IDAHO
DEPARTMENT OF ENVIRONMENTAL QUALITY

PARTIAL PERMIT FOR HWMA STORAGE and TREATMENT

for the

LIQUID WASTE MANAGEMENT SYSTEM at the IDAHO NUCLEAR TECHNOLOGY & ENGINEERING CENTER

on the

IDAHO NATIONAL LABORATORY

EPA ID NO. ID4890008952

Revision Date: September 5, 2019

Book 2 of 4

ATTACHMENT 2 - SECTION C - WASTE ANALYSIS PLAN

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 2, Section C
Waste Characteristics

Revision Date: November 27, 2017

CONTENTS

EXHIBITS

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ACMM	Analytical Chemistry Methods Manual
ALARA	as low as reasonably achievable
APHA	American Public Health Association
APS	Atmospheric Protection System
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
CRR	Carbon Reduction Reformer
DEQ	(Idaho) Department of Environmental Quality
DMR	Denitration and Mineralization Reformer
DOE	Department of Energy
DOT	Department of Transportation
DQO	data quality objective
dscm	dry standard cubic meter
EMCAP	Environmental Management Consolidated Audit Program
EPA	Environmental Protection Agency
ETS	Evaporator Tank System
FR	(WDS) Facility Representative
g	gram
GAC	granular activated carbon
gal	gallon
HEPA	high efficiency particulate air
hr	hour
HWMA	Hazardous Waste Management Act
HWN	hazardous waste number

IDAPA	Idaho Administrative Procedures Act
ILWMS	INTEC Liquid Waste Management System
INL	Idaho National Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTU	Integrated Waste Treatment Unit
kg	kilogram
L	liter
lb	pound
LDR	Land Disposal Restriction
LET&D	Liquid Effluent Treatment and Disposal
mg	milligram
Mg	megagram
MSDS	Material Safety Data Sheet
NA	not applicable
NGLW	newly generated liquid waste
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
NWCF	New Waste Calcining Facility
PEW	Process Equipment Waste
PEWE	Process Equipment Waste Evaporator
PK	process knowledge
ppm	parts per million
ppmw	parts per million weight
PWL	Process Waste Liquid
QA/QC	Quality Assurance/Quality Control

QC	Quality Control
RAL	Remote Analytical Laboratory
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SVOC	semi-volatile organic compound
TBP	Tributyl phosphate
TC	Toxicity Characteristic
TCLP	Toxicity Characteristic Leaching Procedure
TFF	Tank Farm Facility
TOC	total organic carbon
TSS	total suspended solids
UHC	underlying hazardous constituent
VOC	volatile organic compound
VOG	vessel offgas
WAC	waste acceptance criteria
WAP	Waste Analysis Plan
WDDF	Waste Determination and Disposition Form
WGS	Waste Generator Services
WTS	waste technical specialist
µg	microgram

C. WASTE CHARACTERISTICS

This section has been prepared for the Idaho Nuclear Technology and Engineering Center (INTEC) Liquid Waste Management System (ILWMS) located at the Idaho National Laboratory (INL) Site. Five process codes are associated with the regulated hazardous waste management units in the ILWMS. The process codes are S01, container storage; S02, tank storage; S03, waste piles; T01, tank treatment; and X99, other miscellaneous treatment. The purpose of this section is to describe the process and rationale utilized by the Department of Energy (DOE), Idaho Operations Office-designated contractor to determine the physical and chemical characteristics of the wastes managed at these units. This section describes hazardous wastes and only the hazardous components of mixed wastes regulated by the Resource Conservation and Recovery Act (RCRA), Idaho Administrative Procedures Act (IDAPA), and the Code of Federal Regulations (CFR).

The ILWMS includes the Process Equipment Waste Evaporator (PEWE) system, the Liquid Effluent Treatment and Disposal (LET&D) facility, the Evaporator Tank System (ETS), and the Integrated Waste Treatment Unit (IWTU). The ILWMS includes tanks and ancillary equipment in Buildings CPP-604, CPP-649, CPP-659, CPP-1618, CPP-1696, and associated valve boxes.

Detailed descriptions of the PEWE, LET&D, ETS, and IWTU are provided in Attachment 1, Section D of this permit. The regulated tanks and ancillary equipment associated with the ILWMS are listed below:

The regulated tanks and ancillary equipment specific to the PEWE system include:

- VES-WL-132, CPP-604 Evaporator Feed Sediment Tank (regulated under IDAPA as a storage/treatment tank)
- VES-WL-133, CPP-604 Evaporator Feed Collection Tank (regulated under IDAPA as a storage/treatment tank)
- VES-WL-102, CPP-604 Surge Tank for VES-WL-133 (regulated under IDAPA as a storage/treatment tank)
- VES-WL-109, CPP-604 Evaporator Head Tank (regulated under IDAPA as a storage tank).
- EVAP-WL-129, CPP-604 Evaporator Unit, including VES-WL-129, VES-WL-130, HE-WL-307, and HE-WL-308 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)

- VES-WL-134, CPP-604 Process Condensate Surge Tank (regulated under IDAPA as a storage tank)

- EVAP-WL-161, CPP-604 Evaporator Unit, including VES-WL-161, VES-WL-162, HE-WL-300, and HE-WL-301 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)

- VES-WL-131, CPP-604 Process Condensate Surge Tank (regulated under IDAPA as a storage tank)

- VES-WL-108, CPP-604 Process Offgas Condensate Knock Out Pot (regulated under IDAPA as a storage tank)

- VES-WL-111, CPP-604 Bottoms Collection Tank (regulated under IDAPA as a storage/treatment tank)

- VES-WL-101, CPP-604 Bottoms Collection Tank (regulated under IDAPA as a storage/treatment tank)

- VES-WM-100, VES-WM-101, and VES-WM-102, CPP-604 Tank Farm Tanks (regulated under IDAPA as storage/treatment tanks)

- VES-WL-135 (DVB-OGF-D5), VES-WL-136 (DVB-OGF-D8), VES-WL-137 (CPP-649), VES-WL-138, VES-WL-139, VES-WL-142, VES-WL-144 and VES-WL-150 (CPP-604), Process Waste Liquid Collection System (regulated under IDAPA as storage tanks)

- VES-WL-106, VES-WL-107, and VES-WL-163, CPP-604 Process Condensate Collection Tanks (regulated under IDAPA as treatment/storage tanks).

The regulated tanks and ancillary equipment specific to the LET&D facility are listed below:

- VES-WLK-197, CPP-1618 Acid Fractionator Waste Feed Head Tank (regulated under IDAPA as a storage tank)

- FRAC-WLL-170, CPP-1618 Acid Fractionator, including FRAC-WLL-170, HE-WLL-391, HE-WLL-396, HE-WLL-398, and VES-WLL-198 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)

- FRAC-WLK-171, CPP-1618 Acid Fractionator, including FRAC-WLK-171, HE-WLK-392, HE-WLK-397, HE-WLK-399, and VES-WLK-199 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)

- VES-WLL-195, CPP-1618 Acid Fractionator Bottoms Tank (regulated under IDAPA as a storage tank)

- VES-NCR-171, CPP-659 Annex LET&D Nitric Acid Recycle Tank (regulated under IDAPA as a storage tank)

- VES-NCR-173, CPP-659 Annex LET&D Nitric Acid Recycle Head Tank (regulated under IDAPA as a storage tank).

The regulated tanks and ancillary equipment specific to the ETS facility are listed below:

- VES-NCC-152, CPP-659 Constant Head Feed Tank (regulated under the IDAPA as a storage tank)
- EVAP-NCC-150, CPP-659 (which includes VES-NCC-150, HE-NCC-350, HE-NCC-351), (regulated under the IDAPA as a miscellaneous treatment (evaporation) unit with tank storage)
- VES-NCC-101, CPP-659 Blend Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-102, CPP-659 Hold Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-103, CPP-659 Hold Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-119, CPP-659 Fluoride Hot Sump Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-122, CPP-659 Non-Fluoride Hot Sump Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-108, CPP-659 Scrub Hold Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-136, CPP-659 Vent Condenser Knockout Drum (regulated under the IDAPA as a storage tank)
- VES-NCC-116, CPP-659 Mist Collector (regulated under the IDAPA as a storage tank)

The regulated tanks and ancillary equipment specific to the IWTU facility are listed below:

- VES-SRC-131, Waste Feed Tank (regulated under IDAPA as a storage/treatment tank)
- VES-SRC-133, Sump Tank (regulated under IDAPA as a storage/treatment tank)
- VES-SRC-134, Clarifier Tank (regulated under IDAPA as a storage/treatment tank)
- VES-SRC-190 and -191, Product Receiver/Coolers (regulated under IDAPA as storage tanks)
- TK-SRE-196, Firewater Collection Tank (regulated under IDAPA as a storage tank)
- TK-SRH-141, Condensate Collection Tank (regulated under IDAPA as storage tank)
- Integrated Waste Treatment Unit (regulated under IDAPA as a miscellaneous treatment unit), which can be divided into the following two subsystems; 1) Sodium Bearing Waste (SBW) Treatment System, which manages the liquid and offgas phases of the process;

and 2) Product Transfer and Loadout System, which deals with solids management. The components of each of these subsystems are identified below:

- SBW Treatment System, includes VES-SRC-140 [Denitration and Mineralization Reformer (DMR)], F-SRC-153 (Process Gas Filter), VES-SRC-160 [Carbon Reduction Reformer (CRR)], COL-SRC-160 (Offgas Cooler), F-SRC-160 (Offgas Filter), BLO-SRH-260 A and B (Offgas Blowers), F-SRH-140 A, B, C, and D (Process HEPA Pre-filters and Process HEPA Filters), F-SRH-141 A and B (Mercury Adsorbers), and BLO-SRH-240 A and B (Process Exhaust Blowers);

- Product Transfer and Loadout System, which includes AUG-SRC-440 (DMR Auger/Grinder), F-SRC-191 (Product Receiver Filter), VES-SRC-180 (Product Receiver Filter Product Pump), F-SRC-190 (Product Handling Vacuum Filter), and the Canister Filling Stations (3).

The PEWE system, LET&D facility, ETS, and IWTU are part of an overall liquid waste treatment train at the INTEC. The system is comprised of initial storage and accumulation tanks, followed by storage/transfer, and treatment tanks. The overall ILWMS reduces the volume of waste sent to the Tank Farm Facility (TFF) and treats the TFF waste converting it to a waste form suitable for shipment to an ultimate disposal facility. The nitric acid recovered by the LET&D is returned to the original process, where it reenters the primary stage of the treatment process. The reuse of nitric acid is consistent with both the RCRA regulations that encourage reuse, as well as principles of pollution prevention. Rather than continuing to purchase and use "new" nitric acid, the used acid is an effective substitute for commercial product, and ultimately results in less RCRA hazardous waste generation.

Process samples are taken from the New Waste Calcining Facility (NWCF) Tanks (VES-NCD-123, VES-NCD-129, VES-NCC-119, VES-NCC-122, VES-NCC-108, VES-NCC-101, VES-NCC-102, or VES-NCC-103) or F-SRH-141A/B, as necessary, to ensure optimum performance of the units. Process samples may also be taken at VES-WL-106, VES-WL-107, and VES-WL-163. Process samples are analyzed to ensure that the systems operate to minimize corrosion of the vessels and maintain system efficiency. If undesirable concentrations of process parameters are detected, then facility personnel may blend the waste with waste of lesser ionic concentration or add specifically identified commercial chemicals to make the waste more amenable to treatment. In some cases, recovered nitric acid may be added to tank systems to maintain acidity and promote the formation of a protective passivation layer to inhibit corrosion of the stainless steel.

