE AREA HEATER CONDENSATE

The steam condensate from the office heaters flows through an 8-cm (3-in.) 304L stainless-steel pipe to the CSL. Only condensed steam can enter this line.

I.13 AQUEOUS MAKEUP AREA AND PIPE AND OPERATING GALLERY WEST OF COLUMN 31

A 20-cm (8-in.) pipe made of 304L stainless steel runs from the north wall of the aqueous makeup (AMU) area basement and drains to the CSL. This header collects drainage from the west end of the P&O gallery, atmospheric flash tank TK-618-2, the AMU area, and the AMU pipe shaft sump.

A 20-cm (8-in.) 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 20-cm

(8 in.) 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.

Chemical
Nitric acid
Oxalic acid
Potassium hydroxide
Silver nitrate
Sodium nitrate
Cleaning surfactants
Ferrous sulfamate
Hydrogen peroxide
Normal paraffin hydrocarbon
Potassium fluoride
Potassium permanganate
Sodium carbonate
Sodium nitrite
Sugar (sucrose)
Sulfuric acid
Tributyl phosphate

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 water sprayed into the tank quenches the steam vapor component of this tributary. This tank drains directly into the 20-cm (8-in.) header.

The AMU effluent comprises condensate and sanitary water from the atmospheric flash tank TK-618-2, drainage from the two sinks and one water cooler in the AMU area, overflow from the sugar tank and the demineralized water tank (both in the AMU area), 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 of steam condensate, sanitary water, and raw water. The flow is estimated to vary from 0 to 150 L/min (0 to 40 gal/min), with an average flow of 23 L/min (6 gal/min). 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 area basement, drainage from the primary decontamination room, and drainage from the contamination control (SWP) room's electric water cooler, one shower drain, two floor drains and three sink drains. This sump is pumped directly into the 20-cm (8 in.) header inside the AMU pipe shaft.

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

A carbon-steel pipe from the 203-A Pumphouse and Uranium Product Storage Facility carries solution from TK-P5 to the CSL. Wastes from the 203-A Pumphouse and Uranium Product Storage Facility, mostly rainwater and condensed steam that has collected in the sumps surrounding the uranium product storage tanks are collected in TK-P5; however, the 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. Because this facility is located in an arid region, rainwater volume would be insignificant. The capacity of TK-P5 is 14,500 L (3,840 gal) and is emptied only a few times a year.

I.15 MANHOLE NUMBER 2 STEAM TRAP

A steam trap drains condensed steam from a steam supply header through a 3-cm (1-in.) carbon-steel pipe into manhole number 2 via a hole in the manhole cover.

I.16 CAR UNLOADING SPOT NUMBER 1 SUMP

An 8-cm (3-in.) schedule-40 carbon-steel pipe conducts sump liquid into manhole number 2. The sump (for a 3-m by 5-m [10-ft by 15-ft] pad) 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 characterization samples of any effluent. No chemical deliveries via tank car are anticipated in the future and rainwater is minimal because the area is arid, therefore the volume from this contributor is insignificant.

I.17 211-A PUMPHOUSE AND CHEMICAL STORAGE FACILITY

A 15-cm (6-in.) vitrified clay pipe routes the 211-A Pumphouse and Chemical Storage Facility effluents to the CSL via manhole number 2. This line collects effluents from pipe trenches, spills caused by pump leaks, and seal water from the chemical pumps. Possible contaminants introduced include: NH_4F, NH_4NO_3, HNO_3, NaOH, KOH, and H_2SO_4. With the plant in standby, most chemicals have been disposed, and the major portion of this effluent consists of sanitary water from the sink and emergency shower test.

Project B-669 provided a three-chamber pH control system for the effluent from the 211-A Pumphouse and Chemical Storage Facility, which was used primarily for the demineralizer regenerant. Present use could include spill recovery. 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 Pumphouse and Chemical Storage Facility effluent is quite discontinuous and normally would not contribute constituents of concern to the CSL. Spills will be sampled on an individual basis. There is therefore no need to collect routine individual samples of this tributary.

I.18 DEMINERALIZED WATER TANK TK-30

The overflow pipe from the demineralized water tank TK-30 empties through a 15-cm (6-in.) vitrified clay pipe into the CSL. Under normal conditions, there is no flow in this pipe, and during standby no need for demineralized water is anticipated.

I.19 SANITARY WATER HEATER

Steam condensate from the sanitary water heater and from the ventilation air heaters located in the service blower room flows to the CSL through an 8-cm (3-in.) pipe.

I.20 SERVICE BLOWER ROOM HEATER CONDENSATE

Steam condensate from the number 3 ventilation air supply system heaters in the service blower room flows through a 15-cm (6-in.) 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 10-cm (4-in.) header to the CSL. This header is made of cast-iron soil pipe. Two funnel drains accept overflow and drainage from the number 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 distilled water tank TK-V84-1, and water purge from the sanitary water heater service piping.

