DOE/ID-11319
Revision 1

U.S. Department of Energy
Idaho Operations Office

HWMA/RCRA Closure Plan for the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems

Voluntary Consent Order SITE-TANK-005 Action Plan Tank Systems INTEC-066, INTEC-067, INTEC-068, and INTEC-072

May 2007

Idaho Cleanup Project

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May 2007

Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This Hazardous Waste Management Act/Resource Conservation and Recovery Act closure plan for the fluorinel dissolution process makeup and cooling and heating systems located in the Fluorinel Dissolution Process and Fuel Storage Facility (CPP-666), Idaho Nuclear Technology and Engineering Center, Idaho National Laboratory Site, was developed to meet milestones established under the Voluntary Consent Order. The systems to be closed include waste piping associated with the fluorinel dissolution process makeup systems (Voluntary Consent Order Tank Systems INTEC-066, INTEC-067, and INTEC-068) and tanks, piping, and ancillary equipment associated with the fluorinel dissolution process cooling and heating system (Voluntary Consent Order Tank System INTEC-072). These tank systems are included in the Voluntary Consent Order SITE-TANK-005 Action Plan. The fluorinel dissolution process makeup and cooling and heating systems will be closed in accordance with the tank system closure requirements of the Hazardous Waste Management Act/Resource Conservation and Recovery Act, as implemented by Idaho Administrative Procedures Act 58.01.05.009 and 40 Code of Federal Regulations 265. This closure plan presents the closure performance standards and methods of achieving those standards.

CONTENTS

FIGURES

TABLES

ACRONYMS

AL	action level
CFR	Code of Federal Regulations
COC	contaminant of concern
CPP	Chemical Processing Plant
DEQ	State of Idaho Department of Environmental Quality
DI	deionized
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FAST	Fluorinel Dissolution Process and Fuel Storage Facility
FDP	fluorinel dissolution process
FM	fluorinel makeup
HWMA	Hazardous Waste Management Act
HWN	hazardous waste number
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
PE	professional engineer
RCRA	Resource Conservation and Recovery Act
USC	United States Code
VCO	Voluntary Consent Order

HWMA/RCRA Closure Plan for the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems

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1. INTRODUCTION

This Hazardous Waste Management Act (HWMA) (State of Idaho 1983)/Resource Conservation and Recovery Act (RCRA) (42 United States Code [USC] 6901 et seq. 1976) closure plan has been prepared for the Fluorinel Dissolution Process (FDP) makeup and cooling and heating systems, located at the Idaho Nuclear Technology and Engineering Center (INTEC), Idaho National Laboratory (INL) Site. The systems are included in the SITE-TANK-005 Action Plan of the Voluntary Consent Order (VCO) (DEQ 2000) and were addressed in the VCO system identification documentation (INEEL 2001, 2002, 2005a, 2005b) and associated characterization engineering design files (EDFs) (EDF-1648; EDF-1652; EDF-1653; EDF-1838). Waste piping associated with the hydrofluoric acid makeup system (VCO Tank System INTEC-066), the cadmium sulfate makeup system (VCO Tank System INTEC-067), and the zirconyl nitrate makeup system (VCO Tank System INTEC-068), and two tanks and associated piping and ancillary equipment associated with the cooling and heating water system (VCO Tank System INTEC-072), were characterized as having managed HWMA/RCRA-hazardous waste and are addressed by this closure plan.

The Fluorinel Dissolution Process and Fuel Storage (FAST) Facility (CPP-666) began operations in 1984. The facility is divided into two operational areas: the FDP area and the fuel storage area. The FDP area includes the FDP itself and the supporting fluorinel makeup (FM) areas. The FDP was utilized for the dissolution of spent zirconium-based nuclear fuels, complexing fluoride ions in the dissolver product solution, and adjusting the dissolver product in preparation for transfer to the solvent extraction process in the Fuel Process Building (CPP-601). The FM area provided for the mixing, handling, and distribution of acids, nuclear poisons, and cooling and heating water used in the FDP area. The FDP area was last operated in 1988.

The FDP makeup and cooling and heating systems are located in the FDP area of the FAST facility. The waste piping associated with the FDP makeup systems and the two tanks associated with the FDP cooling and heating system are located outside of the FDP cell. The associated piping and ancillary equipment for the FDP cooling and heating system is located both in- and out-of-cell. In accordance with further milestones established under the VCO Action Plan, these tank system components will be closed under this closure plan in accordance with the tank system closure performance standards of Idaho Administrative Procedures Act (IDAPA) 58.01.05.009 [40 Code of Federal Regulations (CFR) 265.111 and 265.197(a)].

This HWMA/RCRA closure plan includes a general description of the FDP makeup and cooling and heating systems, specific descriptions of those system components characterized as having managed HWMA/RCRA-hazardous waste, and a description of the decontamination or removal actions that will be taken during HWMA/RCRA closure for those tank system components characterized as having managed HWMA/RCRA-hazardous waste. The current and maximum hazardous waste inventories are identified in

the plan along with the applicable U.S. Environmental Protection Agency (EPA) hazardous waste numbers (HWNs). Closure activities include removal of the current hazardous waste inventory. Following waste inventory removal, the tanks and tank system components that were determined to have managed hazardous waste will either be removed and appropriately dispositioned or, if removal is deemed impractical, decontaminated to meet the site-specific action levels (ALs) specified in this closure plan. The FDP makeup and cooling and heating systems will be considered HWMA/RCRA closed when the closure activities identified in this closure plan are complete, as certified by an independent, registered professional engineer (PE) and accepted by the DEQ.

Closure activities for the tank systems must comply with U.S. Department of Energy (DOE) orders pertaining to radioactive waste management and worker safety in addition to HWMA/RCRA regulations because portions of the systems contain mixed waste (both radioactive and hazardous waste per HWMA/RCRA). This closure plan was developed to address clean closure of the FDP makeup and cooling and heating systems in compliance with HWMA/RCRA regulations. Residual radioactive contamination will be addressed under a separate regulatory authority.

2. FACILITY DESCRIPTION

2.1 Site Description

The INL Site encompasses approximately 890 mi^2 on the northern edge of the Eastern Snake River Plain in southeastern Idaho. The INTEC facility is located northeast of the Central Facilities Area at the INL Site. The INTEC facility is situated on the south-central portion of the INL Site (see Figure 1) and occupies an enclosed and secured area of approximately 0.39 mi^2.

The FAST Facility (Building CPP-666) is located in the southern portion of the INTEC. The FDP makeup and cooling and heating systems are located in the FDP area of the FAST facility. The FDP makeup systems described in this closure plan supplied chemical feed to the dissolution process. The cooling and heating system is also part of the FDP and was used to provide temperature control for the spent nuclear fuel dissolution process.

Figure 1. Map of the INL Site showing the location of INTEC.

The FDP consists of three identical fuel dissolution trains (Train 1, Train 2, and Train 3). The dissolution trains consist of a dissolver, a complex vessel, an off-gas scrubber, a condenser, and associated ancillary equipment. Spent nuclear fuel was added to the dissolver in a batch process. Strong acids, mixed with cadmium for a nuclear poison, were added to the dissolver(s) to dissolve the fuel. When the correct reagents were added, the contents of the dissolver(s) were transferred to the complex vessel(s)

in order to complex free fluoride ions in the solution. Solids in the solution were allowed to settle in the complex vessel(s) before the solution was transferred to the product transfer vessel. Samples were taken from the product transfer vessel for uranium accountability and to determine the fate of the solution. The solution could be transferred to the Fuel Process Building (CPP-601) either for further treatment and recovery of uranium or for disposal. Reagents were supplied to the dissolution process from the makeup systems located in the FM area of the FDP.

Off-gas from the complex vessel(s) and dissolver(s) was vented to the off-gas condensers where water, acid vapors, and the foam caused by the high rate of hydrogen gas evolution in the dissolver were removed. The off-gas was discharged from the condenser(s) to the train off-gas scrubber(s), which removed and complexed residual entrained acid vapor from the off-gas. Cooling and heating water was supplied to the FDP process from the cooling and heating system.

The final FDP campaign was completed on July 11, 1988.[a] On April 29, 1992, the DOE announced that the reprocessing of spent nuclear fuel would be discontinued.[b]

2.2 FDP Makeup Systems Description and Operating History

The FDP makeup systems are located in Room 114-B and Room 203 of the FAST with distribution header(s) located in the operating and service corridors. The FDP makeup systems are aqueous based and were used to supply aluminum nitrate, nitric acid, hydrofluoric acid, cadmium sulfate, and zirconyl nitrate to the FDP. The aluminum nitrate makeup system (VCO Tank System INTEC-064) was used to supply aluminum nitrate to the FDP in order to complex free fluoride ions and the nitric acid makeup system (VCO Tank System INTEC-065) supplied nitric acid to the FDP. Cadmium was added to nitric acid as a criticality inhibitor. The aluminum nitrate and nitric acid makeup systems (VCO Tank Systems INTEC-064 and INTEC-065, respectively) were classified as inactive process/product units that were determined to be empty, and the tanks and associated process piping and ancillary equipment were characterized as not having managed HWMA/RCRA-hazardous waste; therefore, these units were recommended and approved for movement to Appendix C of the VCO Action Plan – Covered Matters that are Closed. The hydrofluoric acid makeup system (VCO Tank System INTEC-066) supplied the hydrofluoric acid to the fuel dissolution trains for dissolving of the fuel. The cadmium sulfate makeup system (VCO Tank System INTEC-067) was used to supply criticality inhibiting deionized (DI) process water to the dissolution trains and the zirconyl nitrate makeup system (VCO Tank System INTEC-068) was used to supply the complexing agent to the dissolution trains.

This section addresses the waste piping associated with the hydrofluoric acid makeup system (VCO Tank System INTEC-066), cadmium sulfate makeup system (VCO Tank System INTEC-067), and zirconyl nitrate makeup system (VCO Tank System INTEC-068) that has been determined to require closure. The following subsections provide a general description of each of the makeup systems addressed in this closure plan.

2.2.1 Hydrofluoric Acid Makeup System

The hydrofluoric acid makeup system (VCO Tank System INTEC-066) was used to supply hydrofluoric acid solution to the FDP. The DI water and fluoboric acid from the fluoboric acid addition pot were combined in the hydrofluoric acid makeup tank, thoroughly mixed, and transferred to the hydrofluoric acid feed tank. The fluoboric acid was added for the purpose of criticality control for the

a. Ermold, L. F., INEL, to D. W. Siddoway, INEL, August 5, 1988, "Production Department Monthly Report."

b. Ermold, L. F., INEL, to D. W. Siddoway, INEL, May 8, 1992, "Production Department Monthly Report."

dissolution process. The hydrofluoric acid feed tank was used to supply the hydrofluoric acid solution to the fuel dissolution trains via two headers (1" HF-HC-126061 and 1" HF-HC-126064). From each header, waste lines 1" XW-HC-120518 and 1" XW-HC-120519, respectively, allowed the headers to be drained to the high fluoride waste tank (VES-FA-141). Additional information regarding this VCO tank system can be found in the system identification documentation (INEEL 2002).

2.2.2 Cadmium Sulfate Makeup System

The cadmium sulfate makeup system (VCO Tank System INTEC-067) was used to supply criticality inhibiting DI process water to the FDP. The DI water and cadmium sulfate solution were combined in the cadmium sulfate poisoned water makeup tank. After the reagent was thoroughly mixed, it was transferred to the cadmium sulfate poisoned water feed tank, which was used to supply the cadmium sulfate solution to the fuel dissolution trains via chemical distribution headers. The cadmium sulfate header drain lines are connected with the aluminum nitrate and nitric acid headers in the east and west corridors and drain lines that allowed the headers to be drained to the waste collection vessel (VES-FA-142) via waste lines 1 1/2" XW-AD-120531 and 1 1/2" XW-AD-120532. Additional information regarding this VCO tank system can be found in the system identification documentation (INEEL 2005a).

2.2.3 Zirconyl Nitrate Makeup System

The zirconyl nitrate makeup system (VCO Tank System INTEC-068) was used to supply the complexing agent in the dissolution process of zirconium-clad fuels. A solution of nitric acid and DI water was used to dissolve zirconyl carbonate within the zirconyl carbonate dissolver. After the solution was mixed, it was transferred to the zirconyl nitrate makeup tank where cadmium nitrate, a criticality inhibitor, was added. The zirconyl nitrate feed tank received the solution from the zirconyl nitrate makeup tank and was used to supply the reagent to the fuel dissolution trains. An overflow line, drain line, and pump drain line from each of the three tanks drained to a floor drain (4" XW-AD-121176) in Room 203, which discharges to the waste collection vessel (VES-FA-142).[c] Additional information regarding this VCO tank system can be found in the system identification documentation (INEEL 2005b).

2.3 FDP Cooling and Heating System Description and Operating History

The FDP cooling and heating water system (VCO Tank System INTEC-072) used nuclear-poisoned cooling and heating water to control the temperature for the FDP while it was in service. The poisoned makeup water contained borated water enriched with isotope B-10 as a nuclear poison. The cooling and heating water system includes the poisoned cooling water surge vessel (VES-FM-101; 98CPP01296), the poisoned cooling and heating loop makeup tank (VES-FM-103; 98CPP01297), the poisoned heating water supply vessel (VES-FM-104; 98CPP01298), and the dissolution chiller room expansion tank (TK-FH-181; 98CPP01274). Borated water was added to the poisoned cooling and heating makeup tank through the ancillary equipment to the tank system (HO-FM-924). The poisoned cooling and heating loop makeup tank was used to provide poisoned makeup water to the closed-loop FDP cooling and heating system. The poisoned cooling water surge vessel was used to supply the cooling water to the fuel dissolution trains. The poisoned heating water supply vessel was used to supply the heating water to the fuel dissolution trains. The dissolution chiller room expansion tank was used as an expansion tank for the secondary coolant system to further cool the poisoned cooling water from the

c. Drain line 4" XW-AD-121176 joins in sequence 4" XW-AD-121170, 4" XW-AD-121167, 4" XW-AD-120534, and 4" XW-AD-120529 to waste tank VES-FA-142. Both 4" XW-AD-120534 and 4" XW-AD-120529 appear through the north wall on the -31'0" level and 4" XW-AD-120534 tees into 4" XW-AD-120529.

dissolution trains with DI water. Additional information regarding this VCO tank system can be found in the system identification documentation (INEEL 2001).The FDP cooling and heating system was partially drained during the FDP phaseout. As part of an interim action conducted under the VCO SITE-TANK-005 Action Plan for the FDP cooling and heating system, the borated water contained in the out-of-cell piping and ancillary equipment was partially drained. In early 2005, work planning was initiated to drain the accessible portions of the out-of-cell ancillary lines and equipment (i.e., those that were equipped with low points, valves, or flanges) to stop formation of cadmium-contaminated boron crystals on the exterior portions of the affected lines and equipment. Approximately 150 gal were removed and disposed of to the Process Equipment Waste Evaporator System at INTEC.

2.4 Units, Piping, and Ancillary Equipment that Managed Hazardous Waste

Characterization of the VCO Tank Systems addressed in this closure plan was completed in accordance with established milestones under the VCO (DEQ 2000). Characterization documentation was approved as follows:

- Characterization (EDF-1648) of the INTEC/FAST Hydrofluoric Acid Makeup System (VCO Tank System INTEC-066) was approved by DEQ on December 22, 2005 (Gregory 2005)
- Characterization (EDF-1653) of the INTEC Cadmium Sulfate Makeup System (VCO Tank System INTEC-067) was approved by DEQ on December 22, 2005 (Gregory 2005)
- Characterization (EDF-1652) of the INTEC Zirconyl Nitrate Makeup System (VCO Tank System INTEC-068) was approved by DEQ on December 22, 2005 (Gregory 2005)
- Characterization (EDF-1838) of the INTEC/FAST Cooling and Heating Water System (VCO Tank System INTEC-072) was approved by DEQ on September 3, 2003 (Gregory 2003).