C-1 CHEMICAL AND PHYSICAL ANALYSES: [IDAPA 58.01.05.012 and 008; 40 CFR §§ 270.14(b)(2) and 264.13(a)]

The INTEC units described in this permit are used to manage a variety of wastes generated from INL activities. Typical waste streams managed by the ILWMS include:

- Liquids generated incidental to conducting debris treatment, decontamination, and descaling activities on INL equipment, piping, and valves
- Concentrated evaporator bottoms
- Rain water and snow melt that infiltrate into sumps and other containment areas
- Water from radioactive fuel storage basins and pools
- Mop water and other cleaning liquids generated incidental to cleanup activities conducted in radiological areas
- Analytical residues, excess samples, and expired analytical standards generated by sampling and analytical laboratory activities
- Solutions from preventative maintenance and corrective maintenance leak tests on process piping and valves
- Newly generated liquid wastes (NGLW) resulting from normal operations and facility deactivation and decommissioning activities
- Aqueous service wastes, such as steam condensate
- ILWMS treatment residuals that may require further processing
- Other waste streams not currently identified that conform to the ILWMS waste acceptance criteria and process tolerance limits identified in Sections C-2(a)(1) and D-8(b)(5), respectively.

Radionuclides that contribute the majority of the activity for wastes managed in the ILWMS include Y-90, Sr-90, Cs-137, Ba-137m, Pu-238, Sm-151, Pu-241, Pm-147, Eu-155, Eu-154, Pu-239, Am-241, Co-60, Ni-63, Cs-134, Sb-125, H-3, Pu-240, Tc-99, Cd-113m, Te-125m, Pa-233, Np-237, Eu-152, Zr-93, Cm-244, Fe-55, Nb-93m, Nb-94, Ru-106, Rh-106, Cs-135, U-234, Ce-144, and Pr-144. The units that comprise the ILWMS are capable of handling high-level, transuranic, and low-level radioactive wastes. Activities of typical wastes range from <20 nCi/g to 50,000 nCi/g. The exposure rates associated with these process solutions routinely exceed 100 mrem/hr and can pose a potentially serious hazard to workers at the INL if appropriate protective measures such as time, distance, and shielding are not applied. As a result the INL is requesting the use of alternate handling and sampling techniques as proposed in this permit.

Before being received into the ILWMS, wastes undergo RCRA characterization in accordance with IDAPA 58.01.05.006 (40 CFR § 262.11). The characterization is based on process knowledge and/or analytical data. Due to the radiological nature of wastes managed in the ILWMS, characterization and the assignment of Environmental Protection Agency (EPA) hazardous waste numbers (HWNs) occur through the use of acceptable knowledge, which involves both process knowledge (PK) and/or chemical/physical testing of the waste. Listed HWNs are applied based on knowledge of the processes. *A Regulatory Analysis and Reassessment of U.S. Environmental Agency Listed Hazardous Waste Numbers for Applicability to the INTEC Liquid Waste System*, INEEL/EXT-98-01213, Rev. 1, February 1999 identifies the listed HWNs associated with the INTEC liquid waste system. Characteristic HWNs may be applied by testing the waste according to the methods set forth in Subpart C of 40 CFR Part 261, or according to an equivalent method approved by the Director of the Idaho Department of Environmental Quality, or by applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.

The RCRA Part A Permit Application for the PEWE, LET&D, ETS, and IWTU lists 28 EPA HWNs. Of the 28 HWNs identified, 5 are listed HWNs and 23 are characteristic HWNs. Units that comprise the ILWMS manage land disposal restricted waste liquids that exhibit the characteristics of corrosivity and toxicity, and contain one or more listed constituents.

Although the feed solutions to the PEWE, LET&D, ETS, and IWTU do not exhibit the characteristic of ignitability, the EPA HWN D001 is identified on the Part A since small quantities of low total organic carbon (TOC) ignitables may enter the system. Sampling and analysis has demonstrated that when these small quantities of ignitable waste are aggregated with other wastes to facilitate treatment, the characteristic of ignitability is lost. However, the HWN D001 is tracked through the ILWMS to account for these ignitable materials and any underlying hazardous constituents (UHCs) to ensure proper cradle-to-grave management of mixed and hazardous wastes.

C-1a Waste in Containers: [IDAPA 58.01.05.008; 40 CFR §§ 264.172 and 264.177(a)]

The containerized waste produced and stored in the IWTU Vault Loading Area and Vault Storage Area is a sodium carbonate-based granular solid treatment product. In general, the IWTU treats acidic, aqueous liquid wastes that contain small quantities of organics and heavy metals (exhibit the characteristic of toxicity) and/or contain listed hazardous waste constituents identified on the Part A permit application for this permit. The IWTU stores the treatment product prior to shipment to an ultimate disposal facility. The IWTU removes the organic constituents and mercury during the treatment of the TFF waste. The treatment product exhibits the characteristic of toxicity for metals and retains the listed hazardous waste numbers. The canisters are designed and constructed of materials that are compatible with the sodium carbonate-based granular solid for storage, shipment, and ultimate disposal off-Site. The treatment waste will not be added to unwashed canisters that may have previously contained incompatible waste or material.

C-1b Waste in Tank Systems: [IDAPA 58.01.05.008; 40 CFR §§ 264.191(b)(2) and 264.192(a)(2)]

The wastes managed in the ILWMS tank systems described in this permit are all very similar in composition. In general, the ILWMS treats and stores acidic, aqueous liquid wastes that contain small quantities of heavy metals and organics (exhibit the characteristic of toxicity) and/or contain listed hazardous waste constituents identified on the Part A permit application for this permit. These wastes are generated from a variety of INL activities including building and equipment decontamination, debris and liquid waste treatment, and research and development. A brief description of each of the tank systems, and typical wastes managed, is detailed below. Specific characterization information regarding the waste to be treated in the IWTU is presented in Appendix C-1 and Appendix C-2. A more detailed description of each tank system is provided in Attachment 1, Section D, "Process Information," of this permit.

New Waste Calcining Facility (NWCF) Tanks
(VES-NCD-123, VES-NCD-129, VES-NCC-119, and VES-NCC-122)

VES-NCD-123, the Decon Holdup Tank, and VES-NCD-129, the Decon Collection Tank, are located in CPP-659 and support decontamination facility activities. These tanks primarily collect acidic, aqueous decontamination solutions from debris treatment, including high efficiency particulate air (HEPA) filter leaching activities, and equipment decontamination. These tanks are described in detail in the Hazardous Waste Management Act (HWMA)/RCRA Storage and Treatment Permit for the INTEC, Volume 18, Effective Date: April 27, 2009.

Tanks VES-NCC-119, the Fluoride Hot Sump Tank, and VES-NCC-122, the Non-Fluoride Hot Sump Tank, are also located in CPP-659 and support operation of the Evaporator Tank System (ETS) as well as NWCF decontamination activities. During operation of the ETS, evaporator bottoms are routed to VES-NCC-119. Condensed evaporator overheads are collected in VES-NCC-122. These tanks also receive acidic, aqueous liquid decontamination solutions generated in the NWCF as a result of equipment repair or preventive maintenance. Wastes collected in VES-NCC-119 are usually transferred to the TFF. If the fluoride concentration is determined to be below the corrosive limit, or can be blended with other wastes to conform to tolerance limits, or can be complexed to alleviate corrosion concerns, then the solution may be transferred to the PEWE system. Wastes collected in VES-NCC-122 are typically sent to the PEWE for volume reduction.

Process Waste Liquid (PWL) System

(VES-WL-135, VES-WL-136, VES-WL-137, VES-WL-138, VES-WL-139, VES-WL-142, VES-WL-144, and VES-WL-150)

The PWL tanks are located in CPP-604, CPP-649, and associated valve boxes. The PWL system receives condensate from the Atmospheric Protection System (APS) and the Main Stack Sump as well as waste solutions from CPP-604/-605 floor sumps or drains, and sampler drains. These aqueous solutions are typically generated on an irregular basis and are transferred directly to the PEWE Feed Sediment/Feed Tanks, VES-WL-132 or VES-WL-133.

Sumps SU-WL-140, -143, -145, -146, -147 and -148 do not contain tanks. These sumps are not used routinely. The exclusive purpose of these sumps is to contain liquids during immediate responses to discharges of hazardous wastes.

Sump SU-WL-140 is located in the South Cell of the Rare Gas Plant (RGP). The RGP is no longer active. Therefore, there are no sources of waste that would be collected in this sump.

Sump SU-WL-143 is located in the RGP Pump Pit. Since the RGP is no longer active, there are no sources of waste that would be collected in this sump.

Sump SU-WL-148 is located at the INTEC main stack. In the event of equipment failure, condensate from the main stack could collect in this sump.

Sumps SU-WL-145 and SU-WL-146 are part of the secondary containment and leak detection system in the PEWE Condensate Collection Cell.

Sump SU-WL-147 is part of the secondary containment and leak detection system in the PEWE EVAP-WL-161 Cell.

CPP-604 Tank Farm Tanks (VES-WM-100, VES-WM-101, and VES-WM-102)

VES-WM-100, VES-WM-101, and VES-WM-102 typically provide storage capacity for PEWE bottoms. If necessary, these tanks can also be used to store PEWE feed solutions by routing liquids through valve box C-40.

Evaporator Feed Sediment Tank (VES-WL-132)

VES-WL-132 may receive waste from the tank systems previously described in this section as inputs to the ILWMS. In addition, VES-WL-132 may receive snow melt or other liquids from TFF sumps and valve boxes, basin water from CPP-666, or waste from other INL facilities.

VES-WL-132 functions as a settling basin for solids that would otherwise settle out in the Evaporator Feed Collection Tank, VES-WL-133. When the feed stream enters VES-WL-132, it encounters a baffle-and-weir system. The solids settle out of the solution as it flows under the baffle and over the weir. Since the cessation of fuel processing activities in the early 1990's, solids are no longer considered a problem in the feed solutions. However, in the unlikely event that VES-WL-132 was to completely fill, solids would be carried over into VES-WL-133. As VES-WL-132 approached its capacity, solids would be detected as a result of plugging in the vessel's instrument lines. VES-WL-132 would then be immediately bypassed, diverting feed solutions directly to VES-WL-133. Once full of solids, VES-WL-132 is designed to be remotely removed/replaced. The full sediment tank will be managed as a RCRA solid waste and disposed in accordance with all applicable regulations. However, if the solids content in PEWE feed remains low, the INL may elect not to install a new feed sediment tank.

Evaporator Feed Collection Tank (VES-WL-133)

VES-WL-133 receives waste from all the sources previously identified in this section as inputs to the ILWMS. Waste from several of these inputs may be blended to promote optimum operability of the unit. VES-WL-133 serves both evaporators, EVAP-WL-129 and EVAP-WL-161. Wastes are transferred from VES-WL-133 to either the Evaporator Head Tank, VES-WL-109, or directly to EVAP-WL-129.

Surge Tank for VES-WL-133 (VES-WL-102)

The current function of this tank is to provide surge capacity for VES-WL-133.

