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ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

FACILITY SAFETY ANALYSIS

PROCESS WASTE TRANSFER SYSTEM

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EXECUTIVE SUMMARY

This facility safety analysis (FSA) provides final hazard classification and authorization basis documentation for the Process Waste Transfer System based on the hazards associated with this system This FSA meets requirements for an auditable safety analysis as referenced in Department of Energy (DOE) Environmental Management (EM) limited standard, DOE-EM-STD-5502-94, *Hazard Baseline Documentation*

The Process Waste Transfer System (PWTS) provides a means to transport, via a system of underground lines, process liquid low level/low level mixed (LL/LLM) waste solutions from Site process facilities to the 231 "B" Tank for interim storage Interim storage of this waste in the 231 "B" Tank supports the Aqueous Waste Treatment System (AWTS) Project, an integral part of the Site Wastewater Treatment Strategy designed to enable early Site closure AWTS Project interim operations are planned to end in 2003 The 231 "A" Tank is not currently a part of the AWTS Project, but is described in this safety analysis as an element of the 231 Tanks segment of the PWTS The 231 "A" Tank is presently being emptied and cleaned The 231 "A" Tank may be used in the future by the AWTS Project, if required, for contingency storage In addition to underground transfers, various other miscellaneous source transfers are accomplished by means such as tanker truck or aboveground lines Major components of the operating system include underground lines, valve vaults, and the 231 "B" storage tank that provides a 950,000-gallon interim storage capacity until such time as the AWTS Project is operational

The hazards associated with the Process Waste Transfer System include a variety of radioactive and hazardous chemical constituents The principal receptors at risk are the immediate and collocated workers. The major risk to collocated workers is exposure to an accidental release of radioactive and hazardous chemical waste solutions Major risks to the immediate workers are standard industrial hazards that are addressed by DOE-prescribed occupational safety and health standards No potential public consequences were identified.

Based on guidance provided in DOE-STD-5502-94, *Hazard Baseline Documentation*, the final hazard classification for the Process Waste Transfer System, including the system's associated 231 "A" and "B" Tanks segment, the PWTS pumphouse, valve vaults, and transfer lines segment, and the tanker trucks segment is *radiological.* The PWTS is distributed across the Site, and as such, is segmented as allowed by DOE-STD-1027-92, Attachment 1, General Ground Rules The lack of physical interaction between the independent PWTS elements or segments (*e.g.*, holdup in the piping/vaults and interim storage in the 231 Tank) precludes bringing radiological materials such as plutonium (Pu) together or causing harmful interaction from common severe phenomenon

A *radiological* classification requires compliance with applicable OSHA Standards, preparation of a site-specific Health and Safety Plan (HASP), and preparation of an auditable safety analysis. This analysis serves as the Process Waste Transfer System's auditable safety analysis.

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1 INTRODUCTION

The Process Waste Transfer System (PWTS) consists of a network of underground piping, valve vaults, pumps, fixed and portable tanks, and tanker trucks used to transfer liquid low level/low level mixed (LL/LLM) process waste from waste-generating facilities to the 231 "B" Tank for interim storage The 231 "A" Tank is being emptied and cleaned and is not a part of the AWTS Project at this time For purposes of this safety analysis, the 231 "A" Tank is included as part of the 231 Tanks segment, however, thereby allowing its potential use in the future by the AWTS Project, if required In addition to standard baseline operation, maintenance, and surveillance activities, activities performed in the various PWTS elements are focusing on hazard reduction in support of near-term RCRA Stable/Closure activities Future PWTS activities will include remediation, and decontamination and decommissioning (D&D) in support of Site closure

This facility safety analysis (FSA) is a part of the Rocky Flats Environmental Technology Site (RFETS) *Site Safety Analysis Report* (Site SAR) (RFETS, 2001a) It addresses the final hazard classification and documents the authorization basis, including facility participation in Site Safety Management Programs (SMPs) for the PWTS The PWTS is classified as *radiological* in accordance with DOE-EM-STD-5502-94, *Hazard Baseline Documentation* (DOE, 1994a).

DOE Order 5480 23, *Nuclear Safety Analysis Reports* (DOE, 1992), *Hazard Categorization and Accident Analysis Techniques* , DOE-STD-1027-92 (DOE, 1994b), and DOE-STD-5502-94 (DOE 1994a) mandate that safety evaluations be performed for facilities that have the potential to adversely affect the health and safety of the workers and the public or the environment. The Site SAR meets these requirements and provides safety documentation for facilities classified as nuclear hazard Category 3, radiological, non-nuclear, and industrial. The Site SAR is separated into two volumes, the first contains information that is applicable to the site as a whole, and may be referenced by all authorization basis documents. Site-wide information contained in Volume I include

- descriptions of the site and site-wide utilities,
- authorization basis safety analysis methodology,
- information concerning site-wide hazards,
- summaries of the Site Safety Management Programs (SMPs),
- site-wide operational controls, including transportation, engineering, and outdoor waste management controls , and
- facility summaries and interactions

This FSA provides specific information on the activities performed in the PWTS, a general description of the system, and develops the potential consequences associated with hazardous material inventory information The safety analysis uses a hazard identification checklist and description table to provide the framework for the analysis Standard industrial hazards noted on the table are not analyzed in detail unless they initiate a release of hazardous materials or worsen the consequences of a hazardous material release