The following subsections describe the units, piping, and ancillary equipment for which removal and or decontamination activities will be completed under this HWMA/RCRA closure plan (i.e., components that were determined during characterization to have managed HWMA/RCRA hazardous waste).

2.4.1 Hydrofluoric Acid Makeup System Waste Piping

Waste discharge piping (1” XW-HC-120518 and 1” XW-HC-120519) from the tie-in from the 1-in. hydrofluoric acid headers (1” HF-HC-126061 located in the west corridor and 1” HF-HC-126064 located in the east corridor) to the 1 1/2-in. drain line (1 1/2” XW-HC-120528) to waste tank VES-FA-141, was determined during characterization to have managed HWMA/RCRA-hazardous waste (see Figures 2 and 3). Waste line 1 1/2” XW-HC-120528 has been flushed and closed in accordance with the HWMA/RCRA closure plan for waste tanks VES-FA-141 and VES-FA-142 (INEL 1994; Wastren 1996). All remaining tank system components were characterized under the VCO as an inactive process/product units requiring no HWMA/RCRA closure actions. Table A-1 in Appendix A provides a listing of hydrofluoric acid makeup system piping subject to closure.

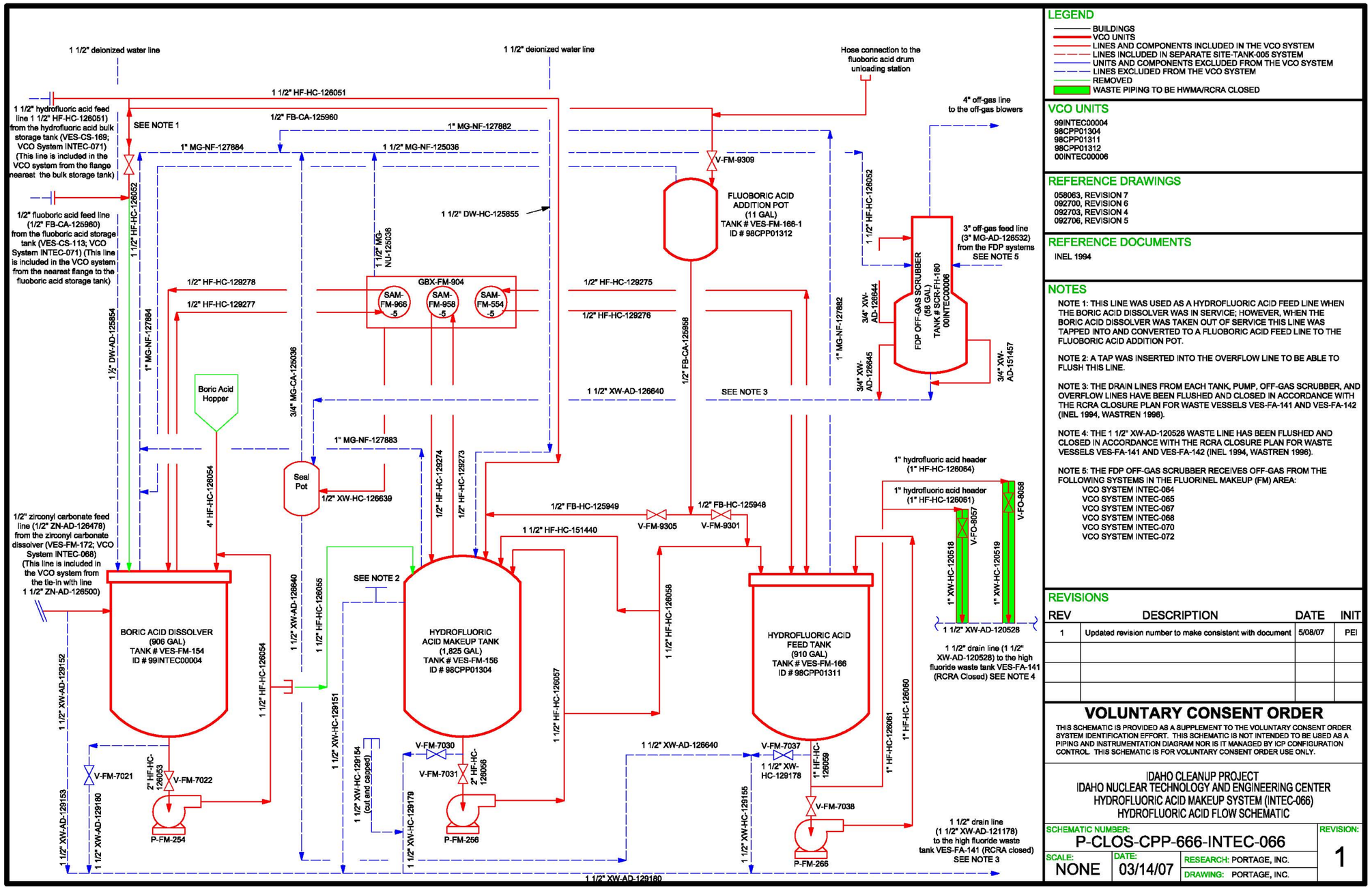


Figure 2. Schematic P-CLOS-CPP-666-INTEC-066. INTEC/FAST Hydrofluoric Acid Makeup System (INTEC-066) hydrofluoric acid flow schematic.

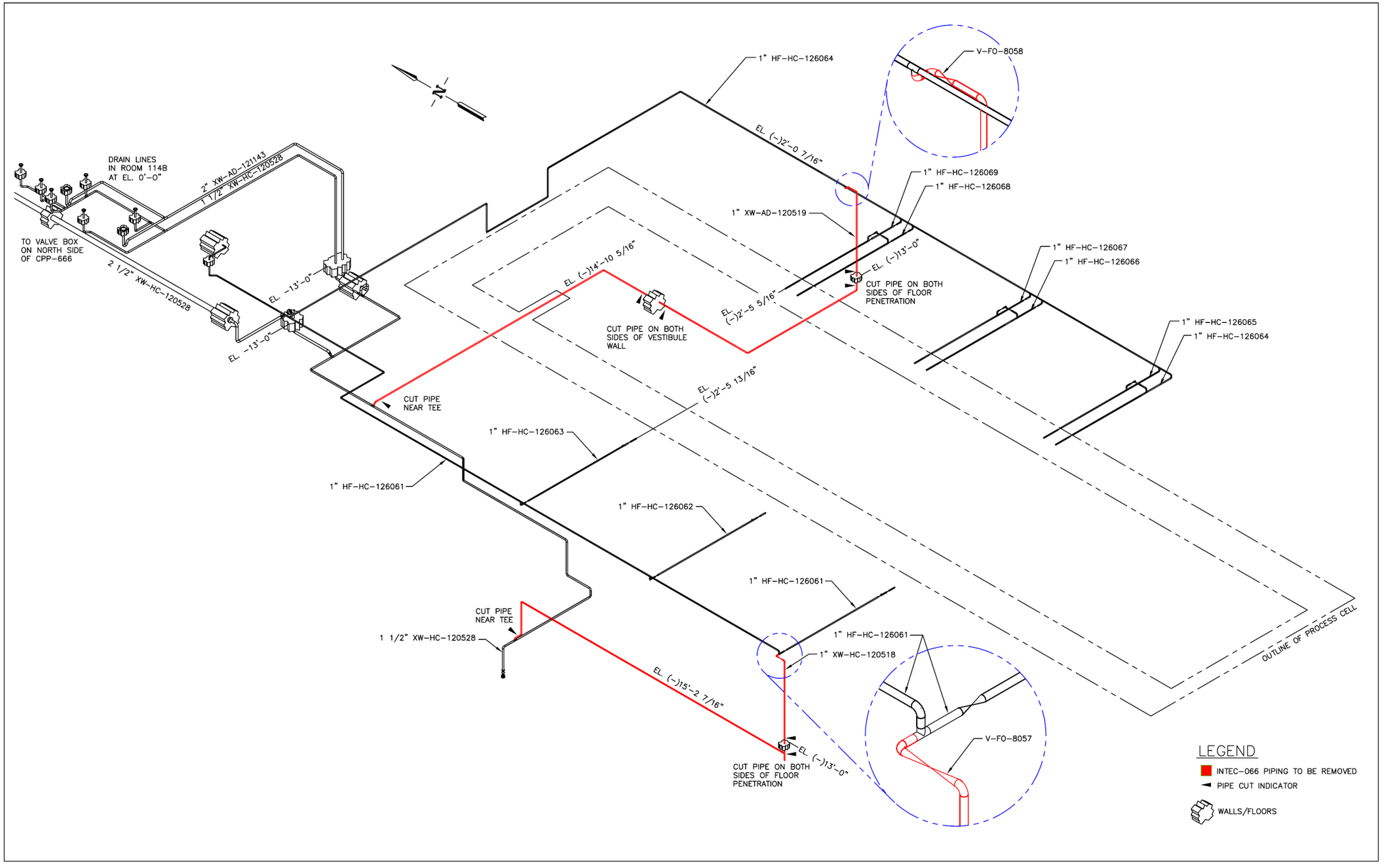


Figure 3. INTEC-066 hydrofluoric acid waste piping to be addressed during closure.

2.4.2 Cadmium Sulfate Makeup System Waste Piping

Waste discharge lines 1 1/2" XW-AD-120531 (located in the east corridor) and 1 1/2" XW-AD-120532 (located in the west corridor) from the connection with the aluminum nitrate, nitric acid, and cadmium sulfate headers to the connection with waste discharge line 4" XW-AD-120529, which discharges to waste tank VES-FA-142, were determined during characterization to have managed HWMA/RCRA-hazardous waste (see Figures 4 and 5). Waste line 4" XW-AD-120529 has been flushed and closed in accordance with the HWMA/RCRA closure plan for waste tanks VES FA-141 and VES-FA-142 (INEL 1994; Wastren 1996). All remaining tank system components were characterized under the VCO as inactive process/product units requiring no HWMA/RCRA closure actions. Table A-2 in Appendix A provides a listing of cadmium sulfate makeup system piping subject to closure.

2.4.3 Zirconyl Nitrate Makeup System Waste Piping

The waste overflow lines, drain lines, and pump drain lines that originate in Room 203 and lead to drain line 4" XW-AD-121176,[d] which discharges to waste tank VES-FA-142, were determined during characterization to have managed HWMA/RCRA-hazardous waste (see Figures 6–8). Waste line 4" XW-AD-120534 has been flushed and closed in accordance with the HWMA/RCRA closure plan for waste tanks VES-FA-141 and VES-FA-142 (INEL 1994; Wastren 1996). All remaining tank system components were characterized under the VCO as inactive process/product units requiring no HWMA/RCRA closure actions. Table A-3 in Appendix A provides a listing of zirconyl nitrate makeup system piping subject to closure.

2.4.4 FDP Cooling and Heating System

The following VCO units were determined to have managed HWMA/RCRA-hazardous waste and are subject to closure activities under this HWMA/RCRA closure plan:

- VES-FM-101—Poisoned cooling water surge vessel
- VES-FM-104—Poisoned heating water supply vessel.

The poisoned cooling and heating loop makeup tank (VES-FM-103) was verified as empty and the dissolution chiller room expansion tank (TK-FH-181) was determined to be nonhazardous per RCRA regulations and also verified as empty. These units are not addressed in this closure plan. The units undergoing closure, including the piping and ancillary equipment, are shown in Figures 9 and 10. Figure 10 provides an illustration of the complexity of the piping and associated ancillary equipment. Table A-4 in Appendix A provides a listing of the piping and ancillary equipment subject to closure.

d. Drain line 4" XW-AD-121176 joins in sequence 4" XW-AD-121170, 4" XW-AD-121167, 4" XW-AD-120534, and 4" XW-AD-120529 to waste tank VES-FA-142.

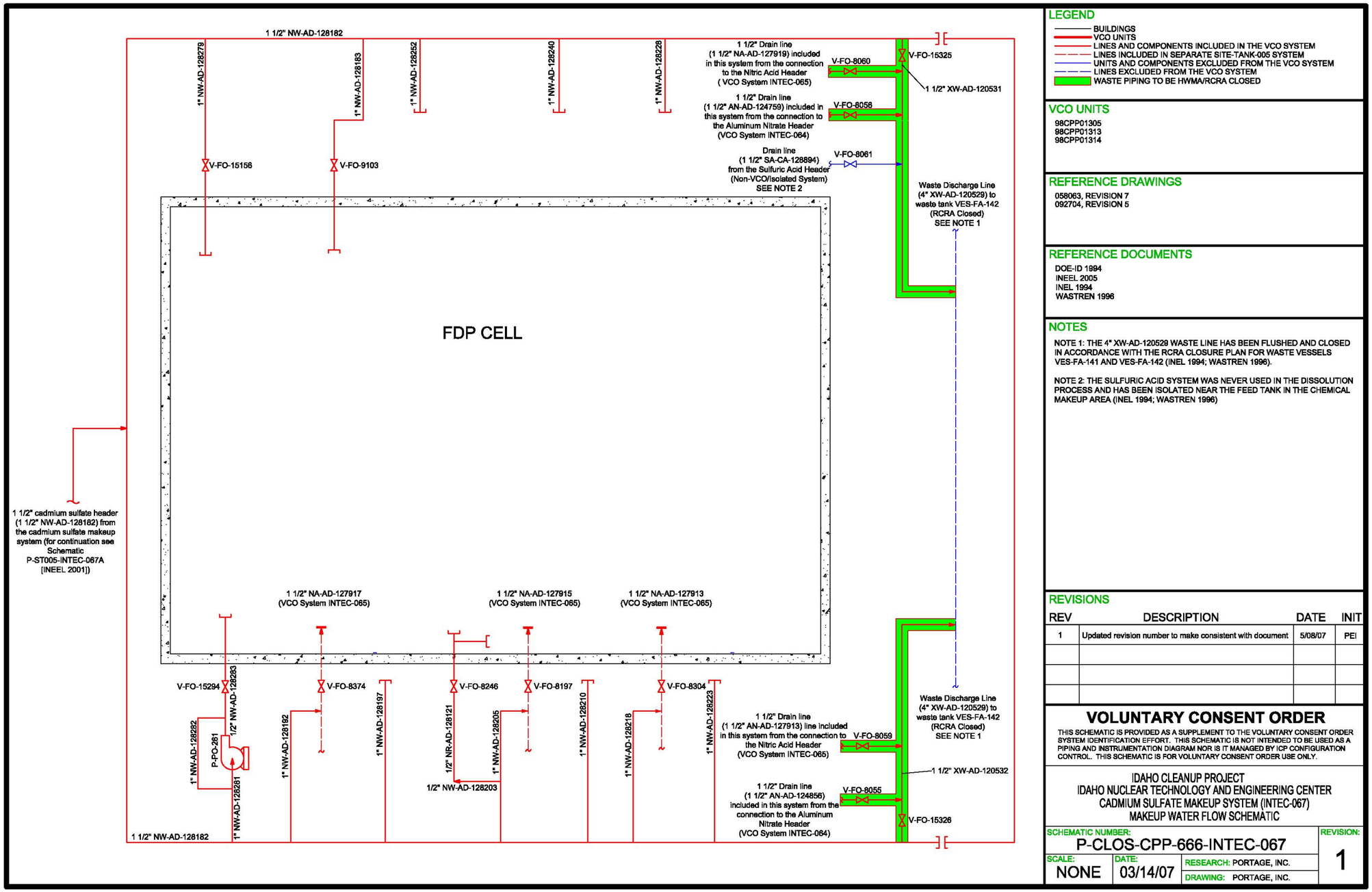


Figure 4. Schematic P-CLOS-CPP-666-INTEC-067. INTEC Cadmium Sulfate Makeup System (INTEC-067) makeup water flow schematic.