Evaporator Head Tank (VES-WL-109)

VES-WL-109 provides a constant head for feed solution to evaporator EVAP-WL-161. Feed is pumped to this tank from the Evaporator Feed Collection Tanks, VES-WL-133 or VES-WL-102. VES-WL-109 has an overflow that returns to either VES-WL-133 or VES-WL-102.

Process Condensate Surge Tank (VES-WL-134)

VES-WL-134 collects acidic condensate from evaporator EVAP-WL-129 overheads. VES-WL-134 provides the capability for the evaporators to be operated in series. For series operation, EVAP-WL-129 is operated until VES-WL-134 is full. This tank then provides feed for EVAP-WL-161.

VES-WL-134 may also be used to store concentrated acidic LET&D bottoms for reuse in other INTEC operations.

Process Condensate Surge Tank (VES-WL-131)

VES-WL-131 collects acidic condensate from evaporator EVAP-WL-129 and/or EVAP-WL-161 overheads. When full, the contents of this tank are transferred to one of the Process Condensate Collection Tanks, VES-WL-106, VES-WL-107, or VES-WL-163.

Process Condensate Collection Tanks (VES-WL-106, VES-WL-107, and VES-WL-163)

VES-WL-106, VES-WL-107, and VES-WL-163 store acidic condensate from Process Condensate Surge Tank, VES-WL-131. This aqueous condensate may be either re-fed to the PEWE or transferred to the LET&D facility for recovery of nitric acid.

Bottoms Collection Tanks (VES-WL-101 and VES-WL-111)

VES-WL-101 and VES-WL-111 primarily collect concentrated acidic PEWE evaporator bottoms from EVAP-WL-129 and EVAP-WL-161. Valve box C-40 allows transfers between these tanks and other facilities including the TFF, ETS, and CPP-659.

Process Condensate Knock Out Pot (VES-WL-108)

The function of the Process Condensate Knock-Out Pot is to remove entrained acidic condensate remaining in the vessel offgas (VOG) for the PEWE process condensate collection and surge tanks. From this point, PEWE condensate VOG passes to the plant VOG system. Any liquid removed drains back to VES-WL-131 or VES-WL-133.

Acid Fractionator Waste Feed Head Tank (VES-WLK-197)

VES-WLK-197 receives PEWE acidic condensate from the CPP-604 Process Condensate Collection Tanks, VES-WL-106, VES-WL-107, and VES-WL-163. This vessel acts as the feed tank to LET&D fractionators, FRAC-WLL-170 and FRAC-WLK-171.

Acid Fractionator Bottoms Tank (VES-WLL-195)

VES-WLL-195 collects concentrated acidic LET&D bottoms from fractionators FRAC-WLL-170 and FRAC-WLK-171. These bottoms are primarily comprised of concentrated nitric acid (10-13 molar) solution.

Nitric Acid Recycle Tank (VES-NCR-171)

VES-NCR-171 stores the concentrated nitric acid recovered by the LET&D facility. This acid may be used elsewhere at the INTEC for decontamination or waste treatment.

Nitric Acid Recycle Head Tank (VES-NCR-173)

VES-NCR-173 acts as a constant head feed tank for transfers of LET&D recovered nitric acid to other INTEC processes. Concentrated nitric acid is airlifted from the Nitric Acid Recycle Tank, VES-NCR-171, to VES-NCR-173 for this purpose.

Blend Tank (VES-NCC-101)

VES-NCC-101 receives waste from VES-NCC-102, VES-NCC-103, VES-NCC-119, VES-NCC-122, VES-NCD-123, VES-NCD-129, PEWE, and the TFF and acts as the feed tank for the ETS. Feed for the IWTU is also stored in this tank prior to transfer to VES-NCC-102 or VES-NCC-103. Chemical adjustments to the feed can be accomplished here.

Hold Tank (VES-NCC-102)

VES-NCC-102 receives waste from VES-NCC-101, VES-NCC-103, VES-NCC-119, VES-NCC-122, VES-NCD-123, VES-NCD -129, PEWE, and the TFF. This tank also provides feed surge capacity for the ETS. Feed for the IWTU is also transferred through this tank. Chemical adjustments to the feed can be accomplished here.

Hold Tank (VES-NCC-103)

VES-NCC-103 receives waste from VES-NCC-101, VES-NCC-102, VES-NCC-119, VES-NCC-122, VES-NCD-123, VES-NCD-129, PEWE, and the TFF. This tank also provides feed surge capacity for the ETS. Feed for the IWTU is also transferred through this tank. Chemical adjustments to the feed can be accomplished here.

Scrub Hold Tank (VES-NCC-108)

VES-NCC-108 collects the condensate from the Vent Condenser Knockout Drum, VES-NCC-136.

Vent Condenser Knockout Drum (VES-NCC-136)

The function of VES-NCC-136 is to remove entrained condensate remaining in the offgas. Any liquid removed drains to VES-NCC-108.

Mist Collector (VES-NCC-116)

The function of VES-NCC-116 is to remove entrained condensate remaining in the offgas. Any liquid removed drains to VES-NCC-119.

Constant Head Feed Tank (VES-NCC-152)

VES-NCC-152 provides a constant head for feed solution to evaporator VES-NCC-150. Feed is airlifted to this tank from the Blend Tank, VES-NCC-101.

Waste Feed Tank (VES-SRC-131)

VES-SRC-131 provides feed solution to the DMR (VES-SRC-140). Feed is transferred to VES-NCC-101, VES-NCC-102 and VES-NCC-103 and then to the Waste Feed Tank.

Sump Tank (VES-SRC-133)

VES-SRC-133 receives decontamination liquids from the WFT, DMR, OGF, PGF, and overflow from VES-SRC-131 through VES-SRC-134.

Clarifier Tank (VES-SRC-134)

VES-SRC-134 receives overflow from the WFT and decontamination liquids and solids from the WTF, DMR, OGF, and PGF. This tank is designed to overflow to VES-SRC-133.

Product Receiver/Cooler (VES-SRC-190 and 191)

VES-SRC-190 and 191 receives solid treatment product from the DMR and CRR, and fines collected in the Process Gas Filter, Offgas Filter, Product Handling Vacuum Filter, and Product Receiver Filter Product Pump, where they are cooled prior to being transferred to storage/shipping canisters.

Fire Water Collection Tank (TK-SRE-196)

TK-SRE-196 is provided to collect fire water resulting from a fire in the IWTU Building Ventilation HEPA Filters, Process HEPA Filters, or Mercury Adsorbers. Any fire water collected in this tank will be analyzed and transferred to suitable containment for treatment or disposal.

Condensate Collection Tank (TK-SRH-141)

TK-SRH-141 is provided to collect condensate from the IWTU stack and off-gas sampling equipment. The collected liquid is transferred to the waste feed tank and fed to the IWTU process.

C-1c Waste Piles: [IDAPA 58.01.05.012; 40 CFR 270.18]

When filling the canisters with treated waste product from the IWTU process, hazardous and mixed waste may be generated from decontamination activities or plastic covers used for contamination control on the outside of the canister.

C-1g Waste in Miscellaneous Treatment Units: [IDAPA 58.01.05.012; 40 CFR §270.23]

The miscellaneous treatment units covered by this permit include the PEW evaporators, EVAP-WL-129 and EVAP-WL-161, the LET&D facility fractionators, FRAC-WLL-170 and FRAC-WLK-171, the ETS, EVAP-NCC-150, IWTU steam reformers, VES-SRC-140 and VES-SRC-160, and associated ancillary equipment including the Product Transfer Loadout System.

As noted previously in Section C-1b, the ILWMS is part of an overall liquid waste treatment train. Aqueous liquids generated from INL decontamination, waste treatment, and other activities are processed in the PEWE and ETS to reduce the volume of mixed waste sent to the TFF for storage. The LET&D facility further reduces this volume by recovering approximately 99% of the nitric acid contained in condensed PEWE overheads. This nitric acid is then used elsewhere on-Site for treatment and decontamination activities in lieu of purchasing commercial grade nitric acid, effectively minimizing the quantity of waste generated from INL activities. The final component(s) of the ILWMS treatment train is the IWTU. PEWE and ETS bottoms currently stored in the TFF, and NGLW will be treated by the IWTU. A brief description of each of the miscellaneous treatment units and typical wastes managed are detailed below. A more detailed description of each miscellaneous treatment unit is provided in Attachment 1, Section D, "Process Information," of this permit.

Process Equipment Waste Evaporator Unit (EVAP-WL-129, includes VES-WL-129, VES-WL-130, HE-WL-307 and HE-WL-308)

The function of EVAP-WL-129 is to reduce the volume of waste sent to the TFF. The evaporator is composed of a flash column, VES-WL-129, a mist eliminator, VES-WL-130, a reboiler, HE-WL-307, and a condenser, HE-WL-308. Feed pumps draw waste from the Evaporator Feed Collection Tank, VES-WL-133, and transfer the waste to the evaporator. The evaporator uses steam to heat the feed in a reboiler. This feed is circulated from the reboiler through the flash column, where vapor is separated from the liquid. Liquid drops to the bottom of the flash column and is recycled back to the reboiler. Constituents of the feed that have a lower boiling point than the system temperature produce a vapor. Any constituents with a higher boiling point remain in the liquid and are recirculated through the evaporator.

The vapor phase rises in the flash column, encounters a baffle, and then passes through a coarse wire mesh to remove entrained liquid droplets from the vapor. The vapor continues through the mist eliminator, which contains a fine wire mesh to remove additional entrained liquid droplets (light constituents and water). Finally, the vapor flows through a condenser where acidic vapor is condensed and collected in VES-WL-131. Any non-condensable vapor is routed to the plant VOG system.

Process Equipment Waste Evaporator Unit (EVAP-WL-161, includes VES-WL-161, VES-WL-162, HE-WL-300 and HE-WL-301)

EVAP-WL-161 is similar to EVAP-WL-129 in both design and operation. One minor difference is that EVAP-WL-161 is gravity fed from an Evaporator Head Tank, VES-WL-109, rather than receiving waste directly from feed pumps. Evaporator EVAP-WL-161 is composed of a flash column, VES-WL-161, a separator, VES-WL-162, a reboiler, HE-WL-300, and a condenser, HE-WL-301. The operation of this evaporator is virtually identical to that described above for EVAP-WL-129.

LET&D Acid Fractionator (FRAC-WLL-170, includes HE-WLL-398, HE-WLL-396, and VES-WLL-198)

The LET&D treatment process reduces the volume of liquid waste by fractionating condensed acidic PEW evaporator overheads into saturated steam/offgas and acid. The fractionators separate the waste solution into water (overheads) and nitric acid (bottoms). Fractionator FRAC-WLL-170 includes a reboiler, HE-WLL-398, a condenser, HE-WLL-396, and a liquid separator, VES-WLL-198. The feed is heated to its boiling point by introducing steam to the reboiler. The vapor from the boiling liquid rises through several stacked sieve trays (perforated plates) in FRAC-WLL-170. The sieve trays installed in the fractionator column mix the vapors and liquid. As the descending liquid contacts the rising vapor on each tray, nitric acid condenses and remains in solution. Due to its higher boiling point, the nitric acid collects in the bottom of the fractionator, while water, with a lower boiling point, is discharged as steam.