2. FACILITY DESCRIPTION AND ACTIVITY CHARACTERIZATION

This section provides a brief description of the elements comprising the PWTS, operation of the system, and the system's interfaces with other facilities and operations on the Site The PWTS provides a means to transfer process liquid LL/LLM wastes from Site nuclear facilities to the 231 "B" Tank for interim storage until the AWTS Project becomes available to treat this waste AWTS Project planning and system descriptions are documented in the *Statement of Work for Offsite Aqueous Waste Treatment System* (K-H, 2001a), *Statement of Work for Onsite Aqueous Waste Treatment System* (K-H, 2001b), and the *Preliminary Hazard Categorization for the Aqueous Waste Treatment System* (K-H, 2001c) Because of the relatively low level of hazards associated with this system, it has no safety class systems that are depended upon to mitigate the consequences of a potential accident System and operational descriptions provided in this safety analysis are for information purposes only

2.1 FACILITY MISSION

The PWTS consists of a network of piping, pumps, valves, and storage tanks that are used to transport process waste from waste-generating facilities to the 231 "B" Tank for interim storage. Waste streams permitted in the system consist of RCRA hazardous, non-hazardous low-level, and radioactive mixed aqueous wastes compliant with 231 Tanks' Waste Acceptance Criteria (WAC) These wastes are categorized as low level wastes (includes incidental groundwater), and higher-level treatable wastes (includes liquid process utility and liquid D&D wastes from waste generator facilities). The various waste streams are transferred through separate pipelines The overall system has been identified as Resource Conservation and Recovery Act (RCRA) Unit 374 3 (RFETS, 1997).

Buildings 559 via 528, 707 via 731, 776, 777, 881 via 887, 883, and 866 are all directly connected to the system. Building 122 uses portable tanks Buildings' 444 and 447 waste is transferred to Building 891 via tanker truck.

After the AWTS Project has been approved for operations and as part of the activities associated with general risk reduction and Site closure, the PWTS will be brought to closure using the RCRA closure process and remediated The system will be systematically deactivated and closed in stages as the operations in interfacing Site facilities cease or are deactivated.

2.2 FACILITY DESCRIPTION

The Process Waste Transfer System for interim operations is comprised of

- Underground lines
- 20 valve vaults (VV 1 thru VV 20)
- Building 231 pumphouse

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- Tanks 231A and 231B (Interim RCRA status pending closure, still designated as Units 43 01 and 43 02 respectively) (Note the "A" Tank is being emptied and cleaned and may be used in the future by the AWTS Project, if operationally required)
- Building 428 pumphouse (PS-1)
- Tank D-853 (presently in a RCRA Stable condition) located in Building 428
- Tanker trucks for onsite transfers to the 231 "B" Tank
- Portable tanks

2 2 1 System Configuration

The previous mission of the PWTS involved transporting process waste from waste-generating facilities to Building 374 for treatment To support Site closure and timely decommissioning of Buildings 371/374 and the PWTS itself, the PWTS' mission changed to provide such liquid waste transfer to the 231 "B" Tank for interim storage until the AWTS Project becomes operational The "231 "A" Tank is not part of the AWTS Project at this time. The PWTS present mission-relationship to the AWTS Project interim and final operation is depicted in Figure 1 Each facility or group of facilities possess(es) a tank or set of tanks for the accumulation of liquid waste Each of these facility tanks or tank systems also has a pump or pumps, which provide the motive force for transfer of the waste from the tank(s) of origin to the 231 "B" Tank for interim storage. As can be seen in the figure, the identified buildings are either individually or collectively connected to the system by way of the PWTS's valve vaults (VV) The lines between the various facilities' tank(s) and the respective first valve vault are equipped with one or more check-valves to prevent backflow

The valve vaults are underground concrete structures with above grade access, varying in depth to compensate for differences in associated piping depth The purpose of the VV is to allow for various valve lineups, isolation of portions of the system for maintenance and the isolation of portions of the system that are no longer in use The interiors of the vaults have four-foot high Gundel liners to provide containment of any fluid leaked into the vault(s). The liners are sufficiently spaced away from the outside wall of the vault to provide a space for potential accumulation of water leaching through the outside wall. Each of the valve vaults is protected by an above ground structure which provides protection from the weather to keep precipitation from entering the vault sumps. The protective structures are either permanent metal buildings (6), temporary structures constructed of wood and reinforced plastic film sheeting (13), and one Plexiglas and wood structure

The system also includes the Building 231 pumping station The station is comprised of the pumphouse itself and the two adjacent tanks, Tanks 231A and B Building 231 houses pumps, piping, and valves that are used to transfer wastewater between the tanks and Valve Vault 12 The Building 231 pumphouse can also be used to pump (or assist to pump) liquids from tanker trucks into Tank 231 "B" As part of the