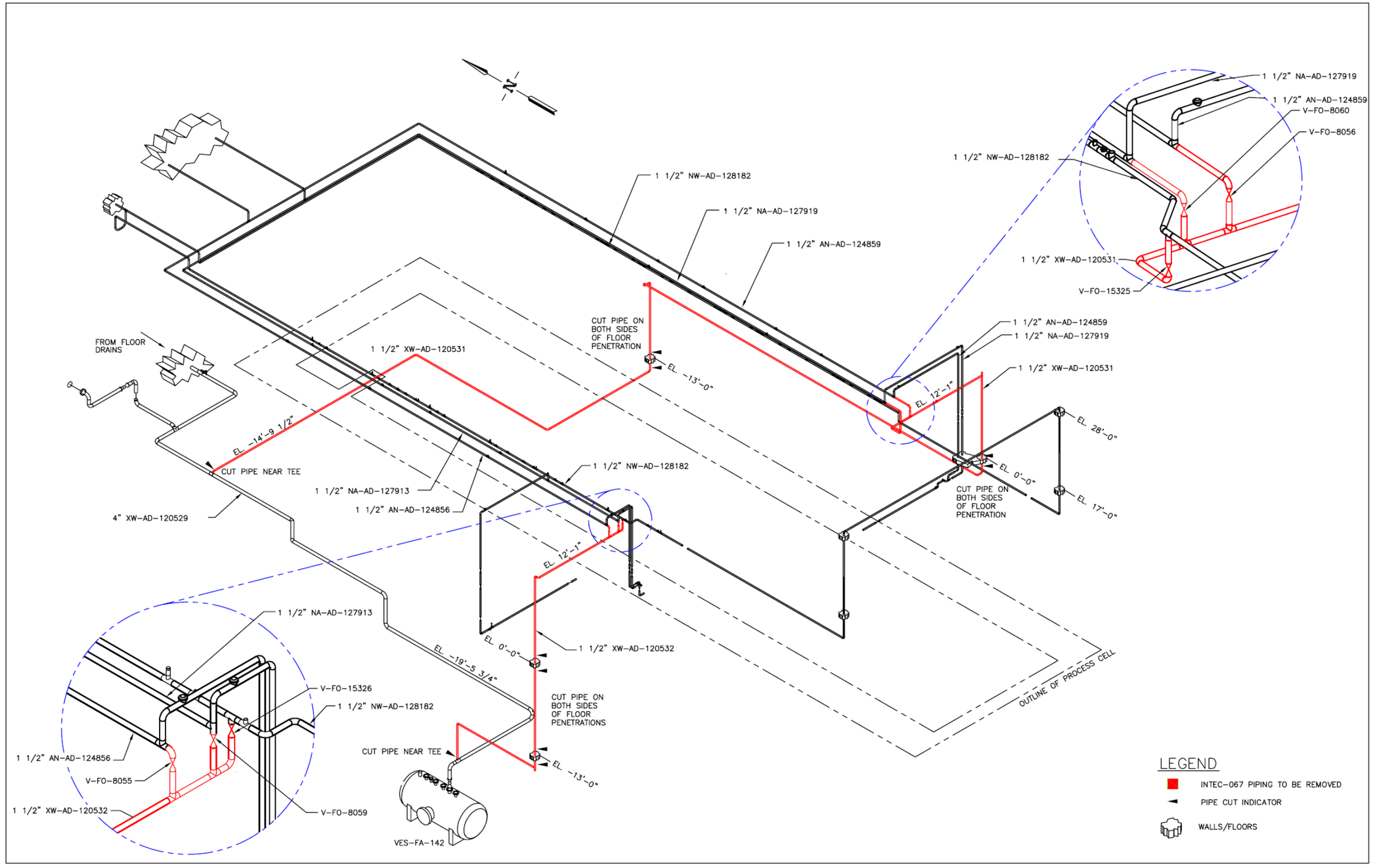
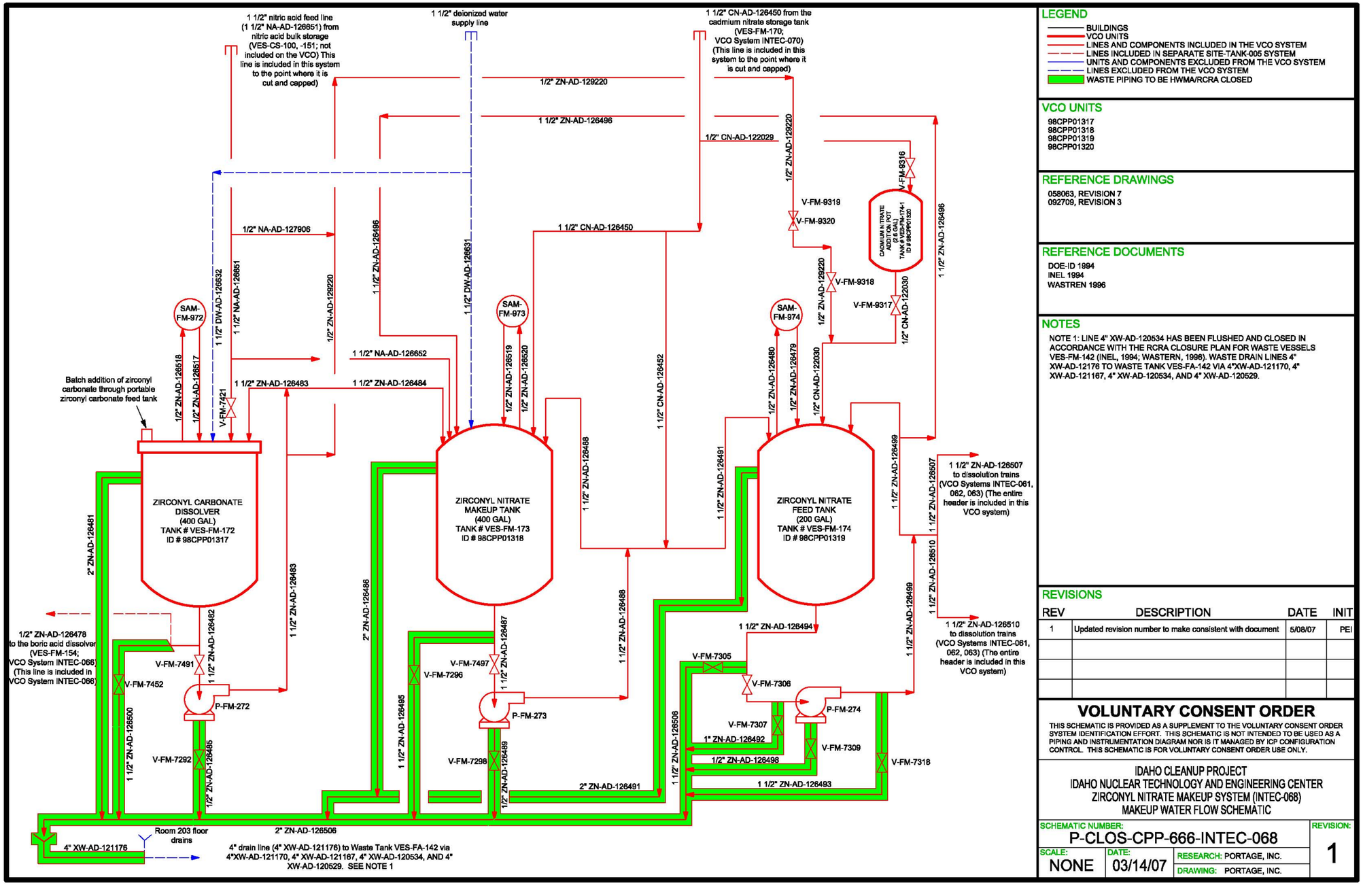


Figure 5. INTEC-067 cadmium sulfate waste piping to be addressed during closure.



LEGEND

- BUILDINGS
- VCO UNITS
- LINES AND COMPONENTS INCLUDED IN THE VCO SYSTEM
- LINES INCLUDED IN SEPARATE SITE-TANK-005 SYSTEM
- UNITS AND COMPONENTS EXCLUDED FROM THE VCO SYSTEM
- LINES EXCLUDED FROM THE VCO SYSTEM
- WASTE PIPING TO BE HWMA/RCRA CLOSED

VCO UNITS

98CPP01317
98CPP01318
98CPP01319
98CPP01320

REFERENCE DRAWINGS

058063, REVISION 7
092709, REVISION 3

REFERENCE DOCUMENTS

DOE-ID 1994
INEL 1994
WASTREN 1996

NOTES

NOTE 1: LINE 4" XW-AD-120534 HAS BEEN FLUSHED AND CLOSED IN ACCORDANCE WITH THE RCRA CLOSURE PLAN FOR WASTE VESSELS VES-FM-142 (INEL, 1994; WASTERN, 1996). WASTE DRAIN LINES 4" XW-AD-12176 TO WASTE TANK VES-FA-142 VIA 4"XW-AD-121170, 4" XW-AD-121167, 4" XW-AD-120534, AND 4" XW-AD-120529.

REVISIONS

REV	DESCRIPTION	DATE	INIT
1	Updated revision number to make consistent with document	5/08/07	PEI

VOLUNTARY CONSENT ORDER

THIS SCHEMATIC IS PROVIDED AS A SUPPLEMENT TO THE VOLUNTARY CONSENT ORDER SYSTEM IDENTIFICATION EFFORT. THIS SCHEMATIC IS NOT INTENDED TO BE USED AS A PIPING AND INSTRUMENTATION DIAGRAM NOR IS IT MANAGED BY ICP CONFIGURATION CONTROL. THIS SCHEMATIC IS FOR VOLUNTARY CONSENT ORDER USE ONLY.

IDAHO CLEANUP PROJECT
IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER
ZIRCONYL NITRATE MAKEUP SYSTEM (INTEC-068)
MAKEUP WATER FLOW SCHEMATIC

SCHEMATIC NUMBER: P-CLOS-CPP-666-INTEC-068
REVISION: 1
SCALE: NONE
DATE: 03/14/07
RESEARCH: PORTAGE, INC.
DRAWING: PORTAGE, INC.

Figure 6. Schematic P-CLOS-CPP-666-INTEC-068. INTEC Zirconyl Nitrate Makeup System (INTEC-068) makeup water flow schematic.

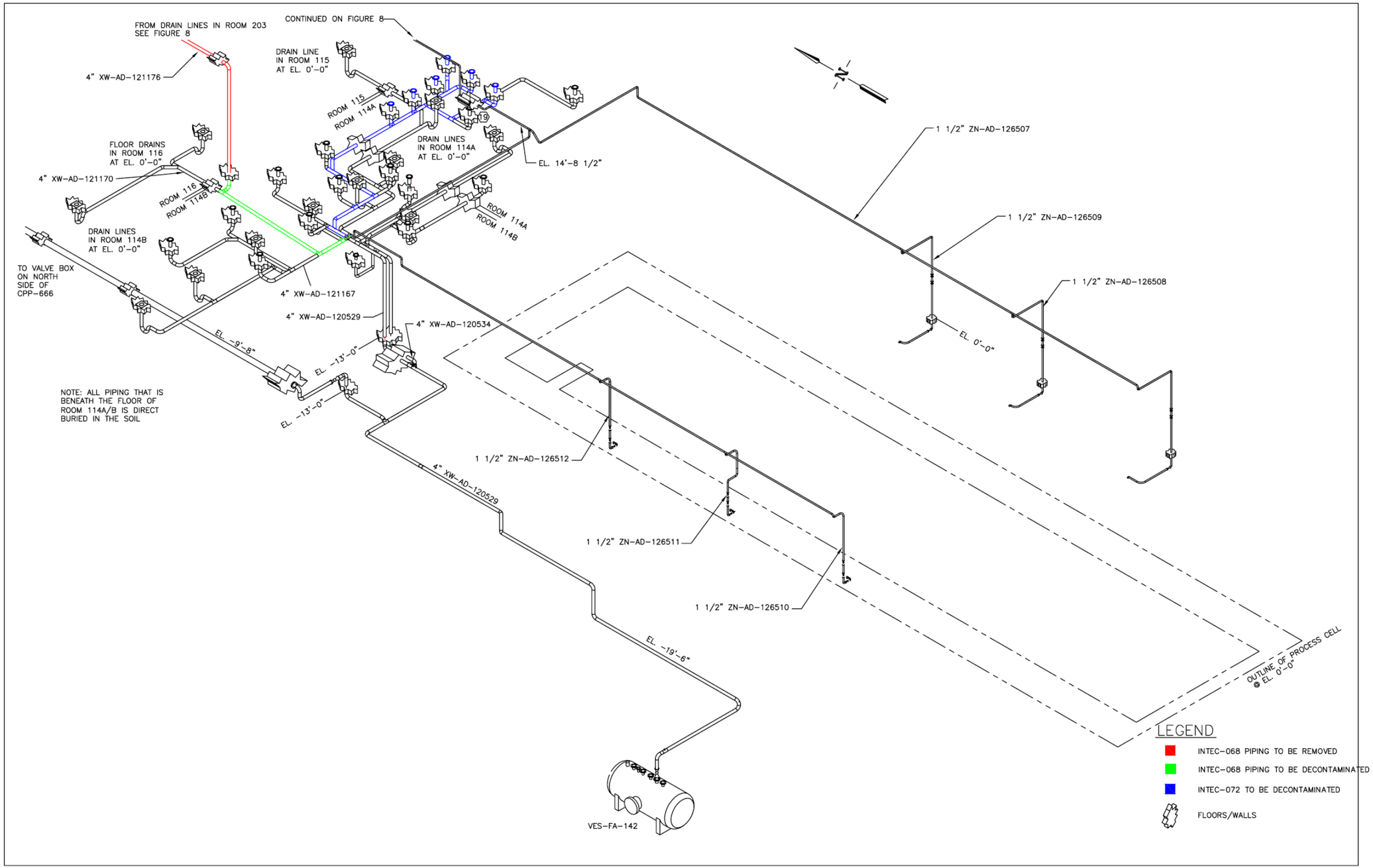


Figure 7. INTEC-068 zirconyl nitrate waste piping to be addressed during closure (showing location in Room 203).