The saturated steam offgas generated from the fractionation process is drawn through the condenser, where it is partially condensed, producing a reflux stream and steam offgas. This mixture then flows through a liquid separator where the reflux is removed and returned to the top of the acid fractionator. The reflux flows downward, providing liquid for the upper trays. The remaining steam flows through the separator, passes through a superheater and HEPA filters, and is exhausted to the atmosphere via the INTEC Main Stack.

LET&D Acid Fractionator (FRAC-WLK-171, includes HE-WLK-399, HE-WLK-397, and VES-WLK-199)

Fractionator FRAC-WLK-171 is identical in design and operation to FRAC-WLL-170. FRAC-WLK-171 includes a reboiler, HE-WLK-399, a condenser, HE-WLK-397, and a liquid separator, VES-WLK-199.

Evaporator Tank System Unit (VES-NCC-150, HE-NCC-350, and HE-NCC-351)

The function of the ETS is to reduce the volume of waste sent to and stored in the TFF. The evaporator is composed of a flash column, VES-NCC-150, a reboiler, HE-NCC-350, and a condenser, HE-NCC-351. An airlift transfers waste from the Blend Tank VES-NCC-101 to VES-NCC-152 and is gravity fed to the evaporator, VES-NCC-150. Steam is used to heat the feed in a reboiler. This feed is circulated from the reboiler through the flash column, where vapor is separated from the liquid. The vapor phase rises in the flash column and encounters a cyclone that separates the liquid from the vapor. The liquid drops to the bottom of the flash column and is recycled back to the reboiler. From the cyclone, the vapor and remaining entrained droplets flow through a demister that de-entrains the liquid droplets. The resulting overhead vapor flows into the condenser, HE-NCC-351. The condensate is collected in VES-NCC-122. Any non-condensable vapor is routed to the process offgas system and then to the APS. When conditions warrant, the bottoms are transferred to VES-NCC-119.

Constituents of the feed that have a boiling point equal to or lower than the system temperature produce a vapor. Any constituents with a higher boiling point remain in the liquid and are recycled through the evaporator.

Integrated Waste Treatment Unit

The purpose of the IWTU is to process SBW currently located in the TFF, as well as NGLW.

The SBW contained in TFF tanks VES-WM-187, -188, and -189 is transferred to the NWCF Blend and Hold Tanks VES-NCC-101, -102, and -103 where the waste is sampled and/or blended, as necessary, prior to being pumped to the Waste Feed Tank, VES-SRC-131.

From the Waste Feed Tank the waste is pumped to the first of two fluidized bed steam reformers, the DMR, VES-SRC-140. The waste is atomized with a controlled flow of compressed nitrogen and instrument air in the feed injectors and then sprayed into the DMR's heated fluidized bed. Coal is added to the bed to maintain temperature and promote a reducing environment to convert nitrogen oxides to nitrogen gas. The liquid waste is immediately vaporized and the solids from the liquid waste are deposited on the bed particles causing the particles to gradually increase in size over time. The bed media, or treatment product, is drawn off the bottom of the DMR using an auger/grinder system and then pneumatically transported to the Product Receiver/Coolers, VES-SRC-190 and 191. This sodium carbonate-based granular solid treatment product is expected to be classified as remote-handled (RH) transuranic (TRU) mixed waste.

The process gas from the DMR is filtered by the Process Gas Filter, F-SRC-153, and then sent to the second steam reformer, the CRR, VES-SRC-160. The process gasses from the DMR are introduced into the lower part of the CRR, into the heated fluidized bed. In the CRR the offgas is mixed with carbon, oxygen enriched air, nitrogen, and water, as necessary for temperature control. The bed particles in the CRR are not expected to increase significantly in size since the input feed is DMR offgas. The offgas continues through the Offgas Cooler, COL-SRC-160, which cools the offgas vapor with an atomized water spray. The offgas then passes through the Offgas Filter, F-SRC-160. Next the offgas is routed through the Process HEPA filters, F-SRH-140A/B/C/D, and the Mercury Adsorbers, F-SRH-141A/B, which are filled with sulfur-impregnated granular activated carbon (GAC). Finally, the offgas stream passes through a Continuous Emissions Monitoring System (CEMS) before being combined with HEPA-filtered building ventilation air and exiting the system through a dedicated stack.

Waste treatment product drained from the DMR and elutriated fines collected in offgas cleanup equipment are sent to one of the Product Receiver/Coolers, VES-SRC-190 and 191. The treatment product is cooled via a nitrogen cooling loop and eventually drained from the Product Receiver/Coolers, in a batch mode, into canisters that are positioned one at a time for filling at one of two Canister Filling Stations.

The full canisters are placed in portable concrete storage vaults in a 4 X 4 pattern for a total of 16 canisters to a storage vault. The storage vault is transported to the Vault Storage Area using mechanical means such as fork lifts or air jacks.

When transport trucks and casks are made available from the ultimate disposal facility, the storage vaults are retrieved from storage and located in the Vault Loading Area, adjacent to a truck bay equipped with air locks. Canisters will be loaded into the appropriate cask on the truck and transported to the disposal facility.

A more detailed description of ILWMS tank systems and miscellaneous treatment units is provided in Attachment 1, Section D of this permit.

C-2 WASTE ANALYSIS PLAN: [IDAPA 58.01.05.008 and 012; 40 CFR §§ 264.13(b) and (c), and 270.14(b)(3)]

The regulations under RCRA, as implemented through IDAPA 58.01.05.008 (40 CFR § 264.13), require a waste analysis plan (WAP) for regulated waste management units. This WAP identifies what waste characterization information is needed, the nature and extent of information required, the method(s) by which the information is gathered, and the quality assurance/quality control (QA/QC) goals.

The process outlined in this WAP is implemented for characterization of all mixed/hazardous wastes or potentially hazardous wastes managed at the INTEC units described herein. Wastes subject to this plan include wastes generated from INL operations, treatment residues generated from INL RCRA-regulated waste management activities, and off-Site wastes that have been verified in accordance with the WAP requirements of IDAPA 58.01.05.008 [40 CFR § 264.13(c)]. As such, this WAP is intended for inclusion in day-to-day waste management operations.

This WAP is established to ensure that all data used for waste characterization is scientifically valid, defensible, and of known precision and accuracy. This objective relies on the identification of appropriate parameters and rationale, analytical methods, sampling methodologies, and quality control.

The objectives of this WAP are as follows:

- Ensure that sufficient information is available to provide safe handling, storage, and treatment of waste materials
- Define the parameters for characterization and the rationale for selection
- Establish consistent sampling, sample management, analytical methods, parameter selection, and controls for wastes received and generated
- Provide a description of the waste stream characterization and approval process from the point of waste generation through final disposition of the waste
- Establish unit-specific waste acceptance criteria (where necessary) for treatment units to ensure that sufficient information is available to determine whether the wastes considered for storage at the respective units meet the requirements established in this permit
- Provide additional requirements for the characterization and acceptance of ignitable wastes
- Define Land Disposal Restriction (LDR) requirements applicable to wastes managed in the miscellaneous treatment, and storage units
- Verify that EPA HWNs for wastes stored or treated are acceptable per the EPA HWNs listed in the Part A.

This WAP will be revised whenever test methods are changed or whenever regulations change that affect the WAP.

C-2a Parameters and Rationale: [IDAPA 58.01.05.008; 40 CFR §§ 264.13(b)(1) and (2)]

Tables C-1 and C-2 outline the parameters for analysis and corresponding rationale that are employed to perform hazardous waste determinations in accordance with IDAPA 58.01.05.006 (40 CFR § 262.11) and to assess LDR requirements. The parameters and rationale presented in these tables are selected to ensure compliance with RCRA and unit-specific waste acceptance requirements and to guarantee safe, compliant treatment and storage. Not all of the parameters identified in Tables C-1 and C-2 are selected for each waste stream. Only the specific parameters applicable to each waste stream proposed for storage or treatment in the ILWMS are evaluated.

Table C-1. Test Methods for Waste Analysis Parameters and Rationale

PARAMETER	TEST METHOD(S)[a]	RATIONALE
Toxicity characteristic	1311 Toxicity Characteristic Leaching Procedure (TCLP) or process knowledge	Determine the waste and LDR status.
Metals: antimony arsenic barium beryllium cadmium chromium lead mercury nickel selenium silver thallium	3005, 3010, 3050, 3051, 3052, 6010, 7470, 7471 or process knowledge	Determine if the waste is characteristically hazardous for toxicity. Determine reasonably expected underlying hazardous constituents (UHCs).
Volatile and semi-volatile organic compounds	5030, 5035, 8015, 8082, 8260, 3510, 3550, 3600, 8270 or process knowledge	Determine whether the waste is characteristically toxic for organic compounds or whether listed waste constituents can be detected. Identify reasonably expected UHCs. Determine the concentration of organic constituents detected.
Flash point	1010, 1020, ASTM D93, D3828 or process knowledge	Determine if waste is characteristically ignitable.
Corrosivity/Acidity, pH or Corrosivity toward steel	ACMM 7012[b], 9040, 9045C, 9041 or process knowledge	Determine if the waste is characteristically corrosive.

Table C-1. Test Methods for Waste Analysis Parameters and Rationale (continued)

PARAMETER	TEST METHOD(S)[a]	RATIONALE
Reactivity (cyanides, sulfides, water reactive, chemical stability, shock sensitive)	C003[c], 9010, 9013, 9014, 9030, 9031, 9034, or process knowledge	Determine if waste is characteristically reactive and prevent mixing of incompatible wastes in tank and treatment systems.
Free liquids	9095 Paint Filter Liquids Test, visual inspection or process knowledge	Determine whether the waste is a solid or a liquid.
Total organic carbon (TOC)	9060 or process knowledge	Determine whether organics may be present in measurable quantities.

ASTM = American Society for Testing and Materials
ACMM = Analytical Chemistry Methods Manual

a. Methods are from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, unless otherwise stated.
b. G. L. Booman, M. C. Elliot, R. B. Kimball, F. O. Cartan, J. E. Rein, "Determination of Free Acid in the Presence of Hydrolyzable Ions," Analytical Chemistry, 30 No. 2 (February 1958), pp. 284-287.
c. Arthur D. Little, Inc., Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, NTIS No. PN84-1555845, February 1984.

Table C-2. Test Methods, Parameters, and Rationale for LDR Status

PARAMETER	TEST METHOD(S)[a]	RATIONALE
Toxicity characteristic	1311 Toxicity Characteristic Leaching Procedure (TCLP) or process knowledge	Determine waste and LDR status for toxicity.
Metals: antimony arsenic barium beryllium cadmium chromium lead mercury nickel selenium silver thallium	3005, 3010, 3050, 3051, 3052, 6010, 7470, 7471 or process knowledge	Determine LDR status for toxicity. Evaluate mercury subcategory and UHCs.
Volatile and semi-volatile organic compounds	5030, 5035, 8015, 8082, 8260, 3510, 3550, 3600, 8270 or process knowledge	Determine listed waste and LDR status for toxicity. Evaluate UHCs.
Flash point	1010, 1020, ASTM D93, D3828 or process knowledge	Determine LDR status for ignitability.
Corrosivity/Acidity, pH or Corrosivity toward steel	ACMM 7012[b], 9040, 9045, 9041 or process knowledge	Determine LDR status for corrosivity.