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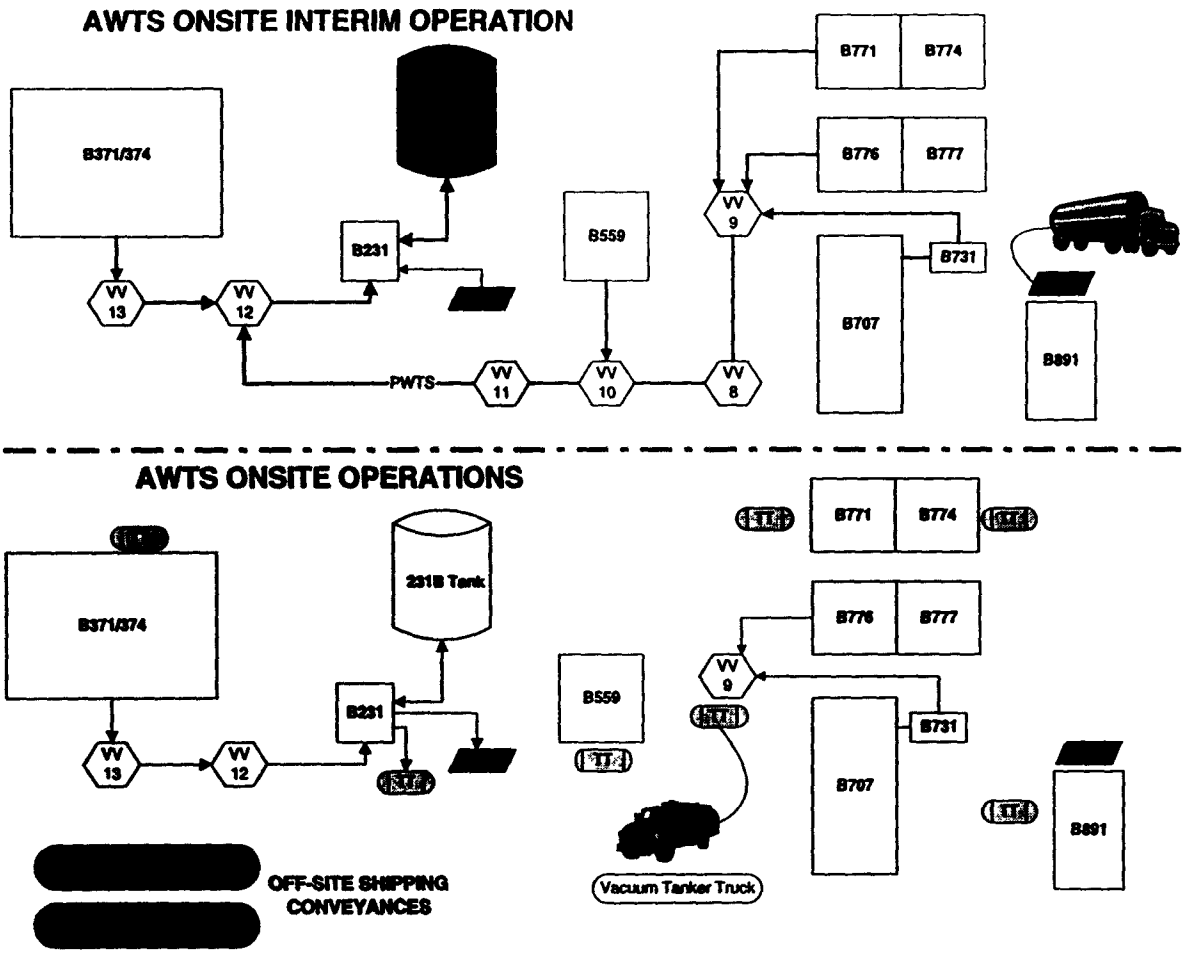

Legend: VV = Valve Vault; TT (shaded = existing transfer station), unshaded TT = TT for use with AWTS

FIGURE 1. NEW PROCESS WASTE TRANSFER SYSTEM

AWTS Project, the 231 "B" Tank will be the primary location for interim storage; the "A" tank is presently being emptied and cleaned The 231 "A" Tank may be used in the future by the AWTS Project, if required, for contingency storage. An existing transfer station is located at Building 231 to facilitate waste transfers to and from the 231 "B" Tank via tanker trucks from sources throughout the Site

Building 231 consists of a below-grade concrete structure and an above-grade pre-engineered metal structure. The operating floor is the lower portion of the building, while the aboveground portion serves primarily as an access way A pad-mounted dry-type transformer outside the building supplies 480-V electrical power A dry-type transformer inside the building provides 240/120-V power

Tank 231"B" is used to store LL/LLM liquid utility wastes from facility sources, dumpster tanks, and tanker trucks, as well as from D&D activities in nuclear facilities across the Site Both the 231 "A" and "B" Tanks are vertical, cylindrical steel tanks

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located north of Sage Avenue near its intersection with Seventh Street The capacities of the 231 "A" and "B" Tanks are 250,000 gallons and 950,000 gallons, respectively The tanks are equipped with both mechanical and ultrasonic level detectors, which have remote readouts in the pumphouse.

Building 428 is Pump Station No 1 of the Process Waste Transfer System The building houses the tank and pump transfer system to accumulate and transfer aqueous wastes Tank D853 is out of service Building 122's waste is transferred from a small tank to a dumpster tank for shipment via tanker truck to the 231 "B" Tank for interim storage

2 2 2 Protective Features, Equipment and Leak Detection

The underground piping runs are made with double wall plastic piping to maximize confinement and to provide a means for leak detection The double wall piping is coupled to single wall piping within the inner space of the vault created by the vault liner. The location of this coupling is made such that leakage of the inner piping, in the between-vault piping runs, will drain into the annular space between the inner and outer piping. The leakage will then be delivered by gravity to collection reservoirs located at the single-double wall transitions in one or both of the valve vaults adjacent to the leakage source. These reservoirs are equipped with level detection, which alarms on fluid accumulation in the reservoir.

Each vault contains a sump in the floor to collect leakage from the valves and piping contained within the vault. There are three alarms in each vault· one in the leak detection bottle, one in the liner sump and one between the liner and the concrete wall of the valve vault behind the liner. Ground water in-leakage is generally the source for water accumulating behind the liner. Any of the three level indicators listed will cause an annunciation local to the valve vault and in the Building 374 control room, alarm annunciation locations may change in the future with operation of the AWTS Project Waste Operations responds to these alarms, identifies the source of in-leakage, isolates processes potentially causing leakage and returns the accumulated fluid to waste processing.