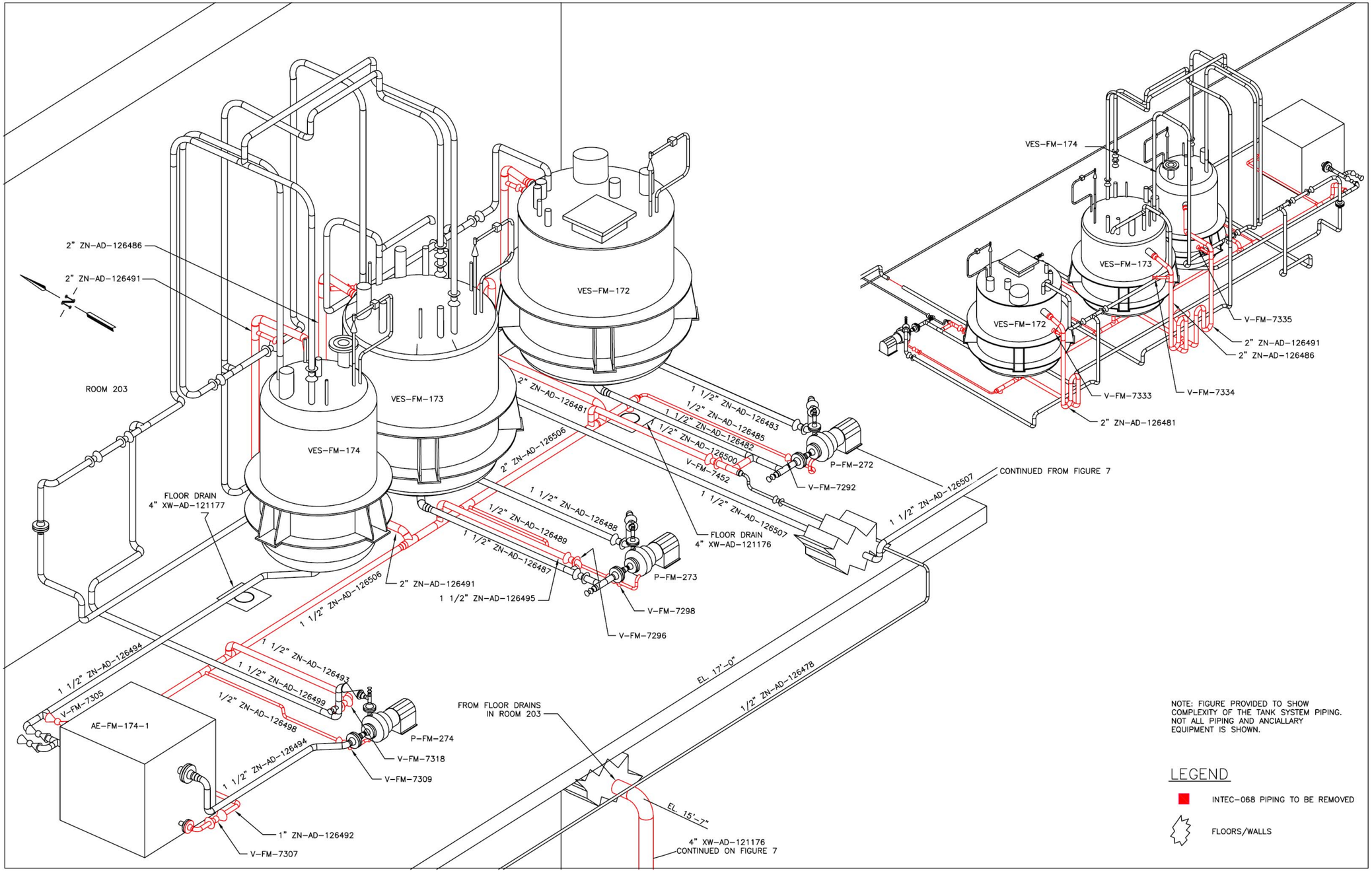
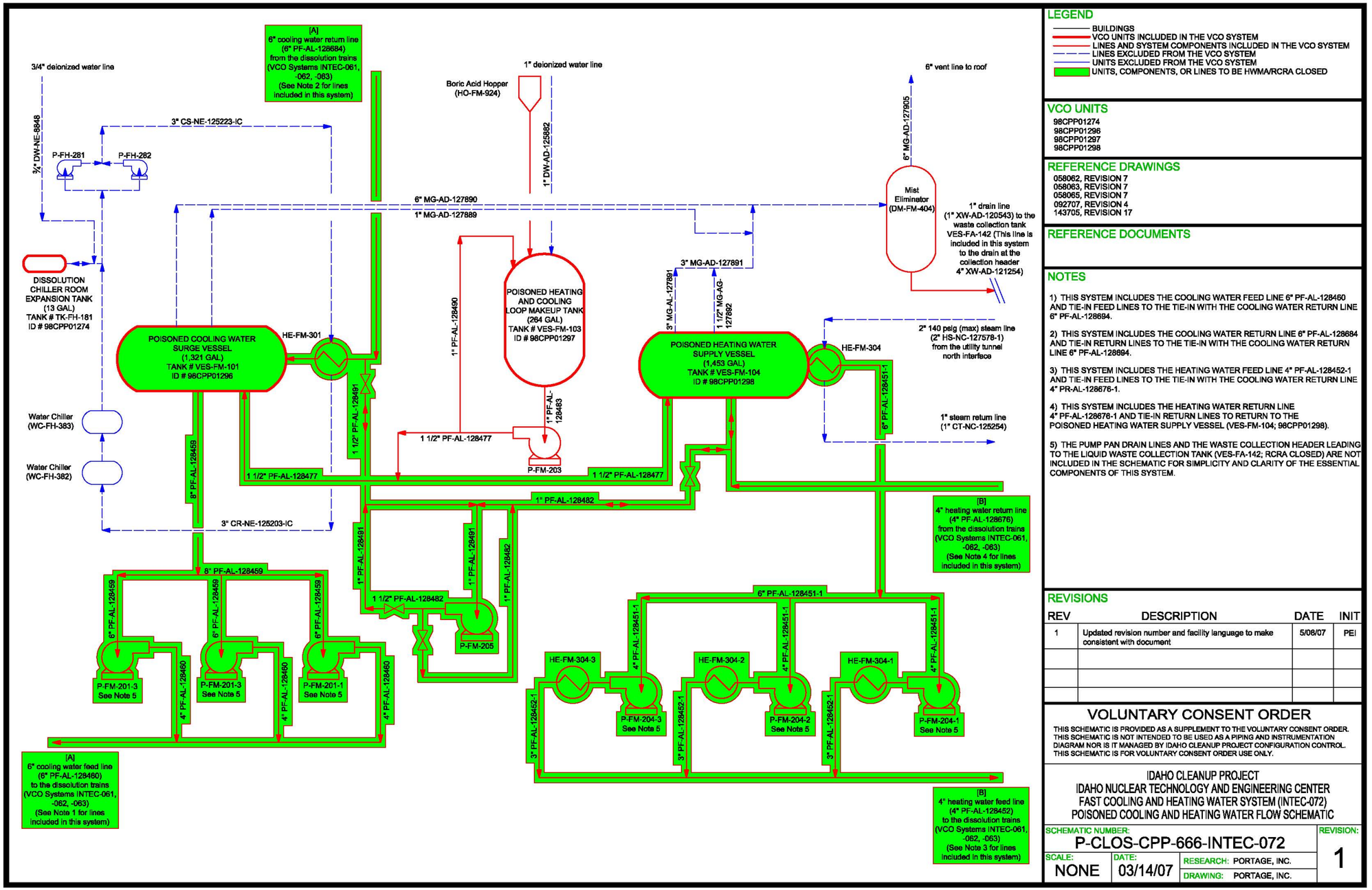


Figure 8. INTEC-068 zirconyl nitrate waste piping to be addressed during closure (showing drain line from Room 203 to waste tank VES-FA-142).



LEGEND

- BUILDINGS
- VCO UNITS INCLUDED IN THE VCO SYSTEM
- LINES AND SYSTEM COMPONENTS INCLUDED IN THE VCO SYSTEM
- LINES EXCLUDED FROM THE VCO SYSTEM
- UNITS EXCLUDED FROM THE VCO SYSTEM
- UNITS, COMPONENTS, OR LINES TO BE HWMA/RCRA CLOSED

VCO UNITS

98CPP01274
98CPP01296
98CPP01297
98CPP01298

REFERENCE DRAWINGS

058062, REVISION 7
058063, REVISION 7
058065, REVISION 7
092707, REVISION 4
143705, REVISION 17

REFERENCE DOCUMENTS

NOTES

1) THIS SYSTEM INCLUDES THE COOLING WATER FEED LINE 6" PF-AL-128460 AND TIE-IN FEED LINES TO THE TIE-IN WITH THE COOLING WATER RETURN LINE 6" PF-AL-128694.

2) THIS SYSTEM INCLUDES THE COOLING WATER RETURN LINE 6" PF-AL-128684 AND TIE-IN RETURN LINES TO THE TIE-IN WITH THE COOLING WATER RETURN LINE 6" PF-AL-128694.

3) THIS SYSTEM INCLUDES THE HEATING WATER FEED LINE 4" PF-AL-128452-1 AND TIE-IN FEED LINES TO THE TIE-IN WITH THE COOLING WATER RETURN LINE 4" PR-AL-128676-1.

4) THIS SYSTEM INCLUDES THE HEATING WATER RETURN LINE 4" PF-AL-128676-1 AND TIE-IN RETURN LINES TO RETURN TO THE POISONED HEATING WATER SUPPLY VESSEL (VES-FM-104; 98CPP01298).

5) THE PUMP PAN DRAIN LINES AND THE WASTE COLLECTION HEADER LEADING TO THE LIQUID WASTE COLLECTION TANK (VES-FA-142; RCRA CLOSED) ARE NOT INCLUDED IN THE SCHEMATIC FOR SIMPLICITY AND CLARITY OF THE ESSENTIAL COMPONENTS OF THIS SYSTEM.

REVISIONS

REV	DESCRIPTION	DATE	INIT
1	Updated revision number and facility language to make consistent with document	5/08/07	PEI

VOLUNTARY CONSENT ORDER

THIS SCHEMATIC IS PROVIDED AS A SUPPLEMENT TO THE VOLUNTARY CONSENT ORDER. THIS SCHEMATIC IS NOT INTENDED TO BE USED AS A PIPING AND INSTRUMENTATION DIAGRAM NOR IS IT MANAGED BY IDAHO CLEANUP PROJECT CONFIGURATION CONTROL. THIS SCHEMATIC IS FOR VOLUNTARY CONSENT ORDER USE ONLY.

IDAHO CLEANUP PROJECT
IDAHO NUCLEAR TECHNOLOGY AND ENGINEERING CENTER
FAST COOLING AND HEATING WATER SYSTEM (INTEC-072)
POISONED COOLING AND HEATING WATER FLOW SCHEMATIC

SCHEMATIC NUMBER: P-CLOS-CPP-666-INTEC-072
REVISION: 1
SCALE: NONE
DATE: 03/14/07
RESEARCH: PORTAGE, INC.
DRAWING: PORTAGE, INC.

Figure 9. Schematic P-CLOS-CPP-666-INTEC-072. INTEC/FAST Cooling and Heating Water System (INTEC-072) poisoned cooling and heating water flow schematic.

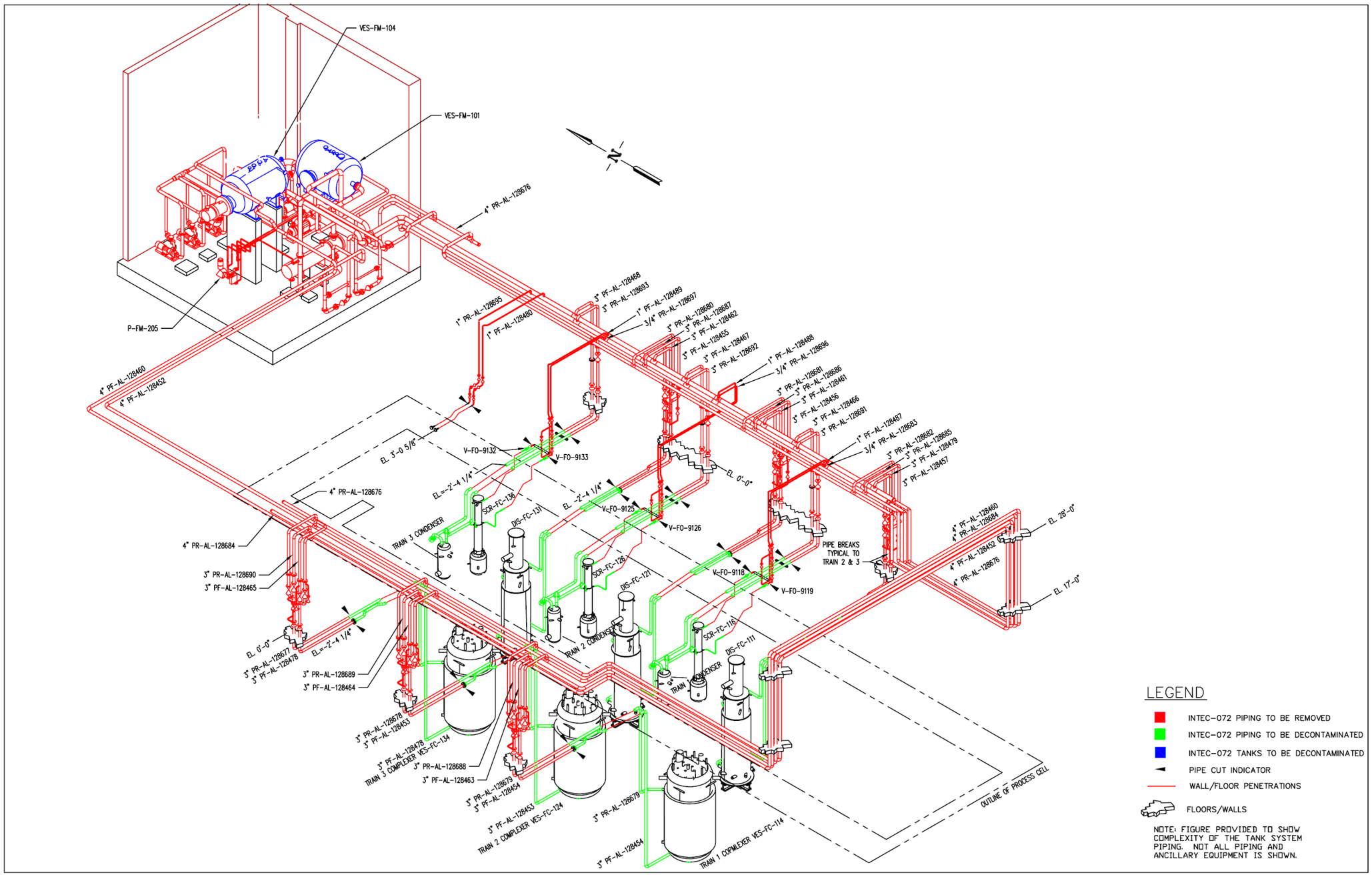


Figure 10. INTEC-072 cooling and heating units, piping, and ancillary equipment to be addressed during closure.

3. CURRENT AND MAXIMUM WASTE INVENTORIES AND CHARACTERISTICS

3.1 FDP Makeup Systems Waste Piping

The waste discharge piping associated with the FDP makeup systems was designed to gravity drain to the waste collection vessel or high fluoride waste tank (VES-FA-142 or VES-FA-141, respectively); only residual liquids, if any, remain in the waste piping.

The VCO tanks associated with the waste piping were identified as process/product units that were verified as empty and moved to Appendix C of the VCO Action Plan – Covered Matters that are Closed. Based on the total tank capacity, the maximum capacity of the tank systems was approximately 7,963 gal.

The waste piping was characterized as HWMA/RCRA hazardous for corrosivity (EPA HWN D002) and the toxicity characteristic for cadmium (EPA HWN D006) with the exception of the hydrofluoric acid makeup system waste piping, which was characterized as HWMA/RCRA hazardous only for corrosivity (EPA HWN D002) (EDF-1648; EDF-1652; EDF-1653).