Table C-2. Test Methods, Parameters, and Rationale for LDR Status (continued)

PARAMETER	TEST METHOD(S)[a]	RATIONALE
Reactivity (cyanides, sulfides, water reactive, chemical stability, shock sensitive)	C003[c], 9010, 9013, 9014, 9030, 9031, 9034, or process knowledge	Determine LDR status for reactivity and subcategory.
Total organic carbon (TOC)	9060 or process knowledge	Determine wastewater or nonwastewater category
Total suspended solids (TSS)	160.1[d] or process knowledge	Determine wastewater or nonwastewater category

ASTM = American Society for Testing and Materials
ACMM = Analytical Chemistry Methods Manual

a. Methods are from *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, unless otherwise stated.
b. G. L. Booman, M. C. Elliot, R. B. Kimball, F. O. Cartan, J. E. Rein, “Determination of Free Acid in the Presence of Hydrolyzable Ions,” Analytical Chemistry, 30 No. 2 (February 1958), pp. 284-287.
c. Arthur D. Little, Inc., Sampling and Analysis Methods for Hazardous Waste Combustion, EPA-600/8-84-002, NTIS No. PN84-1555845, February 1984.
d. *Methods for Chemical Analysis for Water and Wastes*, EPA-600/4-79-020.

Wastes are characterized and LDR requirements are determined at the point of generation by facility personnel with assistance from other contractor organizations, as needed, by analyzing the waste or by applying process knowledge. The following are examples of process knowledge:

- Raw materials used – knowledge of the type, quantity, and concentration of raw materials used in the system combined with detailed knowledge of the generating process may provide enough information to adequately characterize the waste.

- Process description – pertinent details of the process generating the waste and the chemicals used in the process must be described. The more complex the process, the more information would be required.

- Chemical/material composition specifications – chemical specifications may be available from the purchase specifications of a particular chemical, from product information provided by the manufacturer, or from the labels for the particular chemical in question. For pure chemicals whose contents and characteristics are well known (e.g., nitric acid), standard chemical reference materials may supply the required information. Standard material composition reference tables may supply the required information for metals, plastics, and other materials manufactured to certain grades, alloy specifications, etc., whose material contents and characteristics are well known (e.g., Type 304 stainless steel).

- Material Safety Data Sheets (MSDSs) – chemical specifications and related information are available on these standard reference materials. MSDSs may be provided by the manufacturer or acquired through available MSDS databases.
- Process reference materials including laboratory notebooks, strip charts, correspondence, chemical analyses, and analytical reports.
- Analytical reports from non-SW-846 chemical analyses or information from similar processes.

If process knowledge is adequate to ensure that a particular constituent is not present in the waste, then analysis for that constituent will not be performed. For instance, if the waste comes from a well-defined aqueous process, and no organic chemicals are associated with that process, then analysis for volatile or semi-volatile organics will not be conducted. Similarly, if there is no reason to suspect pesticides or herbicides, analysis for those substances will not be conducted. If process knowledge is not sufficient to eliminate a particular parameter, then that parameter will undergo selection for testing.

Specific parameters selected for RCRA characterization analysis are determined on a case-by-case basis. Facility personnel select the appropriate parameters based on knowledge of the waste source, unit-specific waste acceptance criteria, and characterization requirements to identify RCRA-regulated wastes. This ensures that the appropriate parameter selection will be matched with the correct analytical method(s) to generate the data required for subsequent management of the waste within the ILWMS.

All process knowledge determinations and RCRA characterization analytical results are documented in the facility operating record.

LDR requirements identified at the point of generation are carried through the entire ILWMS. Compliance with the required treatment standards specified in IDAPA 58.01.05.011 (40 CFR § 268) is evaluated following treatment in the IWTU. Required LDR notifications are prepared prior to shipment of any treatment residuals for final disposal.

C-2a(1) Waste Acceptance Criteria

Any wastes accepted at the waste management units addressed in this permit must meet the WAC as defined below. Prior to being accepted at these units, a Waste Generator Services (WGS)

Facility Representative (FR), with assistance from an assigned WGS Waste Technical Specialist (WTS), evaluates each waste to ensure the WAC have been met. The waste acceptance process is described in detail in Section C-2a(2) of this WAP. The WAC are dependent on the waste form, EPA HWNs specified on the Part A, method of characterization, waste characteristics, and packaging. Waste generators or INTEC point-of-generation personnel, in cooperation with WGS, are responsible for performing necessary characterization in accordance with the methods specified in this section (See Tables C-1 and C-2).

The following wastes are prohibited from the waste management units addressed in this permit:

- Wastes designated with EPA HWNs not identified on the Part A permit application for the specified receiving treatment and/or storage unit
- Incompatible wastes within the same tank system or wastes not compatible with the tank system in which they are stored
- Wastes with no free liquids(except for the IWTU Vault Loading and Vault Storage Areas)
- Wastes with high solids content that cannot be separated from the liquid portion (PEWE, LET&D, and ETS only)
- Foaming agents
- Polymerizing materials in sufficient concentration to preclude effective blending
- High TOC subcategory ignitables (EPA HWN D001 with ≥ 10% total organic carbon)
- Waste containing mercury ≥ 3,000 ppm in solution (for the ETS and IWTU)
- Waste containing mercury ≥ 260 ppm (for the PEWE and LET&D)
- Ethylene
- Glycerol
- Sodium Glycerite
- Stoddard Solvent
- Unstable, shock-sensitive, and Department of Transportation (DOT)-defined pyrophoric materials
- Unknown wastes

- Wastes containing DOT Class 1 explosives or Class 4 Division 4.1 flammable solids meeting the definition of a wetted explosive, as identified in 49 CFR 173 Subpart C
- Active pathogens, infectious, or etiologic agents
- Wastes that do not comply with the 40 CFR 268.3 dilution prohibition
- Wastes that generate liquid treatment residuals possessing constituents that do not comply with the WAC of downstream treatment, storage, or disposal units (e.g., the LET&D facility). This assessment is performed on a case-by-case basis.

C-2a(2) Waste Acceptance Process

When an activity is expected to generate a new waste, or upon the generation of a waste, a WGS FR is contacted for guidance and a Waste Determination and Disposition Form (WDDF) is completed if the waste stream does not match an existing profile. The WDDF provides the preacceptance certification needed prior to accepting on-Site wastes.

The first two parts of the WDDF are prepared by the generator with assistance from WGS and other organizations, as necessary, to document the characteristics, pertinent details, and probable waste type of the proposed waste based on process knowledge from the generator. The first two parts of the WDDF include:

Section I: Process Knowledge Evaluation - This section includes information provided by the generator based on their knowledge of the processes and materials involved in generating the waste. Process knowledge is used in addition to or in place of sampling and analysis to determine if a waste is RCRA hazardous and to classify it in order to meet treatment, storage, and disposal requirements. If the waste is clearly not a RCRA-regulated hazardous waste, it is managed in accordance with its properties (e.g., low-level, industrial, etc.).

Section II: Probable Waste Type - This section is used to make a preliminary determination of the waste type and probable waste codes that apply based on an evaluation of the information provided by the generator in Section I.

The third part of the WDDF is completed by the WTS to finalize the planned waste determination and disposition of the proposed waste. This part of the WDDF includes:

Section III: Waste Determination and Disposition - This section is completed by determining the regulatory and procedural requirements of the waste stream from information included in the first two sections.

The WDDF is a dynamic document that is subject to revision. As a best management practice, an annual review and recertification is required for all active waste streams. The generator is also required to notify WGS of any process changes. WGS evaluates the changes with the generator to determine potential effects on the waste characterization. If it is determined that the characterization of a given waste stream changes, the WDDF is revised to reflect the change. An example of a typical WDDF is included as Appendix C-3.

Exhibit C-1 presents a flow diagram of the waste acceptance process for on-Site waste. An initial process knowledge evaluation of the waste stream is conducted to determine if the waste is from a recurring stream with an approved waste profile on file. If the stream has an approved profile on file, the process and waste are evaluated to ensure the waste is consistent with the approved profile. All approved waste stream profiles are reevaluated in accordance with Section C-2d, "Frequency of Analysis," of the waste acceptance process.

If the waste is determined to be RCRA-regulated, based on the initial data obtained from the hazardous waste determination, the WTS performs an LDR evaluation and then evaluates the TSDF options available. Once an appropriate TSDF is identified, the WTS arranges for additional waste characterization, as needed, for acceptance to the TSDF. Waste characterization data and supporting documentation are maintained and made available for both generators and TSDFs.

If the waste stream does not meet the acceptance criteria for the intended unit(s), another TSDF is identified (either on- or off-Site) that can compliantly accept the waste. Compliance with "acceptance criteria" implies compliance with the requirements of the unit-specific Part A permit application, Attachment 1, Section D, and adherence to the list of prohibited items in Attachment 2, Section C-2a(1).

When submittal of a new WDDF is required, in accordance with Section C-2d, "Frequency of Analysis," a new waste acceptance evaluation is conducted. Recertification of existing waste streams requires written and signed documentation from the generator stating that the waste stream and corresponding WDDF remain the same as presently approved by the WTS. Recertification also requires that there have been no significant changes in the process generating the waste, the physical and chemical properties of the waste, or the LDR status of the waste per IDAPA regulations. Recertification of waste streams for the ILWMS is conducted annually.

Liquid wastes to be received at the waste management units addressed in this permit may be received from other INL locations. The same characterization and waste acceptance methodology will be applied for wastes received into the ILWMS, regardless of the point of generation.