Each valve vault is equipped with hand-operated fire extinguishers. All of the aboveground buildings are equipped with blowers to ventilate the vaults prior to entry A portable generator powers the blowers After ventilating the vaults, confined space entry requirements are fulfilled before vault entry

Building 231 is equipped with heating, safety shower/eye wash, fire detection, and telephone service. There is also a spill response cabinet on the outside of the building Tanks 231 "A" & "B" are mounted within concrete secondary containment berms that are lined with Hypalon. Water collected in the berms is pumped into the tanks or to ground, dependent upon guidance from surface water personnel The capacity of the berms is adequate to contain the entire contents of the tanks The 231 "A" and "B" tanks are isolated via valve alignment to preclude co-mingling of waste between the "A" and "B" Tanks.

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2 2 3 Facility Systems and Utilities

Operation of the Process Waste Transfer System requires several site utilities electric power, radio and telephone communications, fire detection, and domestic water for safety showers

2 2 4 Facility Interfaces

The Process Waste Transfer System interfaces with several facilities on Site It accepts process waste from Buildings 559, 707, 774, 776, 777, 866, 881, and 883 for transfer to the 231 "B" Tank for interim storage until the AWTS Project becomes operational It also receives wastewater from other Site sources, such as Building 886, via tanker trucks Building 122 waste is collected in portable dumpster tanks that are transferred to the 231 "B" Tank Building 444 waste is transferred via tanker truck to Building 891 for treatment.

2.2 5 PWTS Closure

Upon authorized operation of the AWTS Project, the shutdown and characterization of PWTS will begin. Building 374 will flush PWTS piping and leave as much of the PWTS (piping and 17 valve vaults [VV]) in a RCRA Stable condition as possible, after which PWTS remediation may begin Monitoring of the valve vaults (VV) will continue until PWTS remediation is complete Three PWTS VVs (# 9, 12, and 13), however, will remain in service to facilitate the AWTS project's transfer of LL/LLM wastewater from Buildings 371 / 374 and 707 / 776 / 777 to the 231 "B" Tank These three PWTS VVs will be brought to a RCRA Stable condition and remediated/removed at a later date to complete the PWTS D&D activities

2.2 6 Facility Inventory & Source Term Development

The Process Waste Transfer System transports and collects aqueous liquid wastes from process facilities and environmental sources. Wastes entered into the system must meet the 231 Tanks' WAC limits of < 8.4 grams Pu equivalent and a minimum pH of 5 for each segment: the 231 "A" and "B" Tank segment, the PWTS vaults and lines segment, and the tanker truck segment Individual nuclear facility waste generators maintain radionuclide activity set points that are verified via sampling and analysis and, inventory control balance protocols to meet the 231 Tanks' WAC prior to waste transfers Valve vaults, Building 231 (the process waste pumphouse), and transfer lines do not store wastes, but may contain residual liquid waste holdup that remains in lines after a waste transfer is completed Tank 231 "B" has a capacity of 950,000 gallons (the 231 "A" Tank being emptied and cleaned has a capacity of 250,000 gallons) Site process wastewater is transferred to the 231 "B" Tank for interim storage via either the PWTS piping segment or tanker trucks only after verification that a transfer is compliant with the 231 Tanks' WAC.

3. SAFETY MANAGEMENT PROGRAMS

The authorization basis for the PWTS relies on adequate Site-level implementation of Site Safety Management Programs (SMPs) as defined in the Rocky Flats Environmental Technology *Site Safety Analysis Report* (Site SAR), Chapter 6 (RFETS, 2001a) SMPs provide Site-level implementation of specific safety functions assumed in the safety analysis that are either specifically credited or recognized to be important for providing defense-in-depth All of the identified SMPs and their programmatic elements are implemented at a Site level

Building-specific implementation of some SMPs is required based upon the specific hazards identified in Section 4, Hazards Analyses These SMPs are implemented using a graded approach that is focused on those specific attributes of the SMPs associated with identified hazards, hazard assumptions, and initial conditions presented in the safety analysis

3.1 SMP RELATIONSHIP TO HAZARDS ANALYSIS

The following sections delineate the relationship between the various Site-level SMPs and the PWTS's current mission, operation, and related hazards

3.1.1 Facility Participation In Site-Level Implementation of SMPs

Based on the current facility mission and those hazards identified for the facility mission, the facility participates in the following SMPs at a Site level

- Conduct of Operations
- Configuration Management
- Criticality Safety
- Document Management
- Emergency Preparedness
- Engineering
- Environmental Management
- Fire Protection
- Integrated Work Control
- Nuclear Safety
- Occupational Safety and Industrial Hygiene
- Quality Assurance
- Radiological Protection
- Testing, Surveillance, and Maintenance
- Training
- Transportation Safety
- Waste Management

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3 1 2 SMPs Important to Hazards Analysis

This section describes the SMPs that are applicable to the safe operation of the PWTS based on the system's life cycle The following SMPs provide the basis for maintaining the safety envelope of the facility

- **Waste Management**

Attributes of the PWTS Waste Management Program focus on (a) ensuring waste generation, sampling and analysis/characterization, transfers or transportation, storage, and disposal are performed in accordance with State and Federal regulations, (b) controlling configuration, location, and quantities of hazardous, radioactive, and mixed waste, (c) maintaining a current, documented waste inventory, and (d) performing routine surveillance, inspections, and monitoring of compliance with regulations The facility performs inventory controls such as sampling and analysis to confirm compliance with the 231 Tanks' WAC The facility also performs and documents waste management and environmental protection activities, such as routine surveillance and inspections, in accordance with the permit conditions of the *Site Resource Recovery and Conservation Act (RCRA) Permit* (RFETS, 1997)