3.2 FDP Cooling and Heating System Units, Piping, and Ancillary Equipment

The poisoned cooling water surge vessel (VES-FM-101) and the poisoned heating water supply vessel (VES-FM-104) and associated piping and ancillary equipment were determined to be hazardous per HWMA/RCRA regulations (EDF-1838). The poisoned cooling water surge vessel and the poisoned heating water supply vessel were visually verified as empty; however, process knowledge revealed that the tanks were not emptied within 90 days of final use and were characterized as HWMA/RCRA hazardous for cadmium (EPA HWN D006). The piping and associated ancillary equipment was partially drained; however, the piping and ancillary equipment is known to still contain borated water. The borated water was sampled and analyzed for toxicity characteristic metals (Davis 2003) and was found to contain cadmium concentrations that exceeded the toxicity characteristic level.

The FDP cooling and heating system contained a maximum capacity of approximately 6,308 gal (tanks have a combined capacity of 3,051 gal and lines have a capacity of 3,257 gal). The FDP cooling and heating system was partially drained during the FDP phaseout, at which time approximately 2,645 gal of cooling and heating water remained in the piping and cooling/heating jackets associated with the process vessels.

In 2005 as part of an interim action under the VCO SITE-TANK-005 Action Plan, work planning was initiated to drain the accessible portions of the out-of-cell ancillary lines and equipment. Approximately 150 gal of liquids were removed. The current maximum volume estimate of waste remaining in the piping and ancillary equipment is approximately 2,495 gal.

4. CLOSURE PERFORMANCE STANDARDS

This section describes the performance standards for closure of the FDP makeup and cooling and heating systems per the tank system closure requirements of IDAPA 58.01.05.009 (40 CFR 265.111 and 265.197) and the procedures for meeting the closure performance standards.

4.1 Regulatory Closure Performance Standards

The closure performance standards identified in IDAPA 58.01.05.009 (40 CFR 265.111 and 265.197) applicable to the FDP makeup and cooling and heating systems closure are:

Standard 1: The owner or operator must close the facility in a manner that minimizes the need for further maintenance (IDAPA 58.01.05.009 [40 CFR 265.111(a)]).

Standard 2: The owner or operator must close the facility in a manner that controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere (IDAPA 58.01.05.009 [40 CFR 265.111(b)]).

Standard 3: At closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste, unless §261.3(d) of this Chapter (CFR Title 40) applies. The closure plan, closure activities, cost estimates for closure, and financial responsibility for the tank systems must meet all of the requirements specified in subparts G and H of this part (IDAPA 58.01.05.009 [40 CFR 265.197(a)]).

4.2 Activities for Achieving the Closure Performance Standards

The closure and waste management activities to be conducted under HWMA/RCRA closure are described in detail in Section 5 of this closure plan for each of the subsystems undergoing closure. The closure performance standards will be achieved by the following measures:

4.2.1 Standard 1

Standard 1: The owner or operator must close the facility in a manner that minimizes the need for further maintenance (IDAPA 58.01.05.009 [40 CFR 265.111(a)]).

1. Residual hazardous waste remaining in the waste piping and ancillary equipment will be removed and disposed of. Removal of solid waste residuals may be conducted concurrent with removal of piping and decontamination.

2. Piping and ancillary equipment subject to closure will either be removed and disposed of or decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

3. The poisoned cooling water surge vessel (VES-FM-101) and poisoned heating water supply vessel (VES-FM-104) will be decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

4.2.2 Standard 2

Standard 2: The owner or operator must close the facility in a manner that controls, minimizes, or eliminates to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere (IDAPA 58.01.05.009 [40 CFR 265.111(b)]).

1. Residual hazardous waste remaining in the waste piping and ancillary equipment will be removed and disposed of. Removal of solid waste residuals may be conducted concurrent with removal of piping and decontamination.

2. Piping and ancillary equipment subject to closure will either be removed and disposed of or decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

3. The poisoned cooling water surge vessel (VES-FM-101) and poisoned heating water supply vessel (VES-FM-104) will be decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

4.2.3 Standard 3

Standard 3: At closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste, unless §261.3(d) of this Chapter (CFR Title 40) applies. The closure plan, closure activities, cost estimates for closure, and financial responsibility for the tank systems must meet all of the requirements specified in subparts G and H of this part (IDAPA 58.01.05.009 [40 CFR 265.197(a)]).

1. Residual hazardous waste remaining in the waste piping and ancillary equipment will be removed and disposed of. Removal of solid waste residuals may be conducted concurrent with removal of piping and decontamination.

2. Piping and ancillary equipment subject to closure will either be removed and disposed of or decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

3. The poisoned cooling water surge vessel (VES-FM-101) and poisoned heating water supply vessel (VES-FM-104) will be decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

The FDP makeup systems include direct-buried piping associated with the zirconyl nitrate system (VCO Tank System INTEC-068) that does not have secondary containment. Soils associated with non-secondarily contained, direct-buried piping will be addressed by performing an integrity evaluation of the piping. If the integrity evaluation demonstrates that no release to the environment from the piping has occurred, then no further actions with regard to potentially contaminated soils will be conducted as part of HWMA/RCRA closure activities. If integrity of the piping is not verified, this closure plan will be amended in accordance with Section 7 to address potentially contaminated soils.

The FDP cooling and heating system is located inside Building CPP-666 with adequate roof and walls. Therefore, no actions with regard to potentially contaminated soils will be taken for the FDP cooling and heating system.

The majority of system components undergoing HWMA/RCRA closure are located within Building CPP-666. Known crystal growth has been identified on the outside of various sections of the waste piping associated with the FDP makeup and cooling and heating systems. Potentially contaminated containment system surfaces (i.e., drip pans and concrete floors) underlying the piping will either be removed or decontaminated to the site-specific ALs specified in Section 5 of this HWMA/RCRA closure plan.

5. CLOSURE ACTIVITIES

This section describes the methods for closing the FDP makeup and cooling and heating systems per the interim status tank system closure performance standard requirements of IDAPA 58.01.05.009 (40 CFR 265, Subparts G and J). The systems will be closed through a combination of removal and decontamination to the site-specific ALs specified in this closure plan. The following subsections describe the closure activities to be completed for each system undergoing HWMA/RCRA closure, waste management activities, and required closure documentation to ensure the tank system closure performance standards (see Section 4) are satisfied.

Portions of the systems addressed in this closure plan are to be closed under HWMA/RCRA by decontamination. Decontamination activities will include utilization of physical/abrasive methods and/or chemical decontamination. Water will be utilized as the chemical decontamination agent. Water is an appropriate decontamination solution since the FDP makeup systems and the heating and cooling system were aqueous based and water is also representative of potential leaching liquid that would contact the system under a tank system closure scenario. Compliance with the performance standards for components that will be decontaminated will be demonstrated through visual inspection (physical/abrasive decontamination) or sampling of the final rinsate solutions (chemical decontamination) to demonstrate that the site-specific ALs provided in Table 1 are achieved. These site-specific ALs were developed to ensure that the tank system components, subsequent to completion of closure activities, will be left in a state that is protective of human health and the environment. All rinsate sampling will be conducted in accordance with the *Sampling and Analysis Plan for the HWMA/RCRA Closure of the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems Voluntary Consent Order SITE-TANK-005 Action Plan Tank Systems INTEC-066, INTEC-067, INTEC-068, and INTEC-072* (RPT-360).

The HWMA/RCRA contaminants of concern (COCs) to be addressed under closure based on process knowledge and analytical results limit the COCs to arsenic, barium, cadmium, lead, nickel, selenium, and silver. To be conservative, site-specific ALs were calculated for contract laboratory program (CLP) metals listed in Table 1.

If additional HWMA/RCRA COCs (listed in 40 CFR 261, Appendix VIII, or 40 CFR 268.48) are identified during closure, ALs may be revised, as necessary, to account for these additional COCs. Revised ALs, if necessary, will be addressed in the data quality assessment and/or closure certification, as appropriate.

Table 1. Site-specific ALs for closure of the FDP makeup and cooling and heating systems.

Contaminant of Concern	Action Level (mg/L)	Contaminant of Concern	Action Level (mg/L)
Antimony	8.9E+01	Mercury	1.2E-01
Arsenic	3.0E+00	Nickel	8.9E+01
Barium	5.9E+01	Selenium	5.9E-01
Beryllium	3.9E+01	Silver	3.0E+00
Cadmium	5.9E-01	Thallium	6.6E+01
Chromium	3.0E+00	Vanadium	8.9E+01
Lead	2.5E-01	Zinc	8.9E+01

5.1 Closure Activities for the FDP Makeup Systems

5.1.1 Removal of Waste Piping and Associated Ancillary Equipment

Waste piping associated with the FDP makeup systems will be removed with the exception of waste drain line 4" XW-AD-121176 (associated with the zirconyl nitrate system [VCO Tank System INTEC-068]) where the line penetrates the floor in Room 114B and drains to waste tank VES-FA-142.[e] A summary of the waste piping to be removed during closure of the FDP makeup systems, including piping to be decontaminated, is presented in Appendix A. Figures 3–8 show the FDP makeup systems piping that is planned for removal. Drip pans associated with the makeup systems will also be removed. Piping embedded in concrete floors and walls will be removed as close as practical to the concrete surface. The waste piping generated during closure activities will be managed as described in Subsection 5.3. During removal of waste piping, if any solid or liquid waste residuals are identified in the waste piping, the residual waste will be managed as described in Subsection 5.3. Should removal be deemed impractical, the piping will be decontaminated in accordance with Subsection 5.1.2.

5.1.2 Decontamination of Waste Piping and Short Embedded Stubs

5.1.2.1 Decontamination of Waste Piping. Waste piping associated with the zirconyl nitrate system (VCO Tank System INTEC-068) will be decontaminated in lieu of removal (as noted in Table A-3, Appendix A). Should removal be determined to be impractical for piping currently identified for removal, the waste piping will also be decontaminated. Waste drain line 4" XW-AD-121176, including drain line 4" XW-AD-121177 that ties into 4" XW-AD-121167 beneath the floor of Room 203, will be removed to the point where drain line 4" XW-AD-121176 penetrates the floor in Room 114B. Waste drain line 4" XW-AD-121176 will be decontaminated from where the drain line penetrates the floor in Room 114B and joins in sequence 4" XW-AD-121170 and 4" XW-AD-121167.

Prior to decontaminating the waste piping, an integrity evaluation will be performed for the direct-buried portion of the piping system as described in Subsection 5.1.4 of this closure plan. The waste piping will be decontaminated by flushing the piping with the decontamination solution (water) and transferring the decontamination solution to waste tank VES-FA-142 or collecting the decontamination solution in containers. Water is an appropriate decontamination solution since the FDP makeup systems were aqueous based and water is also representative of potential leaching liquid that would contact the system under a tank system closure scenario. Following decontamination, final rinsate samples will be collected to demonstrate that site-specific ALs specified in this closure plan (Table 1) are met. If the site-specific ALs are not met, then the waste piping will continue to be decontaminated until the site-specific ALs are achieved. All samples will be collected in accordance with the provisions of the *Sampling and Analysis Plan for the HWMA/RCRA Closure of the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems Voluntary Consent Order SITE-TANK-005 Action Plan Tank Systems INTEC-066, INTEC-067, INTEC-068, and INTEC-072* (RPT-360).

Waste tank VES-FA-142 has been closed in accordance with a HWMA/RCRA closure plan (INEL 1994; Wastren 1996). If waste tank VES-FA-142 is used to collect the decontamination solution, final piping rinsate samples collected from VES-FA-142 will verify the waste piping and tank VES-FA-142 have been decontaminated to meet site-specific ALs specified in Section 5 of this closure

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e. Drain line 4" XW-AD-121176 joins in sequence 4" XW-AD-121170, 4" XW-AD-121167, 4" XW-AD-120534, and 4" XW-AD-120529 to waste tank VES-FA-142. Both 4" XW-AD-120534 and 4" XW-AD-120529 appear through the north wall on the -31'0" level and 4" XW-AD-120534 tees into 4" XW-AD-120529. Lines 4" XW-AD-120534 and 4" XW-AD-120529 were flushed and closed in accordance with the HWMA/RCRA closure plan for waste tanks VES-FA-141 and VES-FA-142 (INEL 1994; Wastren 1996).

plan. In the event that piping identified for decontamination cannot successfully be decontaminated to meet the site-specific ALs, or if field conditions should so dictate, piping currently identified for decontamination may be removed and managed in accordance with Subsection 5.3.

5.1.2.2 Decontamination of Short Embedded Piping Stubs. Short embedded piping stubs (e.g., floor and wall penetrations) will be decontaminated using physical/abrasive techniques (e.g., scrubbing and scouring) and visually inspected to ensure no waste-related residues or staining remain. Because these short piping stubs can be visually inspected, it is unnecessary to define ALs for these pipe stubs. The performance standard criteria for decontamination of the piping stub internal surfaces will be decontamination to remove visible waste-related staining. Visible waste-related staining will be considered removed when the surface in question, when viewed without magnification, is free of all visible hazardous waste except that residual staining from waste consisting of light shadows, slight streaks, or minor discolorations, and waste in cracks, crevices, and pits may be present provided that such staining and waste in cracks, crevices, and pits shall be limited to no more than 5% of the volume of any 1-ft piping length. Table 2 below lists the embedded waste piping and location of the embedded portions of the line.

Table 2. FDP makeup systems embedded piping stubs.

Line Number	Location
INTEC-066	
1” XW-HC-120518	Level -13’0”
1” XW-HC-120519	Level -13’0”
1” XW-HC-120519	Level -14’10” (vestibule)
INTEC-067	
1 1/2” XW-AD-120531	Level 0’0”
1 1/2” XW-AD-120532	Level 0’0”
1 1/2” XW-AD-120531	Level -13’0”
1 1/2” XW-AD-120532	Level -13’0”
INTEC-068	
4” XW-AD-121176	Level 15’7”

5.1.3 Decontamination of Containment System Components

The FDP makeup systems waste piping is in close proximity with a majority of the FDP cooling and heating system piping and associated ancillary equipment. As such, containment system components (i.e., painted concrete floor surfaces) will be decontaminated as described in Subsection 5.2.4.

5.1.4 Verification of System Integrity

Prior to decontamination, line 4” XW-AD-121176, which joins in sequence 4” XW-AD-121170 and 4” XW-AD-121167 and lines 1” XW-HC-120519 and 1 1/2” XW-AD-120531 located on the -31’0” level where the lines enter a vestibule until the lines exit the vestibule, will undergo an integrity evaluation. The integrity evaluation will assess the potential for a release to the subsurface as a result of previous operational activities. An appropriate methodology will be used to demonstrate the integrity of

system piping. The results of the integrity evaluation will be provided to the independent PE certifying HWMA/RCRA closure activities. If the integrity of the piping is confirmed, no further actions with regard to potentially contaminated soils will be conducted as part of HWMA/RCRA closure. If the integrity of the waste piping associated with 4" XW-AD-121176 cannot be confirmed, this closure plan will be amended in accordance with Section 7. If the integrity of waste piping for 1" XW-HC-120519 and 1 1/2" XW-AD-120531 cannot be confirmed, then the painted concrete floors underlying the waste piping will be decontaminated.

5.2 Closure Activities for the FDP Cooling and Heating System

5.2.1 Removal of Hazardous Waste Inventory

Hazardous waste remaining in the piping and ancillary equipment will be removed. Liquids will be pumped, drained, or flushed out with water and discharged to waste tank VES-FA-142 or collected in containers. Any solid waste residuals remaining in the piping will be removed and managed with the piping. All waste generated during closure activities will be managed as described in Subsection 5.3.