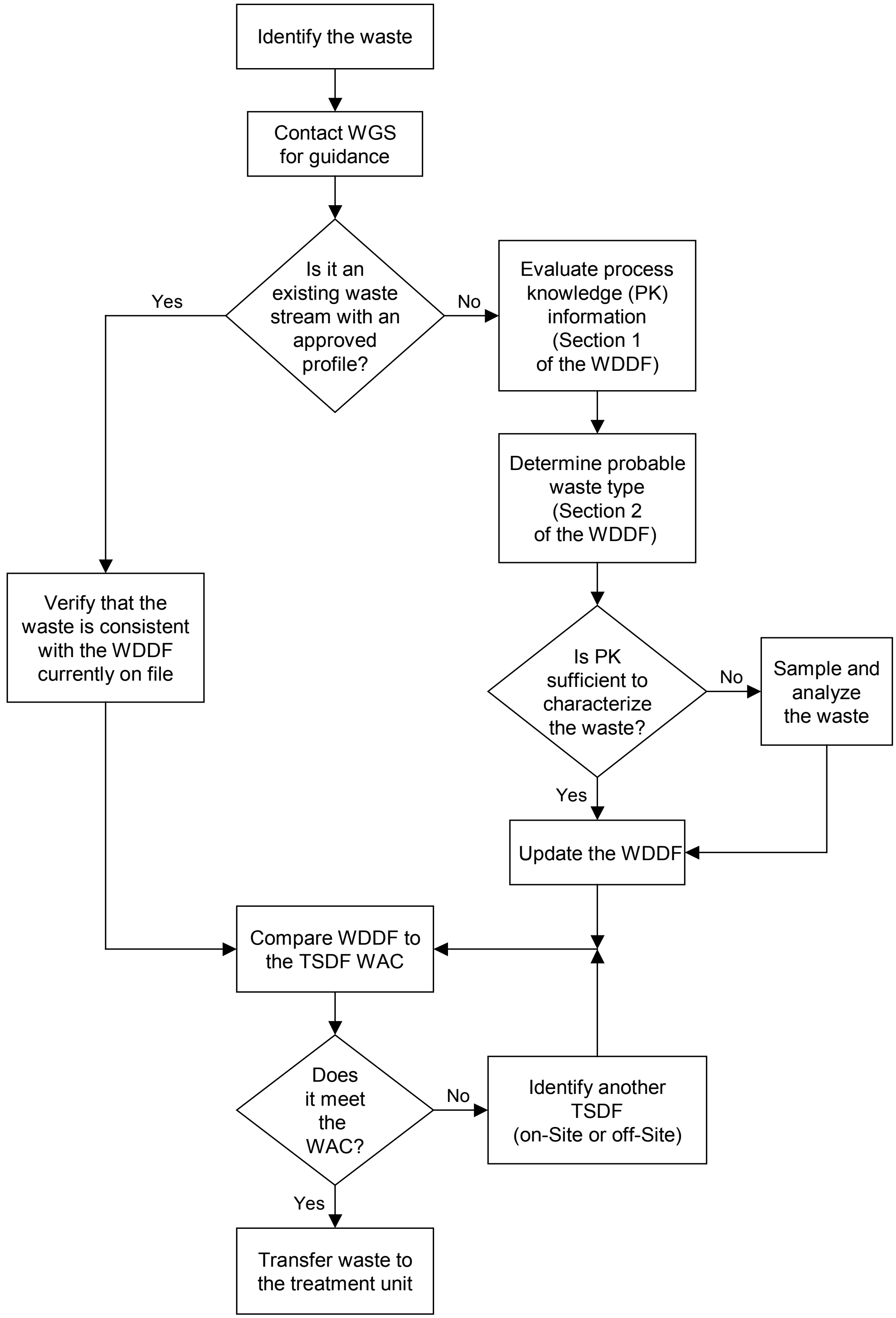


Exhibit C-1. Waste Acceptance Flow Diagram for On-Site Waste.

Wastes transferred within the INTEC perimeter are not subject to DOT shipping requirements. Shipping and receipt of waste from outside the INL is subject to DOT shipping requirements. For those shipments within the INL geographic boundaries, compliance with DOE Order 460.01B (or successor applicable DOE Orders) is required.

LDR Requirements

Point-of-generation facility personnel provide waste characterization information and use this information to complete LDR notifications, per IDAPA 58.01.05.011 (40 CFR § 268.7). In cases where facility personnel determine that an LDR waste does not meet the applicable treatment standard(s) set forth in IDAPA 58.01.05.011 (40 CFR § 268, Subpart D), or exceeds the applicable prohibition level(s) set forth in IDAPA 58.01.05.011 (40 CFR § 268.32) or Section 3004(d) of RCRA, facility personnel provide written notice in accordance with IDAPA 58.01.05.011 (40 CFR § 268.7).

In cases where facility personnel determine that a restricted waste is being managed that can be land-disposed without further treatment, facility personnel submit written notice stating that the waste meets (or is exempt from) applicable treatment standards set forth in IDAPA 58.01.05.011 (40 CFR § 268, Subpart D) and the applicable prohibition level(s) set forth in IDAPA 58.01.05.011 (40 CFR § 268.32) or Section 3004(d) of RCRA. The notice must be in accordance with IDAPA 58.01.05.011 (40 CFR § 268.7).

Required LDR notices are provided by point-of-generation facility personnel. The notifications are reviewed by facility personnel prior to waste treatment and are entered into the treatment unit's operating log. LDR requirements identified at the point of generation are carried through the entire ILWMS. Compliance with the required treatment standards specified in IDAPA 58.01.05.011 (40 CFR § 268) is evaluated following treatment in the IWTU. Required LDR notifications are prepared prior to shipment of any treatment residuals for final disposal.

C-2b Test Methods: [IDAPA 58.01.05.008; 40 CFR § 264.13(b)(2)]

Waste Analysis

Analytical methods employed are primarily taken from *EPA's Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846, Third Edition or later). In those cases where method-defined parameters[1] are required by regulation, SW-846 methods are always employed. Examples of method-defined parameter methods, where the analytical result is wholly dependent on the process used to make the measurement, include the use of the toxicity characteristic leaching procedure (TCLP) to prepare a leachate, flash point, pH, corrosivity tests, and paint filter liquids. The cited test methods will be performed at the laboratories per controlled implementing procedures.

The U.S. EPA provides for a degree of flexibility in the use of SW-846 and other approved methods. This flexibility is dependent on the maintenance of precision, accuracy (or bias), recovery, representativeness, comparability, and sensitivity (detection, quantitation, or reporting limits) relative to the data quality objectives for the intended use of the analytical results. "If an alternative analytical procedure is employed, then EPA expects the laboratory to demonstrate and document that the procedure is capable of providing appropriate performance for its intended application. This demonstration must not be performed after the fact, but as part of the laboratory's initial demonstration of proficiency with the method. The documentation should be in writing, maintained in the laboratory, and available for

---

[1]The use of an SW-846 method is mandatory for the following Resource Conservation and Recovery Act (RCRA) applications contained in 40 CFR Parts 260 through 270:

- Section 260.22(d)(1)(i) - Submission of data in support of petitions to exclude a waste produced at a particular facility (i.e., delisting petitions)
- Section 261.22(a)(1) and (2) - Evaluation of waste against the corrosivity characteristic
- Section 261.24(a) - Leaching procedure for evaluation of waste against the toxicity characteristic
- Section 261.35(b)(2)(iii)(A) - Evaluation of rinsates from wood preserving cleaning processes
- Sections 264.190(a), 264.314(c), 265.190(a), and 265.314(d) - Evaluation of waste to determine if a free liquid is a component of the waste
- Sections 264.1034(d)(1)(iii) and 265.1034(d)(1)(iii) - Evaluation of organic emissions from process vents
- Sections 264.1063(d)(2) and 265.1063(d)(2) - Evaluation of organic emissions from equipment leaks
- Section 266.106(a) - Evaluation of metals from boilers and furnaces
- Sections 266.112(b)(1) and (2)(i) - Certain analyses in support of exclusion from the definition of a hazardous waste for a residue which was derived from burning hazardous waste in boilers and industrial furnaces
- Sections 268.7(a), 268.40(a), (b), and (f), 268.41(a), 268.43(a) - Leaching procedure for evaluation of waste to determine compliance with land disposal treatment standards
- Sections 270.19(c)(1)(iii) and (iv), and 270.62(b)(2)(i)(C) and (D) - Analysis and approximate quantification of the hazardous constituents identified in the waste prior to conducting a trial burn in support of an application for a hazardous waste incineration permit
- Sections 270.22(a)(2)(ii)(B) and 270.66(c)(2)(i) and (ii) - Analysis conducted in support of a destruction and removal efficiency (DRE) trial burn waiver for boilers and industrial furnaces burning low risk wastes, and analysis and approximate quantification conducted for a trial burn in support of an application for a permit to burn hazardous waste in a boiler and industrial furnace. Federal Register, Thursday, November 20, 1997, Vol. 62, No. 224, 62079.

inspection upon request by authorized representatives of the appropriate regulatory authorities" (SW-846, Chapter Two, "Choosing the Correct Procedure").

Joint EPA/NRC guidance[2] for mixed waste also provides flexibility in sample sizes with method-defined parameter methods, as long as the resulting test is sufficiently sensitive to measure the constituents of interest at the regulatory levels prescribed in the TCLP. Other variances to published testing and sampling protocols are permissible under 40 CFR §§ 260.20-21, but must be approved prior to implementation by the Director of the Department of Environmental Quality (DEQ).

The EPA allows for the use of recognized methods other than those prescribed in SW-846. "Whenever methods from SW-846 are not appropriate, recognized methods from source documents published by the EPA, American Public Health Association (APHA), American Society for Testing and Materials (ASTM), the National Institute for Occupational Safety and Health (NIOSH), or other recognized organizations with appropriate expertise should be used, if possible" (SW-846, Chapter One).

Because of the broad range of acceptable methods available for testing specific constituents, and with the rapid incorporation/deletion of methods, not all of the SW-846 methods are specified in Tables C-1 and C-2. Only the currently defined parameter methods are specified.

Certain waste streams are generated at the INTEC that require remote handling and are subject to full RCRA characterization requirements. The remote sample handling requirements and specific process stream requirements may cause deviations in some required analyses systems. For example, the EPA has determined that "if the analyst can demonstrate that the test is still sufficiently sensitive (in the case of reduced sample size in a TCLP extraction) to measure the constituents of interest at the regulatory levels specified in the TCLP and representative of the waste stream being tested" then the sample size can be legitimately decreased[3]. Sample size becomes a critical factor, especially with respect to radiation exposure hazards, and therefore, must be a factor for consideration in any sampling or analytical activity.

The analyses may be performed at INL laboratories or at approved off-Site laboratories. Laboratories contracted by the DOE-designated contractor to perform outside work are audited

[2] *Federal Register*, Thursday, November 20, 1997, Vol. 62, No. 224, 62079.

[3] Federal Register, Thursday, November 20, 1997, Vol. 62, No. 224, 62079.

periodically, to ensure that each laboratory's quality control procedures and standard practices manuals meet the requirements for laboratories conducting EPA test procedures. If the laboratory has not been audited, or has failed to conform to the audit criteria, that laboratory is not authorized by the DOE-designated contractor to conduct waste characterization analysis.

Process Knowledge

The EPA/Nuclear Regulatory Commission (NRC) guidance emphasizes the use of process knowledge to determine if a radioactive waste is hazardous, as a way to avoid unnecessary exposures to radioactivity. Examples of the types of process knowledge information used to characterize wastes for the ILWMS are presented in Attachment 2, Section C-2a of this permit. The INL documents process knowledge through WDDFs (waste stream profiles), correspondence, and memoranda maintained in the Document Management System. As a best management practice, the characterization documentation for all active waste streams is reviewed and each stream recertified annually to ensure the information maintained remains accurate and complete.

All waste characterization information, including documentation of process knowledge, is maintained in the facility operating record.

C-2c Sampling Methods: [IDAPA 58.01.05.008 and 005; 40 CFR § 264.13(b)(3), Part 261 Appendix I]

Facility personnel, in conjunction with WGS, and other organizations as needed, are responsible for initially characterizing wastes before they are received into the ILWMS. Personnel can use process knowledge and/or testing to adequately characterize waste. As part of characterization, the appropriate sampling method is selected based on knowledge of the waste material matrix (e.g., solid, liquid, sludge, radiological component) and radiation exposure considerations, as well as the specific analyte of interest. Facility personnel are also responsible for arranging all sampling and laboratory support and for sample shipments. Sampling personnel document the sampling activities and chain of custody.