- **Nuclear Safety**

Administrative controls are placed on the PWTS hazardous material inventory to prevent the introduction of materials into the facility that would invalidate the safety analysis basis of the facility, including its *radiological* categorization Important attributes of the Nuclear Safety Program for the PWTS focus on inventory controls such as sampling and analysis and material control balance that limits the quantities of radionuclides to less than 8.4 grams Pu equivalent in each PWTS segment in accordance with the 231 Tanks' WAC

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4 HAZARDS ANALYSIS

The activity and facility description provided in this FSA provides the basis for the identification and evaluation of hazards provided in this section Routine occupational hazards are regulated by DOE-prescribed occupational safety and health standards and are not evaluated further unless they initiate a release of hazardous materials or worsen the consequences of a hazardous material release This section determines the final hazard classification from which the operational controls found in Section 5 are derived.

4.1 METHODOLOGY AND ASSUMPTIONS

The methodology contained in the *Safety Analysis and Risk Assessment Handbook* (SARAH), (RFETS, 2001b) is followed in this hazard analysis Characteristics of the system and waste streams described in Section 2 are used for this analysis

4.2 HAZARD IDENTIFICATION

All hazards listed in Table 1 were evaluated to specifically identify those hazards associated with the PWTS operation and hazard reduction activities in advance of remediation and D&D. The hazards present are indicated with a "Yes" and are described in greater detail in Table 2, which provides information on quantity, form, packaging, and location of the hazards. As indicated in the remarks column of Table 2, most of the hazards are considered standard industrial hazards

TABLE 1. PROCESS WASTE TRANSFER SYSTEM HAZARD IDENTIFICATION CHECKLIST

1 High Voltage	Yes	14 High Intensity Magnetic Fields	No
2. Explosive Substances	No	15 Effects of Chemical Exposures	Yes
3 Cryogenic Systems	No	16 Toxic, Hazardous, or Noxious Material	Yes
4 Inert & Low-Oxygen Atmospheres	No	17 Inadequate Ventilation	Yes
5 Direct Radiation Sources	No	18 Material Handling	No
6 Radioactive Materials	Yes	19 Ambient Temperature Extremes	Yes
7 High Noise Levels	No	20 Working at Heights	Yes
8 Flammable Gases, Liquids, Dusts	Yes	21 Pesticide Use	No
9 Compressed Gases	Yes	22 Lasers	No
10 High Temperature & Pressure System	No	23 Inadequate Illumination	Yes
11 Kinetic Energy	Yes	24 Biohazard	No
12. Potential Energy	Yes	25 Unknown or Unmarked Materials	Yes
13 Non-Ionizing Radiation Sources	No	26 Any Other Hazards	No

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TABLE 2. PROCESS WASTE TRANSFER SYSTEM HAZARD DESCRIPTIONS			
Hazard/ Energy Source	**Description**	**Preventive & Mitigative Features**	**Remarks**
1 HIGH VOLTAGE			
13 8-kV power distribution lines and 115-kV transmission lines	Power lines, exposed and underground throughout site	- Lines are constructed per ANSI C2 - Overhead lines isolated by height - Underground lines isolated by burial - Procedures, training, protective equipment for maintenance fuses and breakers, switch out capability	Standard industrial hazard
6. RADIOACTIVE MATERIALS			
Process aqueous waste	950,000 gallons of aqueous process waste stored in the 231 "B" Tank (250,000 gallons of aqueous waste in the "A" Tank undergoing emptying and cleaning), above-ground, double wall lines, valve vault lines, pumps, and associated lines and vessels, tanker trucks	- Confinement - Testing - Radiation Protection Program - Spill Prevention Control and Countermeasure (SPCC) Program. - PPE and training required for operators - Operational requirements for solution pH	Potential to exceed 40 CFR 302 reportable quantities (RQs) (CFR, 1997a) for radionuclides
8. FLAMMABLE GASES, LIQUIDS AND DUSTS			
Flammable storage cabinet	25 gallons of gasoline stored in steel can and liquefied propane cylinder in storage cabinet outside Building 231	- Small quantities - Containers and storage cabinet. - Adjacent SPCC cabinet - HAZCOM Program. - Fire extinguisher	Standard industrial hazard
9. COMPRESSED GASES			
Propane	20 pounds. See Item 8		
11. KINETIC ENERGY			
Vehicular traffic	Movement of equipment and tanker truck vehicles	- Licensing, - Regulation, - Enforcement, - Training, - Markings, - Signage	Standard industrial hazard
Pumps	Several pumps of various types.	- Low pressure capabilities only	Standard industrial hazard
12. POTENTIAL ENERGY			
Pump head pressure in liquid lines	Liquid contained in double wall lines, valve vaults, and associated lines and vessels	- Low pressure system - Limited worker access - Double containment - Underground lines - Below grade components	Standard industrial hazard