5.2.2 Removal of Piping and Associated Ancillary Equipment

Out-of-cell piping and ancillary equipment will be removed. A summary of piping to be removed during closure is listed in Table A-4 (Appendix A). Figure 10 shows the FDP cooling and heating system piping and associated ancillary equipment that is planned for removal. The ancillary equipment includes, but is not limited to, heat exchangers, pumps, and miscellaneous instrumentation. Piping embedded in concrete floors or walls will be removed as close as practical to the concrete surface. The 3-in. supply and return piping that penetrates the cell wall on the -13'0" level will be disconnected approximately 7 ft from the cell wall to allow for flush connections such that the dissolver, complexer, and condenser process vessel jacket can be decontaminated. The 1-in. supply and 3/4-in. return piping that penetrates the cell wall on the 0'0" level will also be disconnected as close as practical from the cell wall to allow scrubber process vessel jacket flush connections to be made.

Sleeved piping will be pulled through the piping penetrations, if possible. The piping and associated ancillary equipment will be removed and managed as described in Subsection 5.3. Should removal be deemed impracticable, the piping will be decontaminated in accordance with Subsection 5.2.3.

5.2.3 Decontamination of Tanks, Piping and Associated Ancillary Equipment

5.2.3.1 Decontamination of Tanks. The poisoned cooling water surge vessel (VES-FM-101) and poisoned heating water supply vessel (VES-FM-104) will be iteratively decontaminated with water until the site-specific ALs specified in Table 1 of this closure plan are met. Compliance with the closure performance standards will be demonstrated by sampling the final rinsate solutions from the decontamination efforts and comparing the resulting analytical data to the site-specific ALs provided in Table 1.

5.2.3.2 Decontamination of In-Cell Piping and Ancillary Equipment. In-cell piping and ancillary equipment will be decontaminated in lieu of removal. Table A-4 in Appendix A lists the piping and ancillary equipment to be decontaminated. An integrity evaluation will not be conducted to assess the potential for releases from in-cell piping and ancillary equipment. Releases from in-cell piping and ancillary equipment will be addressed during closure of VCO Tank System INTEC-061. The piping and ancillary equipment will be decontaminated by introducing water into the piping where the pipes penetrate the cell wall on the 0'0" level and -13'0" level of the FAST facility. The decontamination

solution will be recirculated to ensure the piping and ancillary equipment are flushed and to remove residual waste remaining in the piping. The decontamination solution will be discharged to waste tank VES-FA-142 or collected in containers. Following decontamination, final rinsate samples will be collected to demonstrate that the site-specific ALs specified in this closure plan are met. All samples will be collected in accordance with the provisions of the *Sampling and Analysis Plan for the HWMA/RCRA Closure of the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems Voluntary Consent Order SITE-TANK-005 Action Plan Tank Systems INTEC-066, INTEC-067, INTEC-068, and INTEC-072* (RPT-360).

Following completion of closure activities, liquids may remain within the in-cell piping; however, these liquids will have met the site-specific ALs specified in Section 5 of this closure plan and will not constitute a hazardous waste. Therefore, removal of such liquids will not be required.

Waste tank VES-FA-142 has been closed in accordance with a HWMA/RCRA closure plan (INEL 1994; Wastren 1996). If waste tank VES-FA-142 is used to collect the decontamination solution; the tank will be evaluated for suitability prior to use. The final rinsate samples from VES-FA-142 will verify that the piping, ancillary equipment, and tank VES-FA-142 have been decontaminated to meet the site-specific ALs specified in Section 5 of this closure plan. Once the ALs have been met for the rinsates collected in tank VES-FA-142, no further actions are required and the tank will be considered closed.

In the event that the in-cell piping and ancillary equipment identified for decontamination cannot successfully meet the site-specific ALs specified in Section 5 of this closure plan, then this closure plan will be amended in accordance with Section 7.

5.2.3.3 Decontamination of Out-of-Cell Piping. Waste drain piping associated with the drip pans located beneath the cooling and heating pumps in Room 114-A will be removed to the associated 4-in. floor drains. Each of the floor drains associated with the drain pan (P-FM-201-1, P-FM-201-2, P-FM-201-3, P-FM-204-1, P-FM-204-2, and P-FM-204-3) drain lines will be decontaminated (see Figure 7 and Table A-4 [Appendix A]).

Prior to decontaminating the waste drain piping, an integrity evaluation will be performed for the direct-buried portion of the piping system as described in Subsection 5.2.5 of this closure plan. The waste piping will be decontaminated by flushing the piping with the decontamination solution (water) and transferring the decontamination solution to waste tank VES-FA-142 or collecting the decontamination solution in containers. Following decontamination, final rinsate samples will be collected to demonstrate that site-specific ALs specified in this closure plan (Table 1) are met. If the site-specific ALs are not met, then the waste piping will continue to be decontaminated until the site-specific ALs are achieved. All samples will be collected in accordance with the provisions of the *Sampling and Analysis Plan for the HWMA/RCRA Closure of the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems Voluntary Consent Order SITE-TANK-005 Action Plan Tank Systems INTEC-066, INTEC-067, INTEC-068, and INTEC-072* (RPT-360).

5.2.3.4 Decontamination of Short Embedded Piping Stubs. Short embedded piping stubs will be decontaminated using physical/abrasive techniques (e.g., scrubbing and scouring) and visually inspected to ensure no waste-related residues or staining remain. Because these short piping stubs can be visually inspected, it is unnecessary to define ALs for these pipe stubs. The performance standard criteria for the piping stub internal surfaces will be decontamination to remove visible waste-related staining. Visible waste-related staining will be considered removed when the surface in question, when viewed without magnification, is free of all visible hazardous waste except that residual staining from waste consisting of light shadows, slight streaks, or minor discolorations, and waste in cracks, crevices, and pits may be present provided that such staining and waste in cracks, crevices, and pits shall be limited to no

more than 5% of the volume of any 1-ft piping length. Table 3 lists the embedded waste piping and the location of the embedded portions of the lines.

Table 3. FDP cooling and heating system embedded piping stubs.

Line Number	Location
Piping Exiting Room 114A	
6” PF-AL-128460	Level 0’0”
4” PF-AL-128452	Level 0’0”
Piping Entering Room 114A	
6” PF-AL-128460	Level 0’0”
6” PR-AL-128684	Level 0’0”
4” PF-AL-128452	Level 0’0”
4” PR-AL-128676	Level 0’0”
Piping Located in Operating Corridors	
3” PR-AL-128690	Level 0’0” (west corridor, associated with train 3 complexer VES-FC-134)
3” PF-AL-128645	Level 0’0” (west corridor, associated with train 3 complexer VES-FC-134)
3” PR-AL-128689	Level 0’0” (west corridor, associated with train 2 complexer VES-FC-124)
3” PF-AL-128464	Level 0’0” (west corridor, associated with train 2 complexer VES-FC-124)
3” PR-AL-128588	Level 0’0” (west corridor, associated with train 1 complexer VES-FC-114)
3” PF-AL-128463	Level 0’0” (west corridor, associated with train 1 complexer VES-FC-114)
3” PR-AL-128685	Level 0’0” (east corridor, associated with train 1 dissolver DIS-FC-111)
3” PF-AL-128479	Level 0’0” (east corridor, associated with train 1 dissolver DIS-FC-111)
3” PR-AL-128691	Level 0’0” (east corridor, associated with train 1 condenser HE-FC-314)
3” PF-AL-128466	Level 0’0” (east corridor, associated with train 1 condenser HE-FC-314)
3” PF-Al-128461	Level 0’0” (east corridor, associated with train 2 dissolver DIS-FC-121)
3” PR-Al-128686	Level 0’0” (east corridor, associated with train 2 dissolver DIS-FC-121)
3”-PF-AL-128467	Level 0’0” (east corridor, associated with train 2 condenser HE-FC-324)
3” PR-Al-128692	Level 0’0” (east corridor, associated with train 2 condenser HE-FC-324)
3”-PF-AL-128462	Level 0’0” (east corridor, associated with train 3 dissolver DIS-FC-131)
3”-PF-AL-128487	Level 0’0” (east corridor, associated with train 3 dissolver DIS-FC-131)
3” PR-Al-128693	Level 0’0” (east corridor, associated with train 3 condenser HE-FC-334)
3”-PF-AL-128468	Level 0’0” (east corridor, associated with train 3 condenser HE-FC-334)
4” PF-AL-128452	Level 17’0” (east/west corridor)
4” PF-AL-128460	Level 17’0” (east/west corridor)
4” PR-AL-128676	Level 17’0” (east/west corridor)

Table 3. (continued).

Line Number	Location
4” PR-AL-128684	Level 17’0” (east/west corridor)
4” PF-AL-128452	Level 28’0” (east/west corridor)
4” PF-AL-128460	Level 28’0” (east/west corridor)
4” PR-AL-128676	Level 28’0” (east/west corridor)
4” PR-AL-128684	Level 28’0” (east/west corridor)

5.2.4 Decontamination of Containment System Components

Painted concrete floors underlying the out-of-cell piping and ancillary equipment will be decontaminated. Piping and ancillary equipment is located within the CPP-666 building in the fluorinel operating area (0’0” level), service area (-13’0” level), transmitter area (17’0” level), cell maintenance and load-out area (28’0” level), facility makeup area (Room 114A), and the access area and vestibule (-31’0” level) if the integrity of the piping on the -31’0” level is not verified. The painted concrete floors in proximity to piping subject to closure (both FDP makeup and cooling and heating systems) will be decontaminated by mopping all floor surfaces. The floor surfaces will be iteratively decontaminated to ensure the site-specific closure standards (i.e., ALs) are met. Final decontamination solution will be collected in a mop bucket or other appropriate container and samples will be collected to ensure that the site-specific ALs specified in Section 5 of this closure plan are met. All samples will be collected in accordance with the provisions of the *Sampling and Analysis Plan for the HWMA/RCRA Closure of the Fluorinel Dissolution Process Makeup and Cooling and Heating Systems Voluntary Consent Order SITE-TANK-005 Action Plan Tank Systems INTEC-066, INTEC-067, INTEC-068, and INTEC-072* (RPT-360).

Wastes generated during decontamination of containment system surfaces will be managed as described in Subsection 5.3.

5.2.5 Verification of System Integrity

Prior to decontamination, the drain lines associated with the cooling and heating pumps will undergo an integrity evaluation. The integrity evaluation will assess the potential for a release to the subsurface as a result of previous operational activities. An appropriate methodology will be used to demonstrate the integrity of system piping. The results of the integrity evaluation will be provided to the independent PE certifying HWMA/RCRA closure activities. If the integrity of the drain piping is confirmed, no further actions with regard to potentially contaminated soils will be conducted as part of HWMA/RCRA closure. If the integrity of the waste drain piping associated with the pumps P-FM-201-1, P-FM-201-2, P-FM-201-3, P-FM-204-1, P-FM-204-2, and P-FM-204-3 cannot be confirmed, this closure plan will be amended in accordance with Section 7.

5.3 Waste Management

As required by IDAPA 58.01.05.009 (40 CFR 265.114), contaminated equipment, structures, and soils (that will be managed as waste) must be properly disposed of or decontaminated in accordance with applicable requirements. Waste generated during closure activities may include nonhazardous industrial waste, HWMA/RCRA-hazardous waste, mixed low-level waste, and low-level waste. All closure-generated wastes will undergo a hazardous waste determination in accordance with IDAPA 58.01.05.006 (40 CFR 262.11). All hazardous waste will be managed in accordance with the generator

requirements of IDAPA 58.01.05.006 (40 CFR 262) and will be disposed of appropriately (e.g., RCRA hazardous waste transferred to/disposed of at a RCRA-permitted treatment, storage, and disposal facility). No soils will be managed as waste under this closure plan. Information regarding waste management during closure activities will be provided to the independent PE for closure certification and will be maintained as part of the project file.

All generator requirements of IDAPA 58.01.05.006 (40 CFR 262) will be met except that the 90-day administrative timeframe stipulated in IDAPA 58.01.05.006 [40 CFR 262.34(a)(1), "Generator Standards: Accumulation Time"] will not apply to closure-generated waste. Greater than 90-day storage is necessitated by the nature (mixed radioactive) and volume of the wastes being managed and the attendant hazards and associated work controls. An additional 180 days is being requested to allow for consolidation of similar waste streams, verification sampling, receipt of analytical data from the laboratory, and identification of appropriate disposition pathways.

Closure-generated waste may be managed, packaged, and stored within the facility being closed. For purposes of this closure plan, the facility will be defined as the FDP area of Building CPP-666. All waste and waste containers may be stored within the facility during closure activities. All waste and waste containers will be removed from the facility prior to closure certification.

5.4 Closure Documentation

Closure methods and attainment of the closure performance standards for the FDP makeup and cooling and heating systems will be documented by performing the following:

- Closure activities will be monitored and reviewed by an independent PE registered in the State of Idaho. Following successful completion of closure activities, the PE will certify that closure was performed in accordance with the DEQ-approved closure plan.

- Successful demonstration of achieving closure performance standards will require documentation of the following:

    - Waste removal and disposal, including hazardous waste manifests

    - Documentation of the removal, management, and disposition of waste piping, tank units, and ancillary equipment

    - Validated sampling data showing that rinsates of each component not removed during closure meets the site-specific ALs specified in this closure plan

    - If the independent PE is not present then documentation or photographs will be provided, if practical, showing that the decontamination by physical/abrasive techniques (e.g., scrubbing and scouring) used was completed and a visual inspection was performed to ensure no waste-related residues or staining remain

    - Documentation of the removal, management, and disposition of all closure-derived waste

    - Documentation of integrity evaluations conducted as part of closure (direct-buried piping associated with VCO Tank Systems INTEC-068 and INTEC-072 and piping associated with VCO Tank System INTEC-067 located inside the vestibule on the -31'0" level)

    - Documentation of the decontamination of the secondary containment associated with the FDP makeup and cooling and heating systems.

6. CLOSURE SCHEDULE

Table 4 identifies the closure schedule that will be initiated following DEQ approval of this closure plan. This schedule reflects the time required for conducting closure activities and submitting information to the PE for certification. IDAPA 58.01.05.009 (40 CFR 265.113) requires waste removal activities to be completed 90 days from the approval of the closure plan and closure to be completed within 180 days from the initiation of closure activities. An extension to these time periods is being requested at this time, pursuant to IDAPA 58.01.05.009 (40 CFR 265.113), to ensure that data of adequate quality are collected to show compliance with the closure performance standard. An extension to the 90-day waste removal period is requested at this time to protect worker health and to adequately perform waste removal activities. An extension is requested for the 180-day closure period to protect human health and the environment and to adequately perform closure activities. If closure activities are completed ahead of schedule, the closure certification will be accelerated accordingly.

Quarterly reports summarizing closure activity progress will be submitted to the DEQ by April 30, July 31, October 31, and January 31 of each year. Quarterly progress reports to DEQ will commence on the first of the aforementioned dates following Day 0.

Waste removal, decontamination, and closure activities cannot be completed within these timeframes due to several factors including, but not limited to, the following:

- The need to provide radiological contamination controls to prevent the possible spread of contamination, particularly associated with the decontamination of in-cell piping.

- All work related to removal and management of radioactive mixed waste requires additional time due to the requirements for care in work planning, including radiological work permits.

- In-cell flushing activities and other closure activities will require coordination with high-efficiency particulate air filter removal activities, which are planned concurrently with the closure activities specified in this closure plan. (Portions of the FDP cell are permitted for the storage of debris in accordance with the HWMA storage and treatment permit for INTEC.) Work will also be coordinated, as necessary, with deployment of future missions to the FDP cell during the execution period of this closure.

- The time necessary for the analytical laboratories to complete analysis of samples and data validation, receive analytical results, and complete data quality assessment, as specified in the sampling and analysis plan associated with this closure plan (RPT-360), to determine if the closure performance standards have been met.