Representative waste samples are obtained in accordance with the sampling approaches described in Chapter Nine of *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (SW-846, current edition). Samples are collected using appropriate equipment and methods identified in, but not limited to, the following sources:

- EPA Test Methods for Evaluating Solid Waste, SW-846, Chapter 10, "Sampling Methods," Third Edition
- 40 CFR 261, Appendix I, "Representative Sampling Methods"
- Annual Book of ASTM Standards, American Society for Testing and Materials, Current issue
- Characterization of Hazardous Waste Sites - A Methods Manual, Volume II, Available Sampling Methods, EPA-600/4-84-076, 2nd Edition, December 1984
- "Characterizing Heterogeneous Wastes: Methods and Recommendations," EPA/600/R-92/033, February 1992
- EPA Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual, April 1994
- Other recognized methods from source documents published by the EPA, American Public Health Association, American Society for Testing and Materials, the National Institute for Occupational Safety and Health, or other recognized organizations with appropriate expertise.

Sampling methods that deviate from approved or other recognized methods must be approved prior to implementation by the Director of the DEQ.

C-2c(1) Standard Sampling Methods

Samples from the ILWMS are typically collected through double hypodermic-needle (double-needle) samplers, sample nozzles, or spigots. Both double-needle samplers and sample nozzles utilize airflow to induce a vacuum that draws liquids from the system into sample vials/containers. Due to the radioactive nature of wastes handled in the ILWMS, much of the tank and miscellaneous treatment systems are constructed below ground for shielding purposes. In order to comply with DOE orders to maintain personnel exposure to radiation as low as reasonably achievable (ALARA), these sampling methods are employed in lieu of mechanical devices such as pumps. Mechanical devices would require the generation of large quantities of decontamination solutions to perform preventive maintenance, require confined space entries, and result in personnel exposure to high radiation. Utilizing airflow sampling devices has resulted in fewer sampling failures and dramatically reduces exposure hazards to sampling personnel. Some gravity-flow spigot samplers are located in areas where access and reduced exposure hazard allow. Appendix IV of this permit contains a report from Science Applications International Corporation entitled, "Final Report for Organics Partitioning Resulting from Operation of an INTEC Double-Needle Sampler, Revision 1," dated September 24, 2002. This study compares organic concentrations obtained from double-needle and spigot sampling techniques to determine whether potential stripping of organics occurs. The results of these tests indicate that INTEC sample collection and handling procedures do not significantly affect the concentration of volatile or semi-volatile organic constituents in the waste stream.

Liquid sampling is conducted in accordance with approved sampling and operating procedures which provide instructions for sampling and handling high radiation liquids and other special considerations. In general, where standard samples are collected, the following basic sampling procedure is used as appropriate:

- Obtain samples using precleaned sample equipment, in accordance with the applicable method.
- Fill sample containers. Uniquely identify and label each sample, and document necessary information in the field record (e.g., location, time, characteristics).
- Properly clean and decontaminate the exterior of the sample containers and the sampling hardware.
- Complete the chain-of-custody forms and retain a record copy.
- Deliver the samples and associated forms to the laboratory.

Sampling procedures for certain mixed wastes may deviate from the standard sampling protocols, due to the hazards associated with radioactive materials. For example, due to radiological concerns, the use of remotely operated sample transfer systems may limit the size of sample containers, prevent sealing of the transfer receptacle, or preclude chain-of-custody and other documentation from directly accompanying the samples. However, all sampling procedures are consistent with the stated goals of SW-846, to collect representative samples and to maintain their physical and chemical integrity.

Equipment used to sample waste is disposable or designed for decontamination. Contaminated disposable equipment is managed appropriately. Equipment that can be cleaned and reused is thoroughly decontaminated before reuse or storage. Decontamination solutions are managed appropriately.

C-2c(1)(a) Field Records

Records provide direct evidence and support for the necessary technical interpretations, judgments, and discussions concerning project activities. These records, particularly those anticipated to be used as evidentiary data, directly support current or ongoing technical studies and activities, and provide the historical evidence needed for later reviews and analyses.

Field records may consist of bound field notebooks, sample collection forms, personnel qualification and training forms, sample location maps, equipment maintenance documentation, chain-of-custody forms, and/or sample analysis request forms. Records may include, but are not limited to the following, as applicable:

- Sample Collection - To ensure maximum utility of the sampling effort and resulting data, documentation of sampling protocol, as performed in the field, is essential. Sample collection records may contain the names of persons conducting the activity, sample number, sample location, date and time the sample was taken, equipment used, climatic conditions, documentation of adherence to protocol, and unusual observations.

- Chain-of-Custody Records - The chain of custody involving the possession of RCRA characterization samples from the time they are obtained until they are disposed or shipped off-Site are documented, and may include the project name, signatures of samplers, sample number, date and time of collection, grab or composite sample designation, signatures of individuals involved in sample transfer; and if applicable, the air bill or other shipping number.

- Quality Control (QC) Samples - Documentation for generation of QC samples, such as trip and equipment rinsate blanks, duplicate samples, and any field spikes, are maintained.

- Deviations - All deviations from normal sampling and analysis protocols are recorded in the site logbook or project records.

- Reports - A copy of any report issued and any supporting documentation are retained.

C-2c(2) Quality Control

Defensible and valid data are obtained through implementation of the processes controlling characterization and/or sampling and analysis. Such processes include the use of field and laboratory control samples, data validation, sampling performance assessments, and as necessary, corrective action(s) as identified in this section.

C-2c(2)(a) Field Control Samples

Control samples are QC samples that are intended to monitor the performance of the sampling system. In accordance with this WAP, the following field control samples may be collected:

- Field duplicates
- Equipment rinsate
- Trip blank-sample.

C-2c(2)(b) Laboratory Quality Control

Laboratories maintain QA programs to ensure the quality of data produced. Depending on the data end use and overall data quality objectives (DQOs), the laboratory QC samples may include:

- Matrix spike
- Matrix duplicate
- Matrix spike duplicate
- Laboratory blanks
- Control standards.

Off-Site laboratories must be INL approved. This approval process requires off-Site laboratories to pass stringent audit criteria included in the DOE Environmental Management Consolidated Audit Program (EMCAP). The EMCAP maintains audit checklists for such laboratory activities as general laboratory practices, quality assurance management systems, organic/inorganic data quality, radiochemistry data quality, electronic data management, hazardous and radioactive materials management, and industrial hygiene. These checklists are available to all facilities within the DOE complex via the internet, promoting thorough and consistent evaluation of all analytical facilities. Once approved, laboratories are audited at regular intervals to ensure performance and QA/QC standards are met.

C-2c(2)(c) Data Validation

Depending on the data end use and overall project DQOs, data validation may include evaluation of the following subjects:

- Completeness of laboratory records with regard to processing of all required samples and analyses
- Implementation of appropriate procedures
- Evaluation of sample analytical data to required detection and quantity
- Evaluation of QC analytical data to applicable control criteria
- Comparison of sample holding times to the required holding times prescribed by this WAP.

All deviations from the applicable guidance are documented and corrective actions implemented as necessary.

C-2c(2)(d) Sampling Performance Assessment

A key function of a QC program is the periodic assessment of activities for conformance to required protocols. Sampling performance assessments may evaluate the following activities:

- Completeness of Field Reports - This evaluation determines that a complete record exists for each field activity and that the procedures specified by this WAP or the documents implementing this WAP were executed.
- Identification of Valid Samples - This review involves the evaluation and interpretation of field records to detect problems affecting the representativeness of samples.

All resultant concerns are documented and corrective actions implemented as necessary.

C-2c(2)(e) Corrective Action

Corrective action measures can be divided into two categories as follows:

- Project Corrective Action - Corrective actions are performed when the project objectives are not met, when conditions adverse to quality have been identified, or when an assessment of data reveals questionable or unknown data quality. Conditions adverse to quality are identified promptly, and corrected as soon as possible. When significant conditions adverse to quality are identified, the causes are determined, and corrective actions to prevent their recurrence are performed and documented.

- Laboratory Corrective Actions - The laboratory possesses a QA plan identifying analytical acceptance criteria and what actions to take when these criteria are not satisfied.

C-2c(3) Process Sampling

Process samples are collected on a routine basis prior to transfers from waste collection tanks to the PEWE, LET&D, ETS, and IWTU systems. Process samples are analyzed for specified parameters to ensure ILWMS tolerance limits are met and to promote optimum operability of the miscellaneous treatment units. In some instances it may be possible to blend wastes or introduce additives, such as complexing agents, to bring constituents within the unit tolerance limits provided in Attachment 1, Section D-8b(5) of this permit.

Table C-3 identifies where and when process sampling is conducted and identifies the parameters that may be examined for samples from each location. Process samples may also undergo analyses for total radiation or specific radionuclides. These parameters are not listed in Table C-3.

Process sampling is conducted to optimize system performance, not for RCRA characterization of wastes. Therefore chain of custody and RCRA QC procedures are not followed for process samples. In addition, duplicate samples and field blanks are not generally utilized during process sampling activities. However, laboratory QA/QC procedures will be followed at all times to ensure the performance of analytical instrumentation and the validity of sample results. If process sampling results are inconsistent with the waste characterization information provided by the generator or indicate that the waste generating process may have changed, then the waste is recharacterized.

The IWTU Mercury Adsorbers, F-SRH-141 A/B, utilize sulfur impregnated GAC beds to remove vapor phase mercury that may be present in the process gas. Calculation details for the estimated mercury breakthrough for the GAC beds are featured in Appendix D-3 of this permit.

Using the design basis capacities of the IWTU Mercury Adsorbers, which are detailed in Section D of this permit, it is estimated that each bed of GAC media will hold approximately 4,300 lbs of mercury. This value is conservatively based on a bed loading of 15 weight percent. Pilot-scale testing demonstrated mercury retention approaching 20 weight percent (see Appendix X to this permit).

Table C-3. ILWMS Typical Process Sampling Locations

LOCATION	TIME	SAMPLER TYPE	PARAMETERS	RATIONALE
NWCF Tanks VES-NCD-123, VES-NCD-129,	Prior to each transfer to the PEWE system	Double-needle	Acidity,	Indicator of a representative process sample. Inhibit formation of precipitates. Ensure compatibility.
			Specific gravity,	Indicator of a representative process sample. Promote operational efficiency.
			Aluminum,	Ensure adequate quantity to complex fluorides.
			Chlorides,	Ensure within tolerance range[a].
			Fluorides,	Ensure within tolerance range[a].
			Aluminum:Fluoride ratio,	Ensure that fluorides are adequately complexed.
			Mercury,	Determine mercury loading.
			Sulfates,	Ensure within tolerance range[a].
			Total organic carbon	Ensure compliance with Subparts AA/BB.
VES-NCC-119, VES-NCC-122	Prior to each transfer to the PEWE system unless process knowledge indicates no changes to the wastes (e.g., during ETS processing)	Double-needle	Acidity,	Indicator of a representative process sample. Inhibit formation of precipitates. Ensure compatibility.
			Flashpoint,	Ensure waste is not ignitable.
			Specific gravity,	Indicator of a representative process sample. Promote operational efficiency.
			Aluminum,	Ensure adequate quantity to complex fluorides.
			Chlorides,	Ensure within tolerance range[a].

Table C-3. ILWMS Typical Process Sampling Locations (continued)

LOCATION	TIME	SAMPLER TYPE	PARAMETERS	RATIONALE
			Fluorides, Aluminum:Fluoride ratio, Mercury, Sulfates, Total organic carbon	Ensure within tolerance range[a]. Ensure that fluorides are adequately complexed. Determine mercury loading. Ensure within tolerance range[a]. Ensure compliance with Subparts AA/BB.
Process Condensate Collection Tanks VES-WL-106, VES-WL-107, VES-WL-163	Prior to each transfer to the LET&D unless process knowledge or prior analytical results indicate that the waste is unacceptable for the LET&D	Nozzle	Acidity, Aluminum, Fluoride, Total organic carbon	Indicator of a representative process sample. Inhibit formation of precipitates. Ensure compatibility. Ensure adequate quantity to complex fluorides. Ensure within tolerance range[a]. Ensure compliance with Subparts AA/BB.