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TABLE 2. PROCESS WASTE TRANSFER SYSTEM HAZARD DESCRIPTIONS

Hazard/ Energy Source	Description	Preventive & Mitigative Features	Remarks
12. POTENTIAL ENERGY (cont.)			
Fluid density pressure in Storage Tanks	Liquid with density near 1 g/cc, varies with height of fluid in tank	- Workers not generally in basin (bermed area) for large tanks (T 231A and B) - Relatively low specific activity of liquid - Chemical acceptance criteria (i e , pH) for liquids to enter the system	Standard industrial hazard
15. CHEMICAL EXPOSURES			
General industrial chemicals	Fuel, maintenance products stored in cans, primarily manufacturers' packaging, outside Building 231	- Procedures - Chemical tracking - Warning labels - Ventilation - Packaging - HAZCOM Program. - SPCC Program.	Standard industrial hazard
16. TOXIC, HAZARDOUS, OR NOXIOUS MATERIALS			
Process waste	950,000 gallons of aqueous process waste stored in steel shell "B" tank (250,000 gallons of aqueous waste in the "A" Tank undergoing emptying and cleaning) with concrete, Hypalon lined, secondary containment berm, process waste transferred via PWTS segment itself; tanker trucks.	- Double containment/container - PPE and training for operators - HAZWOPER Program and operations training - Chemical acceptance criteria (i e , pH) for liquids to enter the system. - Locked access - Administrative control	Potential to exceed 40 CFR 302 RQs but remain below 29 CFR 1910 119 (CFR, 1994) or 40 CFR 355 (CFR, 1997b) thresholds for some metals Constituents are anticipated to be below 29 CFR 1910 119 (CFR, 1994) or 40 CFR 355 (CFR, 1997b) thresholds due to limited groundwater source See Item 25
17. INADEQUATE VENTILATION			
Process wastewater tanks	Two steel tanks at ground level, two at Bldg 231, one mostly underground tank in Bldg 428,	- Confined space entry program - Accesses sealed - Tanks not normally entered	Standard industrial hazard
Valve vaults	20 below-grade concrete vaults with access hatches located throughout site.	- Confined space entry program - Forced ventilation and testing prior to entry	Standard industrial hazard

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TABLE 2. PROCESS WASTE TRANSFER SYSTEM HAZARD DESCRIPTIONS			
Hazard/ Energy Source	**Description**	**Preventive & Mitigative Features**	**Remarks**
17. Inadequate Ventilation (continued) Valve vaults	20 below-grade (outdoor) concrete vaults with access hatches, located throughout the Site	- Workers dressed as appropriate for the weather	Standard industrial hazard
20. WORKING AT HEIGHTS			
Tanks	Access to top of tanks and tanker trucks	- Protective railings - OSHA compliance - Training	Standard industrial hazard
23. INADEQUATE ILLUMINATION			
Valve vaults	20 below-grade concrete vaults with access hatches, located throughout site.	- Training - Portable illumination when accessed	Standard industrial hazard
25. UNKNOWN OR UNMARKED MATERIALS			
Process waste could contain arsenic, chromium, lead, silver, selenium, toluene, cadmium, nickel, acetone, 1,1,1-trichloroethane, methylene chloride, barium, ethylene glycol, penetrating oil, carbon tetrachloride, denatured alcohol, isopropanol, Mariko, Oakite, spent emulsifier, spent developer, and diamond paste. (No longer applicable to D-853 in Bldg. 428 due to its RCRA Stable condition)	Potential for groundwater with unknown contaminants (No longer applicable to D-853 in Bldg. 428 due to its RCRA Stable condition)	- HAZWOPER and operations training - Double containment - Locked access - PPE - Administrative controls - Chemical acceptance criteria (i e , pH) for liquids to enter the system. pH for this system is 2 or greater (No longer applicable to D-853 in Bldg 428 due to its RCRA Stable condition)	Based on process knowledge, this output should not be hazardous Such unknown hazards will be addressed via IWCP process, JHAs, HASP (No longer applicable to D-853 in Bldg 428 due to its RCRA Stable condition)

4.3 WORKER SAFETY EVALUATION

Many of the worker safety hazards presented by the Process Waste Transfer System are standard industrial hazards. Hazards in this category include high voltage, general industrial chemicals, process chemical exposure, and inadequate ventilation Worker training, use of controls established in the *Building 374 HASP* (RFETS, 1999a), use of approved Site procedures including the *Site Occupational Safety and Industrial Hygiene Manual* (RFETS, 1999b), and implementation of Site SMPs assure appropriate levels of worker protection for these hazards

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Nuclear hazards associated with the PWTS are limited in that high radiation fields are not present, and specific activities are relatively low Workers are trained to handle these materials in accordance with approved procedures Radiological protection for workers is further assured by compliance with *Site SAR, Chapter 6, "Safety Management Programs"* (SMPs) (RFETS, 2001a)

4.4 FINAL HAZARD CLASSIFICATION

The final hazard classification is determined from the bounding quantities of radionuclides and chemicals that may reside in the system

The PWTS is categorized as *radiological* based on the amount of Pu and other radionuclides to be transferred and stored in its associated piping, pumps, tankers, and temporary and permanent tanks The AWTS Project, which includes the PWTS segment, includes a conservatively high average onsite operational treatment throughput of 500,000 gallons per year (assumes a one-shift operation) with a potential treatment expansion capability of approximately 1,500,000 gallons per year, if necessary For conservative Material at Risk (MAR) planning, the MAR for the PWTS, on a year-to-year treatment basis, is assumed using the Table 3 MAR estimate for Fiscal Year (FY) 2003 of 2,100,700 gallons of influent This influent is transferred via the PWTS to the 231 "B" Tank for interim storage and treatment via the AWTS Project (K-H, 2001 a, b, and c) Note: AWTS Project interim operations are planned to end in 2003

