DRAFT

Department of Energy

PDC PROJECT

UTILITY WASTEWATER MANAGEMENT STUDY

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STUDY SIGN-OFF PAGE

DEPARTMENT OF ENERGY

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DENVER, COLORADO
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Revision P1

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1.0 PURPOSE

The purpose of this study is to identify a path forward for the management of utility wastewater generated from the Pit Disassembly and Conversion (PDC) Project. The study should assist in the identification of design requirements and unit operations required to develop design documents in support of the development of a cost estimate for the PDC project. This study will also attempt to identify risk associated with PDC path forward discussed.

2.0 INTRODUCTION

The PDC Project includes the following: Direct Metal Oxidation (DMO) lines, Oxide Product Handling (OPH) lines, a Sanitization (SAN) line, a PIT Disassembly (PITD) line, a Special Recovery Line (SRL) line, HEUM HED lines, HEUM DMO lines, Hydride lines, Product Canning lines, an Internal Transport System (ITS), a NDA area, a Waste NDA area, a Waste Management area, and other support operations. The equipment and facilities associated with Stabilization & Packaging (S&P) Project will be incorporated into the larger PDC footprint. The PDC project will connect the Internal Transport System (ITS) to the S&P gloveboxes.

The PDC Project will process pits to plutonium oxide for feed for the MOX Fuel Fabrication Facility. The S&P Project will continue to combine the daughter products created in KIS back into a single item, stabilize it, then package into a 3013 compliant container. The S&P Project will also continue processing the 3.74 metric tons of Alternative Feed Stock-2 (AFS-2) materials. AFS-2 metals are split, oxidized and stabilized in the DMO furnace, and subsequently canned in 3013 inner and outer containers, packaged in 9975 and stored for future shipment to MFFF.

3.0 WASTE TYPES

The only utility wastewater type to be encountered during PDC operations is:

- Low Activity Waste (LAW) – Alpha contaminated radioactive liquid with an activity level less than 1,000 dpm per milliliter.

High activity waste (HAW) will not be generated from the PDC Project.

4.0 ASSUMPTIONS

1. Wastewater sources are from the PDC Project.

2. Any PDC utility wastewater collected will be sampled and sent to the F/H Analytical Laboratory for analysis prior to release to the Effluent Treatment Project (ETP) to determine if the wastewater meets the criteria required for treatment at the ETP. ETP Low-Level Liquid Waste Acceptance Criteria is defined in Reference 4 (WAC 3.17, Rev. 11, Page 45-52) and Reference 5. PDC

utility wastewater is expected to meet ETP acceptance requirements without treatment. Otherwise a deviation will be obtained from ETP.

3. A truck provided by ETP will transport collected PDC utility wastewater.

4. Non-routine sources of wastewater will not require routine management.

5. Firewater as a source of utility wastewater is an off normal occurrence and is not covered in this study.

5.0 WASTE SOURCES

Potential sources of LAW wastewater related to the PDC Project includes: mop water, Limited Volume Cooling Water (LVCW) blow down, Process Cooling Water blow down, RCT Lab waste, RO Reject Blow Down, and roof leaks.

1. Mop Water – Mop water will result from the floors in the PDC process area and hallways being cleaned. The area potentially includes all floors with the scope of the PDC Project. Mop water is non-routine wastewater. If generated, absorbent pads will be used or an absorbent will be added to the mop water and disposed of as LLW waste.

   Miscellaneous safety shower/eyewash use will generate personnel decontamination water. The wastewater collected from the safety showers/eyewashes is also considered mop water. Water generated from safety/eyewash use is non-routine wastewater. If generated, an absorbent will be added to the mop water and disposed of as solid waste.

   Normal testing of these showers/eyewashes is required. Wastewater generated from the testing of the safety showers/eyewashes is collected in bottles and will normally be placed into the process drain upon successful testing as clean.

2. LVCW Blow Down – The LVCW System is composed of 10 separate packaged closed-loop LVCW Units and associated piping. The closed-loop design serves as a contamination barrier, preventing the release of radioactive contaminants from the glovebox to Process Cooling Water via the LVCW Units. The gloveboxes requiring LVCW are listed below (Ref. 9):
   - Plutonium Conversion (DMO-1, 2, 3, 4)
   - Hydrogen Process (HYD-1 & 2)
   - Main Uranium Oxidation (HEUM- 1, 2, 3)
   - DMO Glovebox associated with the S&P Project.

   The LVCW system will occasionally be blown down. When utility wastewater from LVCW blow down is generated, the utility wastewater is collected (max. 6 L), and an absorbent is added and disposed of as LLW solid waste.

3. Process Cooling Water Blow Down – The Process Cooling Water Loop provides cooling to support glovebox processes within the PDCF Process Building, either directly or via the LVCW System. The Process Cooling Water Loop provides a barrier to prevent radioactive contamination migration from the supported processes into the Process Chilled Water Loop. Process cooling water system provides cooling to the LVCW System Heat Exchangers (10 Heat Exchangers) in LVCW Units, SRL Argon Purification, SRL Staging Argon purification, Sanitization Heat Exchangers, Pu Conversion Argon Purification, and Sanitization Magnetrons (Ref. 10).

   The Process Cooling Water will occasionally be blown down as utility wastewater. Prior to blow down, the process cooling water will be sampled in-line. After sampling, the Process Cooling Water will be blown down into a portable Tuff tank. The utility wastewater in the Tuff tank would then be transferred to a tanker and dispositioned to the ETP.

4. RCT Lab Waste – The RCT Lab will generate utility wastewater from the excess samples, instrument flush water and safety shower/eyewash use. Wastewater generated from excess samples and instrument flush water is non-routine wastewater, and will be mixed with absorbent and disposed of as solid waste. Wastewater generated from safety shower use/testing is non-routine wastewater. If generated, an absorbent will be added to the mop water and disposed of as solid waste. Wastewater generated from the testing of the safety showers is collected in bottles and will normally be placed into the process drain upon successful testing as clean.