- The quantity of piping to be removed and the associated chemical hazards associated with out-of-cell piping removal activities.

- Complexities of flushing in-cell piping due to the radiological environment of the FDP cell and the configuration of the cooling and heating piping.

The system components being removed can be conducted in any order as long as they are completed on schedule.

Table 4. FDP makeup and cooling and heating systems closure schedule.

Activity	Completion[a, b]
DEQ approval of closure plan	Day 0
Complete removal of hydrofluoric acid makeup system waste piping • Removal of any residual liquids • Removal of hydrofluoric acid waste piping	Day 90
Complete removal of cadmium sulfate makeup system waste piping • Removal of any residual liquids • Removal of cadmium sulfate waste piping	Day 180
Complete removal of zirconyl nitrate makeup system waste piping • Removal of any residual liquids • Removal of zirconyl nitrate waste piping	Day 270
Complete integrity evaluation for FDP makeup systems waste piping not removed	Day 390
Complete decontamination of waste piping not removed	
Complete isolation and decontamination of VES-FM-101 and VES-FM-104	Day 520
Complete liquid waste removal for out-of-cell FDP cooling and heating system piping and ancillary equipment	Day 700
Complete removal activities of the out-of-cell portions of the piping and ancillary equipment for the FDP cooling and heating system	
Complete decontamination of short embedded stubs or piping deemed impractical for removal associated with the FDP makeup and cooling and heating systems	Day 790
Complete flushing and decontamination of the in-cell portions of the piping and ancillary equipment	Day 910
Complete decontamination of the floor surfaces associated with the FDP cooling and heating system, including FDP makeup systems	Day 970
Closure activities complete	Day 1000
PE and owner/operator certification submitted to DEQ	Day 1060[c]

a. The closure schedule will be coordinated, as necessary, with deployment of future missions to the FDP cell during the execution period of this closure.

b. If any of the closure activities are completed 180 days ahead of the proposed schedule, the schedule for the subsequent closure activities will be reduced by 90 days. DEQ may waive this schedule compression requirement upon receipt of a request for a waiver from the INL.

c. If closure activities are completed ahead of the proposed schedule, the DOE Idaho Operations Office will submit the closure certification to DEQ within 60 days of the completion of closure activities. The subsequent approval from DEQ of the closure certification will be received within 60 days of this submittal.

7. CLOSURE PLAN AMENDMENTS

The conditions described in IDAPA 58.01.05.009 (40 CFR 265.112), "Closure Plan; Amendment of Plan," will be followed to implement changes to the approved closure plan. Should unexpected events during the closure period require modification of the approved closure activities or closure schedule, the closure plan will be amended within 30 days of the unexpected event or the DEQ will be otherwise notified. A written request detailing the proposed changes and the rationale for those changes and a copy of the amended closure plan will be submitted to DEQ for approval. Minor changes to the approved closure plan, which are equivalent to or do not compromise the closure requirements and performance standards identified in the approved closure plan, may be made without prior notification to DEQ. Minor changes will be identified in the documentation supporting the independent PE's certification.

8. CERTIFICATION OF CLOSURE

Within 60 days of completing the closure activities, a certification of closure of the FDP makeup and cooling and heating systems will be provided, in accordance with IDAPA 58.01.05.009 (40 CFR 265.115), by an independent, Idaho-registered PE to the Idaho Cleanup Project operating contractor and the DOE Idaho Operations Office. The PE and owner/operator signatures on the closure certification will be submitted as a milestone deliverable under Subsection 9.8 of the VCO. The PE and owner/operator signatures on the closure certification, which is submitted to the DEQ, will document the completion of closure activities in accordance with the approved closure plan and State of Idaho HWMA/RCRA requirements. The closure certification may also identify any minor changes to the closure plan made without prior approval of the DEQ. Closure of the FDP makeup and cooling and heating systems will be considered complete upon receipt of written acceptance issued by the DEQ.

Copies of documentation supporting the closure of the FDP makeup and cooling and heating systems will remain in the project files, the VCO Program files, and the Idaho Cleanup Project Environmental Affairs Administrative Records in the event that information is requested by DEQ. The FDP makeup and cooling and heating systems are not a hazardous waste disposal facility, and therefore, a "Notice in Deed" and a survey plat are not required.

9. COST AND LIABILITY REQUIREMENTS

The federal government, as owner of the INL Site, is exempt from the requirements to provide cost estimates for closure, to provide a financial assurance mechanism for closure, and regarding state-required mechanism and state assumption of responsibility. The federal government, as owner of the INL Site, is also exempt from liability requirements.

10. REFERENCES

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40 CFR 262, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register, as amended.

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, Office of the Federal Register, as amended.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, Office of the Federal Register, as amended.

42 USC 6901 et seq., 1976, "Resource Conservation and Recovery Act of 1976," as amended.

Davis, L. P., INEEL, to R. A. Willson, INEEL, May 13, 2003, "Closure Report For Sampling Idaho Nuclear Technology and Engineering Center Central Processing Plant-666 Heating and Cooling Loop (WGS-062-02)."

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IDAPA 58.01.05.006, "Standards Applicable to Generators of Hazardous Waste," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality, as amended.

IDAPA 58.01.05.009, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality Rules, as amended.

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INEEL, 2002, *Voluntary Consent Order SITE-TANK-005 System Identification*, "INTEC/FAST Hydrofluoric Acid Makeup System (INTEC-066)," INEEL/EXT-2000-00037, Rev.2, November 2002.

INEEL, 2005a, *Voluntary Consent Order SITE-TANK-005 System Identification*, "INTEC Cadmium Sulfate Makeup System (INTEC-067)," INEEL/EXT-2000-00037, Rev.4, October 2005.

INEEL, 2005b, *Voluntary Consent Order SITE-TANK-005 System Identification*, "INTEC Zirconyl Nitrate Makeup System (INTEC-068)," INEEL/EXT-2000-00037, Rev.3, October 2005.

INEL, 1994, *Fluorinel Dissolution Process and Fuel Storage Facility Final Safety Analysis Report Volume I: Fast Facility*, Idaho National Engineering Laboratory, WIN-105, Rev. 2, May 1994. (This document is considered to contain UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION.)

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Appendix A

Waste Piping to be Removed or Decontaminated

Table A-1. Waste piping to be addressed during closure of the INTEC/FAST Hydrofluoric Acid Makeup System (VCO Tank System INTEC-066).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
1” XW-HC-120518 including valve V-FO-8057	Tie-in at 1” HF-HC-126061	Tie-in at 1 1/2” XW-AD-120528	Hydrofluoric acid	Removal
1” XW-HC-120519 including valve V-FO-8058	Tie-in at 1” HF-HC-126064	Tie-in at 1 1/2” XW-AD-120528	Hydrofluoric acid	Removal

Table A-2. Waste piping to be addressed during closure of the INTEC Cadmium Sulfate Makeup System (VCO Tank System INTEC-067).

Piping	Valve	Origin	Terminus	Original Contents	Planned Closure Action
1 1/2” XW-AD-120531	V-FO-15325	Tee branch at 1 1/2” NW-AD-128182 upstream of V-FO-15325	Tee branch at 4” XW-AD-120529	Cadmium sulfate	Removal
1 1/2” XW-AD-120532	V-FO-15326	Tee branch at 1 1/2” NW-AD-128182 upstream of V-FO-15326	Tee branch at 4” XW-AD-120529	Cadmium sulfate	Removal
1 1/2” XW-AD-120532	V-FO-8055	Tee branch at 1 1/2” AN-AD-124856 upstream of V-FO-8055	Tee branch at 1 1/2” XW-AD-120532	Aluminum nitrate	Removal
1 1/2” XW-AD-120531	V-FO-8056	Tee branch at 1 1/2” AN-AD-124859 upstream of V-FO-8056	Tee branch at 1 1/2” XW-AD-120531	Aluminum nitrate	Removal
1 1/2” XW-AD-120532	V-FO-8059	Tee branch at 1 1/2” AN-AD-127913 upstream of V-FO-8059	Tee branch at 1 1/2” XW-AD-120532	Nitric acid	Removal
1 1/2” XW-AD-120531	V-FO-8060	Tee branch at 1 1/2” AN-AD-127919 upstream of V-FO-8060	Tee branch at 1 1/2” XW-AD-120531	Nitric acid	Removal

Table A-3. Waste piping to be addressed during closure of the INTEC Zirconyl Nitrate Makeup System (VCO Tank System INTEC-068).

Piping	Valve	Origin	Terminus	Original Contents	Planned Closure Action
1 1/2” ZN-AD-126506	V-FM-7305	Tee branch at 1 1/2” ZN-AD-126494	Reducer at 2” ZN-AD-126506	Zirconyl nitrate, zirconyl carbonate	Removal
2” ZN-AD-126506	None	Reducer at 1 1/2” ZN-AD-126506	Reducer at 1/2” ZN-AD-126485	Zirconyl nitrate, zirconyl carbonate	Removal
1” ZN-AD-126492	V-FM-7307	AE-FM-174-1	Tee branch at 1 1/2” ZN-AD-126506	Zirconyl nitrate	Removal
1/2” ZN-AD-126498	V-FM-7309	P-FM-274	Tee branch at 1 1/2” ZN-AD-126506	Zirconyl nitrate	Removal
1 1/2” ZN-AD-126493	V-FM-7318	Tee branch at 1 1/2” ZN-AD-126499	Tee branch at 1 1/2” ZN-AD-126506	Zirconyl nitrate	Removal
2” ZN-AD-126491	V-FM-7335	VES-FM-174	Tee branch at 2” ZN-AD-126506	Zirconyl nitrate	Removal
1/2” ZN-AD-126489	V-FM-7298	P-FM-273	Tee branch at 2” ZN-AD-126506	Zirconyl nitrate	Removal
1 1/2” ZN-AD-126495	V-FM-7296	Tee branch at 1 1/2” ZN-AD-126487	Tee branch at 2” ZN-AD-126506	Zirconyl nitrate	Removal
2” ZN-AD-126486	V-FM-7334	VES-FM-173	Tee branch at 2” ZN-AD-126491	Zirconyl nitrate	Removal
1/2” ZN-AD-126485	V-FM-7292	P-FM-272	Tee branch at 2” ZN-AD-126506	Zirconyl carbonate	Removal
1 1/2” ZN-AD-126500	V-FM-7452	Tee run at 1/2” ZN-AD-126478 & Tee branch at 1-1/2” ZN-AD-126482	Tee branch at 2” ZN-AD-126506	Zirconyl carbonate	Removal
2” ZN-AD-126481	V-FM-7333	VES-FM-172	Tee branch at 2” ZN-AD-126506	Zirconyl carbonate	Removal
4” XW-AD-121176	None	Below floor drain at Room 203	Floor at Room 114B	Zirconyl nitrate, zirconyl carbonate	Removal

Table A-3. (continued).

Piping	Valve	Origin	Terminus	Original Contents	Planned Closure Action
4” XW-AD-121177	None	Below floor drain at Room 203	Tee in 4” XW-AD-121176	Zirconyl nitrate, zirconyl carbonate	Removal
4” XW-AD-121176	None	Floor at Room 114B	Tee in 4” XW-AD-121170	Zirconyl nitrate, zirconyl carbonate	Decontaminate
4” XW-AD-121170	None	Tee branch from 4” XW-AD-121176	Tee in 4” XW-AD-121167	Zirconyl nitrate, zirconyl carbonate	Decontaminate
4” XW-AD-121167	None	Tee branch from 4” XW-AD-121170	Tee in 4” XW-AD-120534	Zirconyl nitrate, zirconyl carbonate	Decontaminate