The PWTS is distributed across the Site, and as such, is segmented as allowed by DOE-STD-1027-92, Attachment 1, General Ground Rules (DOE, 1992) The lack of physical interaction between the independent PWTS elements or segments (*e g*, holdup in the piping/vaults, interim storage in the 231 Tanks, transfers via tanker truck) precludes bringing radiological materials together or causing harmful interaction from common severe phenomenon. The maximum amount of plutonium (Pu) in any given PWTS segment is estimated at 4.7 grams Pu (see Table 3 below, and see *Preliminary Hazard Categorization for the Aqueous Waste Treatment System* and that documents approval by DOE, respectively [K-H, 2001c and DOE, 2001]) This MAR is less than the hazard Category 3 threshold value of 8 4 grams Pu listed in DOE-STD-1027-92 The final hazard classification for the elements and components of the Process Waste Transfer System is summarized in Table 4 and Section 4 4 3. Chemical hazards are bounded by the radiological hazards involved with the MAR associated with the PWTS

PWTS Pu MAR estimates (K-H, 2001a, b, and c) are delineated by Building Utility and High D&D waste streams in Table 3 below The Pu average concentration for all influent LL/LLM wastewater is 2E-06 The maximum Pu concentration is 1 7E-03 Wastes from the Caustic Waste Treatment System (CWTS) in Building 371 can be as high as 5E-03 g/L Pu There are, on average, less than 1,000 gallons/yr of aqueous waste with Pu concentrations above 1E-05 gm/L, and 300 gal/yr above 100 nCi/g (6E-04 gm/l) All average Pu concentrations shown are weighted averages Activity calculations are based on 32-yr. old Pu mixtures that are equivalent to 0 1614 Ci/gm Higher level activity wastes may require blending in the 231 "B" Tank, however, procedural controls

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delineated in this Safety Analysis, Section 5, ensure that no PWTS segment will exceed 8 4 g Pu equivalent MAR at any time

TABLE 3 PWTS MAR ESTIMATES BY FISCAL YEAR

Waste Steam	FY 02 (gr Pu)	FY 03 (gr Pu)	FY 04 (gr Pu)	FY 05 (gr Pu)	Volume Basis
Utility	1 3	0 9	0 7	0 2	Building Estimates (1)
High D&D	1 0	3 9	1 6	-	Sq Ft Estimates (2)
Total Grams Pu/Yr	2 3	4 8	2 3	0 2	
Total Gallons To Be Treated (3)	645,600	2,100,700	886,232	25,500	Highest Reasonable Volume Estimates

Note (1) See Building 374 Logbooks (4-year weighted average)
Note (2) Estimate based on Building 779 D &D average Pu concentration X 10
Note (3) Volumes are for the onsite treatment option Existing interim storage/treatment capacity is currently insufficient, however, additional shifts can be added if required to allow entire waste volume treatment.

4.4.1 MAR Assumptions

Major assumptions used to estimate the Table 3 MAR include

- Metals Data is based on current samples from the T231 Tanks
- The 231 "A" and "B" Tanks are being emptied and cleaned, the "A" Tank will not be used for interim storage for the AWTS Project.
- D&D High aqueous waste volumes are based on reasonably conservative square footage estimates (Building 779 historical measurements)
  - ➢ 50% of floor square footage requires Hydrolasing for Nuclear Facilities
  - ➢ 10% of walls requires Hydrolasing excluding Buildings 776/777 and 707
  - ➢ 100% of walls require Hydrolasing for Buildings 776/777 and 707
  - ➢ Ceiling square footage is 2X floor square footage
  - ➢ 2 gallons/square foot for floor and walls, 1 gallons/square foot for ceiling
- Process waste stream influent for the PWTS treatment facility assumes 5% solids and 10 ppm of organics. Note: These solids and organic constituents have not historically been seen by Building 374. The radiological inventory bounds the waste stream chemical constituent and process chemical inventory (see Table 2, Items 15, 16, 25 for standard industrial hazards descriptions)
  - ➢ Influent does not include Modular Storage Tank waste water or sludges
  - ➢ Influent does not include waste waters associated with the storage of Solar Pond Sludge on the 750 Pad
  - ➢ Waste from the Caustic Waste Treatment System (CWTS) will be metered into the PWTS and the 231 Tanks to maintain the facility's *radiological* hazard categorization

4 4 2 Hazardous Chemical Contaminants

Process waste may contain numerous chemicals with relatively low RQs of 1 to 100 pounds, particularly heavy metals (CFR, 1994, 1995, 1997a and b) It is conceivable that the RQs of one or more hazardous constituents could be exceeded in the 1,200,000 combined gallons stored in the 231 "A" (250,000 gallons) and "B" (950,000 gallons) Tanks Chemical hazards, however, are standard industrial hazards and bounded by the radiological hazards and are not analyzed further herein Waste streams are sampled for organic constituents as well as radiological constituents as described in Section 5 LL/LLM wastewater transferred to the 231 "B" Tank for interim storage must comply with 231 Tanks' WAC including a minimum pH of 5 Chemical hazards are addressed in Table 2