Distilled water was used when processing fuel and by the PUREX Laboratory. The distilled water was 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. Distilled water is no longer produced.

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 to 75 L/min (0 to - 20 gal/min), with an average flow of 11 L/min (3 gal/min). This effluent does not usually exist when the PUREX Plant is not processing fuel.

Heated 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 HEATER CONDENSATE

Condensed steam from number 1 and number 2 ventilation air supply system heaters in the process blower room flows through a 15-cm (6-in.) 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 10-cm (4-in.) cast-iron soil pipe to the CSL. The funnel drains are fed by the overflow from the number 1 and number 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 15-cm (6-in.) 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 the PUREX Plant for:

- Instrumentation that controls the ventilation systems
- Instrumentation used for fuel processing
- Preventing radioactive process solutions from entering the jet gang valves in the P&O gallery
- Preventing radioactive process solutions from leaking into the SCD header
- The jet motive force for sampling and ventilation
- Mixing solutions in annular tanks
- 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 570 L/min (150 gal/min).

I.25 LABORATORY WATER STILL CONDENSATE

Condensed steam and distillation bottoms from the two laboratory stills flow through an 8-cm (3-in.) pipe of 304L stainless steel to the CSL.

I.26 LABORATORY VENTILATION ROOM FLOOR DRAINS

One floor drain and four funnel drains from the Lab Ventilation Room empty through an 8-cm (3-in.) 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 laboratory ventilation heaters and sanitary water heater may be present.

I.27 LABORATORY VENTILATION HEATING CONDENSATE

The ventilation heating steam condensate from the first floor lab area and the second-floor laboratory ventilation room flows to the CSL via a 10-cm (4-in.) pipe of 304L stainless steel.

I.28 LABORATORY COLD CHANGE ROOMS

Drains from the laboratory cold change rooms lead through a 10-cm (4-in.) 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. Flow is estimated to vary from 0 to 150 L/min (0 to 40 gal/min).

I.29 BATTERY ROOM

The battery room contains batteries, which power the switches from normal electrical power to an alternate power supply during power failure. The floor drain and sink drain from the battery room empty to CSL manhole number 3 via a 10-cm (4-in.) Durion* 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) from hand-washing. Sulfuric acid could enter the battery room floor drain in the event of a spill or ruptured battery. If the quantity was sufficient to reduce the CSL pH to 5.0, the CSL pH alarm would sound in the Central Control Room.

The battery 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 normal conditions, this tributary is not likely to contribute constituents of concern to the CSL. Any spills would be responded to per WHC procedures.

I.30 VACUUM FRACTIONATOR

Cooling water from the three fractionator condensers and reboiler steam condensate enter the CSL via a 30-cm (12-in.) pipe made of type 304L 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 effluents to the CSL: SCD and CWL. During normal processing, the SCD flow is estimated at 110 L/min (30 gal/min), and the CWL flow at 2,480 L/min (750 gal/min), with a maximum flow of 3,400 L/min (900 gal/min). During standby, the vacuum fractionator is shut down and 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 wt% by

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*Durion is a trademark of the Duriron Company.

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 when PUREX is in standby. 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

An 8-cm (3-in.) carbon-steel pipe routes cooled, depressurized steam condensate from flash tank TK-618-1 (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 PIPING AND OPERATING GALLERY EAST OF COLUMN 30

A series of ten P&O gallery floor drains east of column 30 flow to a 15-cm (6-in.) 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 select 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 that 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 FOURTH FILTER HEATING CONDENSATE

The 291-AE Building houses several stages of high-efficiency particulate air (HEPA) filters that decrease the concentration of radionuclides in the number 1 (main) ventilation system exhaust. These filters can fail if they get wet. The building is heated, by steam, to prevent water from condensing out of the ventilation air and getting the filters wet. The condensed steam flows to the SCD catch tank. This tributary (flow estimated at 1,000 gal per day during the winter months) flows through the SCD header to the 216-A-42 retention basin, and is pumped out periodically after sampling to the 216-B-3 Pond via the CSL or back to the 202-A Building and then to underground storage.

I.34 DRY AIR SUPPLY COOLING WATER

The dry air supply cooling water effluent (2711-A-1 Building) 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 flows via the CWL header to the 216-A-42 retention basin and then is pumped out to 216-B-3 Pond. The effluent consists of water that has passed through a heat exchanger.

I.35 REFERENCES

DOE, 1989, *General Design Criteria*, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

WHC, 1990, *PUREX Plant Chemical Sewer Stream-Specific Report*, WHC-EP-0342, Add. 2, Westinghouse Hanford Company, Richland, Washington.

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