Table A-4. Piping to be addressed during closure of the INTEC/FAST Cooling And Heating Water System (VCO Tank System INTEC-072).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
Room 114A – Process Cooling Water				
8” PF-AL-128459	VES-FM-101	Tie-in to 6” PF-AL-128459	DI water and borated water	Removal
6” PF-AL-128459	Tie-in to 8” PF-AL-128459	P-FM-201-1, -2, -3	DI water and borated water	Removal
4” PF-AL-128460	P-FM-201-1, -2, -3	Tie-ins at 6” PF-AL-128460	DI water and borated water	Removal
6” PF-AL-128460	Tie-in at 4” PF-AL-128460	~6 in. from room wall	DI water and borated water	Removal
3/4” XW-AD-120512	P-FM-201-1 drip pan	Tie-in at 3/4” XW-AD-120536	DI water and borated water	Removal
3/4” XW-AD-120513	P-FM-201-2 drip pan	Tie-in at 3/4” XW-AD-120537	DI water and borated water	Removal
3/4” XW-AD-120514	P-FM-201-3 drip pan	Tie-in at 3/4” XW-AD-120538	DI water and borated water	Removal
6” PR-AL-128684	~6 in. from room wall	HE-FM-301	DI water and borated water	Removal
6” PR-AL-128694	HE-FM-301	VES-FM-101	DI water and borated water	Removal
2” PF-AL-128485	VES-FM-101	VES-FM-101	DI water and borated water	Removal
2” PF-AL-128485 branch	2” PF-AL-128485	Include V-FM-9354	DI water and borated water	Removal
Floor drain tubing	2” PF-AL-128485	End	DI water and borated water	Removal
3/4” XW-AD-120536	3/4” XW-AD-120512	4” XW-AD-121262	DI water and borated water	Removal
3/4” XW-AD-120537	3/4” XW-AD-120513	4” XW-AD-121254	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
3/4” XW-AD-120538	3/4” XW-AD-120514	4” XW-AD-121265	DI water and borated water	Removal
4” XW-AD-121262	3/4” XW-AD-120536	4” XW-AD-121254	DI water and borated water	Decontaminate
4” XW-AD-121254	3/4” XW-AD-120537	4” XW-AD-121253	DI water and borated water	Decontaminate
4” XW-AD-121265	3/4” XW-AD-120538	4” XW-AD-121264	DI water and borated water	Decontaminate
4” XW-AD-121264	Tee-in at 4” XW-AD-121265	4” XW-AD-121263	DI water and borated water	Decontaminate
4” XW-AD-121263	Tee-in at 4” XW-AD-121264	4” XW-AD-121254	DI water and borated water	Decontaminate
4” XW-AD-121253	Tee-in at 4” XW-AD-121254	4” XW-AD-121251	DI water and borated water	Decontaminate
4” XW-AD-121251	Tee-in at 4” XW-AD-121253	4” XW-AD-120529	DI water and borated water	Decontaminate
Room 114A – Process Cooling Water and Heating Water Interface				
1 1/2” PF-AL-128491	Tie-in at 6” PR-AL-128684	1” PF-AL-128491	DI water and borated water	Removal
1” PF-AL-128491	1 1/2” PF-AL-128491	Tie-in at P-FM-205 & 1” PF-AL-128482	DI water and borated water	Removal
Pressure relief line P-FM-205	1” PF-AL-128491	1” PF-AL-128482	DI water and borated water	Removal
1” PF-AL-128482	1 1/2” PF-AL-128482 and 1” PF-AL-128491	4” PR-AL-128676	DI water and borated water	Removal
1 1/2” PF-AL-128482	1” PF-AL-128482	P-FM-205	DI water and borated water	Removal
1 1/2” PF-AL-128477	VES-FM-101	VES-FM-104	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
1 1/2” PF-AL-128477 (branch)	1 1/2” PF-AL-128477	Upstream of V-FM-9335	DI water and borated water	Removal
1 1/2” XW-AL-120542	1 1/2” PF-AL-128477	4” XW-AD-121263 floor drain	DI water and borated water	Removal
4” XW-AD-121263	1 1/2” XW-AL-120542	4” XW-AD-121254	DI water and borated water	Decontaminate
Room 114A – Process Heating Water				
6” PF-AL-128451	HE-FM-304	Tie-in at 4” PF-AL-128451	DI water and borated water	Removal
4” PF-AL-128451	Tie-in at 6” PF-AL-128451	P-FM-204-1, -2, -3	DI water and borated water	Removal
3“ PF-AL-128452	P-FM-204-1, -2, -3	4” PF-AL-128452	DI water and borated water	Removal
4“ PF-AL-128452	3” PF-AL-128452	~6 in. from room wall	DI water and borated water	Removal
3/4” XW-AL-120520	P-FM-204-1 drip pan	Tie-in at 3/4” XW-AL-120539	DI water and borated water	Removal
3/4” XW-AL-120521	P-FM-204-2 drip pan	Tie-in at 3/4” XW-AL-120540	DI water and borated water	Removal
3/4” XW-AL-120522	P-FM-204-3 drip pan	Tie-in at 3/4” XW-AL-120541	DI water and borated water	Removal
Seal cooler tubing	P-FM-204-1	P-FM-204-1	DI water and borated water	Removal
Seal cooler tubing	P-FM-204-2	P-FM-204-2	DI water and borated water	Removal
Seal cooler tubing	P-FM-204-3	P-FM-204-3	DI water and borated water	Removal
4“ PR-AL-128676	~6 in. from room wall	VES-FM-104	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
1/2” PF-AL-128458	Tie-in at 4” PF-AL-128452	HE-FM-305	DI water and borated water	Removal
1/2” PF-AL-128458	HE-FM-305	Pigtail end	DI water and borated water	Removal
2” PF-AL-128493	VES-FM-104	VES-FM-104	DI water and borated water	Removal
2” PF-AL-128493 branch	2” PF-AL-128493	Include V-FM-7620	DI water and borated water	Removal
Floor drain tubing	2” PF-AL-128493 branch	End	DI water and borated water	Removal
3/4” XW-AL-120539	3/4” XW-AL-120520	4” drain line fed by 3/4” XW-AL-120539	DI water and borated water	Removal
3/4” XW-AL-120540	3/4” XW-AL-120521	4” drain line fed by 3/4” XW-AL-120540	DI water and borated water	Removal
3/4” XW-AL-120541	3/4” XW-AL-120522	4” drain line fed by 3/4” XW-AL-120541	DI water and borated water	Removal
4” drain line fed by 3/4” XW-AL-120539	3/4” XW-AL-120539	4” XW-AD-121254	DI water and borated water	Decontaminate
4” drain line fed by 3/4” XW-AL-120540	3/4” XW-AL-120540	4” XW-AD-121254	DI water and borated water	Decontaminate
4” drain line fed by 3/4” XW-AL-120541	3/4” XW-AL-120541	4” XW-AD-121254	DI water and borated water	Decontaminate
Operating Corridors Process Cooling and Heating Header Piping				
6” PF-AL-128460	~6 in. from corridor wall	4” PF-AL-128460	DI water and borated water	Removal
4” PF-AL-128460	6” PF-AL-128460	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
6” PR-AL-128684	4” PR-AL-128684	~6 in. from corridor wall	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
4” PR-AL-128684	End of line pipe cap in west corridor	6” PR-AL-128684	DI water and borated water	Removal
4” PF-AL-128452	~6 in. from corridor wall	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
4” PR-AL-128676	End of line pipe cap in west corridor	~6 in. from corridor wall	DI water and borated water	Removal
Train 1 Dissolver (DIS-FC-111)				
3” PF-AL-128479	Tie-in at 6” PF-AL-128460	Tie-in at 3” PF-AL-128457	DI water and borated water	Removal
3” PR-AL-128685	Tie-in at 3” PR-AL-128682	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
3” PF-AL-128457	Tie- in at 4” PF-AL-128452	3” PF-AX-128457	DI water and borated water	Removal
3” PF-AX-128457	3” PF-AL-128457	Break flanges at FE FC-111-18 ~7 ft from cell wall	DI water and borated water	Removal
1” PF-AL-128457	Tie-in at 3” PF-AL-128457	Tie-in at 3” PF-AL-128479	DI water and borated water	Removal
3” PR-AL-128682	3” PR-AX-128682	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
3” PR-AX-128682	~7 ft from cell wall	3” PR-AL-128682	DI water and borated water	Removal
3” PF-AX-128457	3” PF-AX-128457 ~7 ft from cell wall	Train 1 Dissolver Jacket	DI water and borated water	Decontaminate
3” PR-AX-128682	Train 1 Dissolver Jacket	3” PR-AX-128682 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 2 Dissolver (DIS-FC-121)				
3” PF-AL-128461	Tie-in at 6” PF-AL-128460	Tie-in at 3” PF-AL-128456	DI water and borated water	Removal
3” PR-AL-128686	Tie-in at 3” PR-AL-128681	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
3” PF-AL-128456	Tie-in at 4” PF-AL-128452	3” PF-AX-128456	DI water and borated water	Removal
3” PF-AX-128456	3” PF-AL-128456	Break flanges at FE FC-121-18 ~7 ft from cell wall	DI water and borated water	Removal
1” PF-AL-128456	tie-in at 3” PF-AL-128456	Tie-in at 3” PF-AL-128461	DI water and borated water	Removal
3” PR-AL-128681	3” PR-AX-128681	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
3” PR-AX-128681	~7 ft from cell wall	3” PR-AL-128681	DI water and borated water	Removal
3” PF-AX-128456	3” PF-AX-128456 ~7 ft from cell wall	Train 2 Dissolver Jacket	DI water and borated water	Decontaminate
3” PR-AX-128681	Train 2 Dissolver Jacket	3” PR-AX-128681 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 3 Dissolver (DIS-FC-131)				
3” PF-AL-128462	Tie-in at 6” PF-AL-128460	Tie-in at 3” PF-AL-128455	DI water and borated water	Removal
3” PR-AL-128687	Tie-in at 3” PR-AL-128680	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
3” PF-AL-128455	Tie-in at 4” PF-AL-128452	3” PF-AX-128455	DI water and borated water	Removal
3” PF-AX-128455	3” PF-AL-128455	Break flanges at FE FC-131-18 ~7 ft from cell wall	DI water and borated water	Removal
1” PF-AL-128455	Tie-in at 3” PF-AL-128455	Tie-in at 3” PF-AL-128462	DI water and borated water	Removal
3” PR-AL-128680	3” PR-AX-128680	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
3” PR-AX-128680	~7 ft from cell wall	3” PR-AL-128680	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
3” PF-AX-128455	3” PF-AX-128455 ~7 ft from cell wall	Train 3 Dissolver Jacket	DI water and borated water	Decontaminate
3” PR-AX-128680	Train 3 Dissolver Jacket	3” PR-AX-128680 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 1 Complexer (VES-FC-114)				
3” PF-AL-128454	Tie-in at 4” PF-AL-128452	3” PF-AX-128454	DI water and borated water	Removal
3” PF-AX-128454	3” PF-AL-128454	Break flanges at FE FC-114-16 ~7 ft from cell wall	DI water and borated water	Removal
3” PF-AL-128463	Tie-in at 4” PF-AL-128460	Tie-in at 3” PF-AL-128454	DI water and borated water	Removal
1” PF-AL-128463	Tie-in at 3” PF-AL-128463	Tie-in at 3” PF-AL-128454	DI water and borated water	Removal
3” PR-AX-128679	~7 ft from cell wall	3” PR-AL-128679	DI water and borated water	Removal
3” PR-AL-128679	3” PR-AX-128679	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
3” PR-AL-128688	Tie-in at 3” PR-AL-128679	Tie-in at 4” PR-AL-128684	DI water and borated water	Removal
3” PF-AX-128454	3” PF-AX-128454 ~7 ft from cell wall	Train 1 Complexer Jacket	DI water and borated water	Decontaminate
3” PR-AX-128679	Train 1 Complexer Jacket	3” PR-AX-128679 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 2 Complexer (VES-FC-214)				
3” PF-AL-128453	Tie-in at 4” PF-AL-128452	3” PF-AX-128453	DI water and borated water	Removal
3” PF-AX-128453	3” PF-AL-128453	Break flanges at FE FC-124-16 ~7 ft from cell wall	DI water and borated water	Removal
3” PF-AL-128464	Tie-in at 4” PF-AL-128460	Tie-in at 3” PF-AL-128453	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
1” PF-AL-128464	3” PF-AL-128464	Tie-in at 3” PF-AL-128453	DI water and borated water	Removal
3” PR-AX-128678	~7 ft from cell wall	3” PR-AL-128678	DI water and borated water	Removal
3” PR-AL-128678	3” PR-AX-128678	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
3” PR-AL-128689	Tie-in at 3” PR-AL-128678	Tie-in at 4” PR-AL-128684	DI water and borated water	Removal
3” PF-AX-128453	3” PF-AX-128453 ~7 ft from cell wall	Train 2 Complexer Jacket	DI water and borated water	Decontaminate
3” PR-AX-128678	Train 2 Complexer Jacket	3” PR-AX-128678 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 3 Complexer (VES-FC-314)				
3” PF-AL-128478	Tie-in at 4” PF-AL-128452	3” PF-AX-128478	DI water and borated water	Removal
3” PF-AX-128478	3” PF-AL-128478	Break flanges at FE FC-134-16 ~7 ft from cell wall	DI water and borated water	Removal
3” PF-AL-128465	Tie-in at 4” PF-AL-128460	Tie-in at 3” PF-AL-128478	DI water and borated water	Removal
1” PF-AL-128465	Tie-in at 3” PF-AL-128465	Tie-in at 3” PF-AL-128478	DI water and borated water	Removal
3” PR-AX-128677	~7 ft from cell wall	3” PR-AL-128677	DI water and borated water	Removal
3” PR-AL-128677	3” PR-AX-128677	Tie-in at 4” PR-AL-128676	DI water and borated water	Removal
3” PR-AL-128690	Tie-in at 3” PR-AL-128677	Tie-in at 4” PR-AL-128684	DI water and borated water	Removal
3” PF-AX-128478	3” PF-AX-128478 ~7 ft from cell wall	Train 3 Complexer Jacket	DI water and borated water	Decontaminate

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
3” PR-AX-128677	Train 3 Complexer Jacket	3” PR-AX-128677 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 1 Condenser (HE-FC-314)				
3” PF-AL-128466	Tie-in at 6” PF-AL-128460	3” PF-AX-128466	DI water and borated water	Removal
3” PF-AX-128466	3” PF-AL-128466	~7 ft from cell wall	DI water and borated water	Removal
3” PR-AX-128691	~7 ft from cell wall	3” PR-AL-128691	DI water and borated water	Removal
3” PR-AL-128691	3” PR-AX-128691	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
3” PF-AX-128466	3” PF-AX-128466 ~7 ft from cell wall	Train 1 Condenser	DI water and borated water	Decontaminate
3” PR-AX-128691	Train 1 Condenser	3” PR-AX-128691 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 2 Condenser (HE-FC-324)				
3” PF-AL-128467	Tie-in at 6” PF-AL-128460	3” PF-AX-128467	DI water and borated water	Removal
3” PF-AX-128467	3” PF-AL-128467	~7 ft from cell wall	DI water and borated water	Removal
3” PR-AX-128692	~7 ft from cell wall	3” PR-AL-128692	DI water and borated water	Removal
3” PR-AL-128692	3” PR-AX-128692	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
3” PF-AX-128467	3” PF-AX-128467 ~7 ft from cell wall	Train 2 Condenser	DI water and borated water	Decontaminate
3” PR-AX-128692	Train 2 Condenser	3” PR-AX-128692 ~7 ft from cell wall	DI water and borated water	Decontaminate

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
Train 3 Condenser (HE-FC-334)				
3” PF-AL-128468	Tie-in at 6” PF-AL-128460	3” PF-AX-128468	DI water and borated water	Removal
3” PF-AX-128468	3” PF-AL-128468	~7 ft from cell wall	DI water and borated water	Removal
3” PR-AX-128693	~7 ft from cell wall	3” PR-AL-128693	DI water and borated water	Removal
3” PR-AL-128693	3” PR-AX-128693	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
3” PF-AX-128468	3” PF-AX-128468 ~7 ft from cell wall	Train 3 Condenser	DI water and borated water	Decontaminate
3” PR-AX-128693	Train 3 Condenser	3” PR-AX-128693 ~7 ft from cell wall	DI water and borated water	Decontaminate
Train 1 Scrubber (SCR-FC-116)				
1” PF-AL-128487	Tie-in at 6” PF-AL-128460	1” PF-AO-128487	DI water and borated water	Removal
1” PF-AO-128487	1” PF-AL-128487	~6 in. from cell wall	DI water and borated water	Removal
3/4” PR-AG-128683	~6 in. from cell wall	3/4” PR-AL-128683	DI water and borated water	Removal
3/4” PR-AL-128683	3/4” PR-AG-128683	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
1” PF-AO-128487	1” PF-AO-128487 ~6 in. from cell wall	Train 1 Scrubber Cooling Jacket	DI water and borated water	Decontaminate
3/4” PR-AG-128683	Train 1 Scrubber Cooling Jacket	3/4” PR-AG-128683 ~6 in. from cell wall	DI water and borated water	Decontaminate
Train 2 Scrubber (SCR-FC-126)				
1” PF-AL-128488	Tie-in at 6” PF-AL-128460	1” PF-AO-128488	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
1” PF-AO-128488	1” PF-AL-128488	~6 in. from cell wall	DI water and borated water	Removal
3/4” PR-AG-128696	~6 in. from cell wall	3/4” PR-AL-128696	DI water and borated water	Removal
3/4” PR-AL-128696	3/4” PR-AG-128696	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
1” PF-AO-128488	1” PF-AO-128488 ~6 in. from cell wall	Train 2 Scrubber Cooling Jacket	DI water and borated water	Decontaminate
3/4” PR-AG -128696	Train 2 Scrubber Cooling Jacket	3/4” PR-AG-128696 ~6 in. from cell wall	DI water and borated water	Decontaminate
Train 3 Scrubber (SCR-FC-136)				
1” PF-AL-128489	Tie-in at 6” PF-AL-128460	1” PF-AO-128489	DI water and borated water	Removal
1” PF-AO-128489	1” PF-AL-128489	~6 in. from cell wall	DI water and borated water	Removal
3/4” PR-AG-128697	~6 in. from cell wall	3/4” PR-AL-128697	DI water and borated water	Removal
3/4” PR-AL-128697	3/4” PR-AG-128697	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal
1” PF-AO-128489	1” PF-AO-128489 ~6 in. from cell wall	Train 3 Scrubber Cooling Jacket	DI water and borated water	Decontaminate
3/4” PR-AG-128697	Train 3 Scrubber Cooling Jacket	3/4” PR-AG-128697 ~6 in. from cell wall	DI water and borated water	Decontaminate
Custom Processing Loop				
1” PF-AL-128480	Tie-in at 6” PF-AL-128460	1” PF-AX-128480	DI water and borated water	Removal
1” PF-AX-128480	1” PF-AL-128480	~6 in. from cell wall	DI water and borated water	Removal
1” PR-AX-128695	~6 in. from cell wall	1” PR-AL-128695	DI water and borated water	Removal

Table A-4. (continued).

Piping	Origin	Terminus	Original Contents	Planned Closure Action
1” PR-AL-128695	1” PR-AX-128695	Tie-in at 6” PR-AL-128684	DI water and borated water	Removal