4.4 3 Final Hazard Classification Conclusion

Based on guidance provided in DOE-STD-5502-94 (DOE, 1994a), the final hazard classification for the Process Waste Transfer System, including the system's associated 231 "A" and "B" Tanks segment , the PWTS pumphouse, valve vaults, and transfer lines segment, and the transfer tanker trucks segment, is *radiological* The PWTS is distributed across the Site, and as such, is segmented as allowed by DOE-STD-1027-92, Attachment 1, General Ground Rules (DOE, 1992) The lack of physical interaction between the independent PWTS elements or segments (*e g*, holdup in the piping/vaults, interim storage in the 231"B" Tank, transfers via tanker truck) precludes bringing radiological materials together or causing harmful interaction from common severe phenomenon While the tanker trucks physically interact with the 231 "B" Tank and the PWTS, however, sampling and analysis prior to all waste transfers precludes exceeding the *radiological* limit for the entire PWTS facility The MAR associated with the tanker truck is far less than the 200 gram Pu analyzed in the *Site SAR, Chapter 7 "Transportation Safety Analysis"* (RFETS, 2001a)

A *radiological* classification requires compliance with applicable OSHA Standards, preparation of a site-specific Health and Safety Plan (HASP) (RFETS, 1999b), and preparation of an auditable safety analysis This analysis serves as the Process Waste Transfer System's auditable safety analysis

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TABLE 4. PROCESS WASTE TRANSFER SYSTEM HAZARDS AND HAZARD CATEGORIES

Facility No.	Description	Chemical/Radiological Hazard	Hazard Category	Comments
1-20	Valve Vaults	Provides connection path and leak detection for underground aqueous process waste lines (Maximum activity limit of 5E-3 grams/liter fissile material, minimum pH is 5)	*Radiological*	
231	Process Waste Pumphouse	Pumps and transfers aqueous waste in Process waste system (Maximum total solution activity limit of 5E-03)	*Radiological*	
231A	Process Waste Storage Tank	Process waste - 250,000 gallons (Maximum MAR for both "A" and "B" Tanks is < 8 4 g Pu equivalent, minimum pH is 5 [average])	*Radiological*	Residual radiological constituents Tank is being emptied cleaned The tank is not part of AWTS Project at this time but may be used in the future if required
231B	Process Waste Storage Tank	Process waste - 950,000 gallons (Maximum MAR for both "A" and "B" Tanks is < 8 4 g Pu equivalent; minimum pH is 5 [average])	*Radiological*	Aqueous waste storage 950,000 gallons capacity Radiological bounds chemical
	Double Wall Underground Lines	Contains and transfers aqueous process wastes from generator facilities to Building 374 treatment facilities (Maximum activity limit of 5E-03) Minimum pH is 5 [average])	*Radiological*	
	Tanker trucks	Each tanker contains approximately 5,000 gallons. Maximum MAR ≤ 8 4 grams Pu equivalent) Minimum pH is 5 [average]	*Radiological*	

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5 SCOPE OF APPROVED ACTIVITIES AND OPERATIONAL CONTROLS

Operational controls for the PWTS are defined in applicable Safety Management Programs (SMPs) (Section 3) and administrative controls set forth in the PWTS material transfer procedures Such controls include inventory control, sampling and analysis, and material balance

Approved activities and commensurate controls protective of the PWTS safety envelope and its *radiological* facility hazard categorization are summarized below

- Bulk LL/LLM liquid wastewater transfers from facility sources via the PWTS compliant with the 231 Tanks' WAC is authorized This WAC is established as a maximum total MAR of 8 4 grams of Pu equivalent and a pH of 5 Staging and transport of WAC-compliant LL/LLM liquid wastewater via tanker trucks to the 231 "B" Tank for interim storage and from the 231 "B" Tank for shipment onsite or offsite for treatment and disposal is also authorized
    - Transfer of containerized waste is NOT allowed via the PWTS to the 231 "A" and "B" Tanks
    - The valves/supply line between the 231 "A" and "B" Tanks must be isolated to NOT allow co-mingling of two tank's contents
- Field measurements, inventory control, sampling and analysis, and mass balance surveillance procedures, and logs are authorized methods to verify material holdup and continued operation as a *radiological* facility
- Transfer via the PWTS for interim storage of LL/LLM waste in the 231 "A" and "B" Tank segment ("B" Tank only used for interim storage) in excess of 8 4 grams total Pu equivalent MAR is prohibited If at any time it is discovered that the *radiological* facility MAR limit for any PWTS segment (231 "A" and "B" Tanks segment, PWTS segment, transfer truck segment) is exceeded (*i.e*, Category 3 threshold), the project will have 30 days to assess and correct system problems and reduce system/segment MAR to acceptable limits
    - Should waste in excess of the 15 0 grams of fissile material be exceeded, the project shall invoke a project Criticality Safety Program in accordance with the *Criticality Safety Program Manual* (RFETS, 2000) and the *Site SAR* (RFETS, 2001a)
- PWTS hazard reduction activities supporting pursuit of RCRA Stable/Closure are authorized Safety analyses for activities involving PWTS remediation and PWTS D&D shall be documented in a future *PWTS Health and Safety Plan* (HASP)

Any unforeseen and/or uncharacterized hazards shall be managed in accordance with applicable Site operations, documentation, and analysis requirements Additionally,

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a revised or new analysis is required if facility operational controls are not sufficient to adequately address such unanticipated hazards or conditions encountered The Responsible Manager shall immediately stop work and contact cognizant Nuclear Safety personnel to evaluate the discovered condition A revised or new analysis will be required if project operational controls are deemed insufficient to adequately address the unanticipated hazards or conditions encountered, or if new or additional equipment (*i e*, interim storage in the 231 "A" Tank) that could potentially change the safety basis for the facility's operation is deemed necessary To ensure work is safely and compliantly completed, the Responsible Manager must recognize these unanalyzed situations and request the necessary evaluation and revision to this auditable safety analysis before proceeding with such work

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