5. RO Reject/Blow Down - The production of deionized water begins with the introduction of a water supply though an RO membrane. The feed water for this process is process service water and a RO pump is utilized to force the water through the membrane. Reverse osmosis is induced by applying pressure with a pump to a solution with a high concentration of dissolved solids causing the water from the concentrated solution to pass through the membrane. This water is referred to as permeate. Dissolved solids do not pass through the membrane. They are continually flushed to the drain as waste. This flushing action also keeps the membrane surface from fouling or scaling. Also, the blow down and drainage of DI water storage tanks due to production of off -spec water will be performed on an infrequent basis. This utility wastewater is collected in a collection tank nearby and sampled. The utility wastewater is transferred to the Tuff tank and then to a tanker to be dispostioned to the ETP.

6. Wastewater may be generated from roof leaks and is non-routine wastewater. If a significant amount is generated, the wastewater will be mopped up, collected into the portable Tuff tank, transferred to a tanker, and transported to the ETP. If small amounts of wastewater are generated, an absorbent will be added and disposed of as solid waste.

6.0 WASTE ASSAY EQUIPMENT

NDA in the PDC Project area will not be required for collected utility wastewater. Collected utility wastewater will be sampled in a sample vial and analyzed to characterize the wastewater in the F/H Analytical Lab.

Absorbed wastewater will be packaged as LLW and will not require NDA in the PDC Project area. Characterization will occur from smear-to-curie and process knowledge.

7.0 PDC UTILITY WASTEWATER SYSTEM AREA DESCRIPTION

A specific area is not required for the PDC Utility Wastewater System.

8.0 INVENTORY CONTROL

Inventory control for inventory tracking purposes will not be required of utility wastewater.

9.0 CHARACTERIZATION OF WASTE

Any large amounts of utility wastewater will be shipped to ETP where the wastewater will be treated. A sample will be taken of the collected utility wastewater before it leaves the MAA. The analysis of the sample will characterize the wastewater and confirm that the utility wastewater is LAW. The following analyses are performed on utility wastewater: alpha spectroscopy for total alpha activity, ICP-MS for uranium, liquid scintillation for tritium, pH, conductivity, gamma spectroscopy for fission products, and density.

An absorbent will be added to small amounts of utility wastewater and treated as solid waste. This waste will be LLW and characterization will be based on smear-to-curie and process knowledge.

10.0 UTILITY WASTEWATER MANAGEMENT ACTIVITIES DESCRIPTION

Potential sources of PDC utility wastewater includes: mop water, LVCW blow down, Process Cooling Water blow down, RCT Lab waste, RO Reject/Blow Down, and roof leaks. Figure 1 – PDC Utility Wastewater Block Flow Diagram depicts a high level view of the flow of various utility wastewater sources and their disposition.

11.0 ISSUES REQUIRING FURTHER INVESTIGATION/SOLUTION

The following questions/issues require further investigation or require information not available yet.

1. The process is still maturing; therefore the layout of the S&P is still in progress.

2. The destination for treatment of utility wastewater has not been finalized. For this study, it was assumed that collected utility wastewater would be sent to the ETP.

12.0 CONCLUSION

Potential sources of PDC utility wastewater includes: mop water, LVCW blow down, Process Cooling Water Blow Down, RCT Lab waste, RO Reject/Blow Down, and roof leaks. The only utility wastewater type to be encountered during PDC operations is LAW. HAW will not be generated from the PDC Project.

Waste assay equipment in the PDC Project area will not be required for the PDC utility wastewater. Any large amounts of utility wastewater collected will be shipped to ETP where the wastewater will be treated. A sample will be taken of the collected utility wastewater before it leaves the MAA. The analysis of the sample will confirm that the utility wastewater is LAW and characterize the wastewater. An absorbent/absorbent pad will be added to small amounts of utility wastewater and treated as solid waste. This waste will be LLW and characterization will be based on smear-to-curie and process knowledge.

13.0 REFERENCES

1) Y-AES-K-00002, Rev. 0, NNSA, Refinement Study of the K-Area (KAC) Combination Project which provides Pit Disassembly and Conversion Capability and Plutonium Preparation Project Capability, 9/29/09 (UCNI)
2) SK-DA-WM-0007, Rev. A, Waste Management Strategy for the Plutonium Preparation Project in the K-Area Complex, 7/22/08
3) Q-PRP-F-00001, Rev. 1, Pit Disassembly and Conversion Facility, Waste Management Plan, 6/30/05
4) 1S, Savannah River Site Waste Acceptance Criteria Manual, Dated 6/30/09
5) X-SD-H-0009, Rev. 4, Effluent Treatment Project Engineering
6) Calc X-CLC-F-00276, Rev. 2., LAW Mass Balance
7) SK-PDC-15002-GA, Pit Disassembly & Conversion 0'-0" Level – plan General Arrangement, Rev. B.
8) G-SYD-F-00018, Rev. F Draft, Pit Disassembly And Conversion Facility System Design Description For Analytical Laboratory System (U)
9) M-SYD-F-00038, Draft, Pit Disassembly and Conversion Facility System Design Document for Limited Volume Cooling Waster (U)
10) M-SYD-F-00039, Rev. F Draft, Pit Disassembly and Conversion Facility System Design Document for Process Chilled Water System (U)
11) M-SYD-F-00037, Rev. F Draft, Pit Disassembly and Conversion Facility System Design Document for Deionized and Process Water System (U)

PDC Utility Wastewater Block Flow Diagram – Figure 1