Table C-3. ILWMS Typical Process Sampling Locations (continued)

LOCATION	TIME	SAMPLER TYPE	PARAMETERS	RATIONALE
LET&D Bottoms Tank VES-WLL-195	Infrequently, to validate nitric acid concentration	Nozzle	Acidity,	Validate concentration of nitric acid.
			Chlorides,	Determine chloride carryover.
			Fluorides,	Determine fluoride carryover.
			Nitrates	Validate concentration of nitric acid.
Blend and Hold Tanks VES-NCC-101, VES-NCC-102, VES-NCC-103	Prior to each new TFF batch transfer to the ETS	Double-needle	Acidity,	Indicator of a representative process sample. Inhibit formation of precipitates. Ensure compatibility.
			Specific gravity,	Indicator of a representative process sample. Promote operational efficiency.
			Aluminum,	Ensure adequate quantity to complex fluorides.
			Chlorides,	Ensure within tolerance range[a].
			Fluorides,	Ensure within tolerance range[a].
			Aluminum:Fluoride ratio,	Ensure that fluorides are adequately complexed.
			Mercury,	Determine mercury loading.
			Sulfates,	Ensure within tolerance range[a].
			Flashpoint,	Ensure waste is not ignitable.

Table C-3. ILWMS Typical Process Sampling Locations (continued)

LOCATION	TIME	SAMPLER TYPE	PARAMETERS	RATIONALE
VES-NCC-102, VES-NCC-103	Characterization of the TFF tanks is complete. When characterized tanks are blended the ratios for the feed will be used to mathematically determine the process parameter concentrations.	Double-needle	Acidity Specific gravity Chlorides Fluorides Mercury	Indicator of a representative process sample. Inhibit formation of precipitates. Ensure compatibility. Indicator of a representative process sample. Promote operational efficiency. Ensure within tolerance range[a] Ensure within tolerance range[a] Determine mercury loading
F-SRH-141A/B	Monthly[b]	Offgas sampler	Mercury	Determine whether Mercury Adsorber primary and/or secondary bed material should be replaced

a. ILWMS tolerance limits are provided in Section D-8b(5).

b. Inspections will be increased to weekly upon reaching 85% estimated loading of the primary bed (approximately 30 days prior to forecasted breakthrough)

Mercury sample nozzles are provided across each of the carbon beds and also across both combined beds. Mercury detection will be performed by obtaining samples and having the samples analyzed at a laboratory facility on a frequency of once per month. Upon reaching 85% estimated bed loading of the primary bed, based on the bed capacity of approximately 4,300 lbs of mercury, the sampling frequency will be increased to once per week to ensure that breakthrough of the primary bed is detected in a timely fashion. Since the Mercury Adsorbers are configured in series, any mercury that passes through the primary bed upon breakthrough is captured in the secondary bed. It is estimated that a bed will reach 85% loading approximately 30 days prior to breakthrough. With this sampling routine, an excellent history/trend of performance and removal efficiency can be reliably collected and maintained that will provide assurance of continuous efficient mercury removal.

When breakthrough of the primary GAC bed commences, mercury will be detected in the samples taken between the beds. When the mercury concentration in the offgas between the beds exceeds 50,000 µg/dscm, waste feed to the IWTU will be halted, and changeout of the spent GAC media will be initiated.

Monthly sampling of the offgas after the secondary GAC bed will be initiated when the tabulated mercury loading reaches 30% based on feed rates, waste feed composition, and a holding capacity of approximately 4,300 lbs mercury. When the mercury concentration in the offgas approaches 8.0 µg/dscm waste feed to the IWTU will be halted and changeout of the spent GAC media will be initiated.

The spent GAC media will be properly managed, stored, and disposed of in accordance with the hazardous and mixed waste requirements of Section C of this permit.

C-2d Frequency of Analyses: [IDAPA 58.01.05.008; 40 CFR § 264.13(b)(4)]

Waste stream characterizations are reviewed and recertified annually to ensure continued accuracy of the information provided. Typical waste streams managed by the ILWMS are generated several times a year from highly controlled processes in which the waste composition remains consistent for the duration of the year. Recharacterization is required when:

- The process generating an established waste stream changes
- The waste characteristics are highly variable from batch to batch

- There is reason to suspect a change in the waste based on inconsistencies in the packaging or labeling of the wastes, or there are inconsistencies between the waste verification results and the waste characterization data provided by the generator

- Facility personnel reject the waste because it is inconsistent with the profile for that waste.

Facility personnel can require additional waste analysis to substantiate waste characterization data prior to acceptance of a waste**.**

C-2f Additional Requirements for Ignitable, Reactive, or Incompatible Wastes: [IDAPA 58.01.05.008; 40 CFR §§ 264.13(b)(6), 40 CFR 264.17]

Each waste stream proposed for treatment or storage in the units addressed in this permit is evaluated for all applicable RCRA characteristics by WGS personnel as part of the waste characterization process. Small quantities of low TOC ignitables (EPA HWN D001) may enter the ILWMS. Sampling and analysis has demonstrated that when these small quantities of ignitable waste are aggregated with other wastes to facilitate treatment, the characteristic of ignitability is lost. However, the HWN D001 is tracked through the ILWMS to account for these ignitable materials and any underlying hazardous constituents (UHCs) to ensure proper cradle-to-grave management of mixed and hazardous wastes.

Incompatibility determinations are based on the characterization data developed by WGS during initial characterization activities. The storage and miscellaneous treatment units operate in accordance with defined procedures that demonstrate how these data are used to prevent incompatible wastes, including reactives, from contacting one-another. The tables in Appendix V of 40 CFR 264/265 and 49 CFR § 177.848 are examples of resources that may be used to determine compatibility. In addition, the quantity and concentration of wastes or chemicals to be commingled are considered for compatibility determinations.

In order to protect equipment and promote effective treatment, chemical additives may be introduced into the ILWMS. Chemicals added include:

- Nitric acid – recovered from the LET&D facility or purchased as a commercial product to inhibit the formation of precipitates and to ensure passive layer formation on stainless-steel vessels and piping

- Aluminum nitrate – purchased as commercial product to complex fluorides, reducing corrosion to the system

- Sodium hydroxide (rust remover) – purchased as a commercial product for descaling equipment.

Other chemical commercial products, including oxalic acid and potassium permanganate, may be used during decontamination activities. These chemicals are not added to promote treatment of wastes and are therefore not considered tank treatment (T01).

The chemical additives described above are typically added to tank systems through decontamination headers/lines or through preventative maintenance areas. Mixing occurs via air sparge, mechanical mixers, or recirculation. Chemical addition is controlled through standard operating procedures, which specify the quantity/concentration of each chemical to be added and require review and approval by a system engineer. These controls maintain compatibility and provide adequate protection of equipment.

The WTS evaluates for the characteristic of reactivity during the waste characterization process. If, based on the information provided by the source generating the waste, the waste is a new, unused chemical product that is either a P- or U-listed waste for which reactivity is the basis for listing, the waste is considered a reactive waste. If the waste is a mixture that contains P- or U-listed constituents for which reactivity is the basis for listing, the waste is evaluated to determine if the waste matrix will be a reactive waste. Consideration must be given to concentration, purity, and processes in which the chemicals have been previously employed, the matrix in which they may be combined, specific characteristics of the chemicals (i.e., volatility, mobility, reaction to water and/or other solvents, viscosity, density, pH, etc.), cumulative chemical effects, and the time the chemical constituents have been in contact with each other. The ILWMS will not manage wastes that exhibit the characteristic of reactivity, EPA HWN D003.

The safety analysis documentation for the ILWMS indicates that, under the proper conditions, two potentially explosive reactions could occur. These reactions are tributyl phosphate (TBP) with nitric acid and hexone with nitric acid.

Conditions necessary for a TBP/nitric acid reaction include appropriate TBP concentration and elevated temperature (studies have shown that this reaction does not become extremely exothermic until the solution reaches 186° C).

In order for a hexone/nitric acid reaction to occur, similar conditions must exist. A reaction can only be sustained if an adequate concentration of hexone is present and necessary temperature requirements are met.

Provided as Appendix C-2 to this section of the permit is a report entitled, "Organic Compounds in INTEC Tank Farm Waste," ICP/EXT-05-00962, September 2005. This report summarizes historical analytical results from samples of INTEC TFF wastes. Tables 5, 6, and 8 of this report show analytical results for wastes currently stored in tanks VES-WM-189 and VES-WM-188. The waste contained in VES-WM-187 is derived from similar processes and has been processed and mixed in the ILWMS in the same way as the other tanks. These results show that TFF liquids contain less than or equal to 44 parts per billion of TBP and less than or equal to 10 parts per billion of hexone. Furthermore, TBP and hexone are no longer used at INTEC. Therefore, additional volumes of these compounds will not be introduced into ILWMS feed streams. The low reactant concentrations in the waste that would be available for potentially explosive TBP/nitric acid and hexone/nitric acid reactions mitigate any risk to ILWMS operations.

C-3 WASTE ANALYSIS REQUIREMENTS PERTAINING TO LAND DISPOSAL RESTRICTIONS [IDAPA 58.01.05.011; 40 CFR § 268]

The Hazardous and Solid Waste Amendments to RCRA authorize the land disposal of certain types of wastes only if LDR treatment standards are met. Information provided in this section describes the additional characterization requirements for assessing LDR applicability and compliance with the treatment standards before land disposal.

C-3a Waste Characterization

The ILWMS is a highly acidic waste treatment system. The system is designed and operated as part of an overall liquid waste treatment train. Maintaining an acidic condition is necessary in order to keep metals and radioactive isotopes in solution and prevent chloride- and fluoride-induced corrosion. The waste undergoing treatment is a known restricted waste due to corrosivity, toxicity characteristics for metals, and previous receipt of listed waste into the system.

LDR applicability is determined for each waste at the point of generation based on the EPA HWNs assigned to individual waste streams. Before receipt into the ILWMS, wastes undergo initial characterization for EPA HWN applicability and LDR requirements. Once LDRs are identified, they remain applicable through treatment and/or disposal of the final waste form produced by the IWTU. Final assessment and compliance with LDR treatment standards will take place before land disposal by evaluating the final waste form. This assessment will take place on-Site and appropriate LDR notifications will be completed as described in Attachment 2, Section C-2a(2) of this permit. Applicable LDR documentation will be provided to the disposal facility in accordance with IDAPA 58.01.05.011 (40 CFR § 268.7).

The characterization process for purposes of LDR is the same as that employed during the initial characterization process noted in past sections. Facility personnel, with the assistance of WGS, and other organizations as needed, conduct hazardous waste determinations before management of the waste. The hazardous waste determination includes, where applicable, characteristic and listed EPA HWN determinations in addition to identification of wastewater and non-wastewater treatability groups, UHCs, LDR subcategories, and LDR treatment standards applicable to the waste.

During the initial characterization process, facility personnel select parameters and rationale for testing based on the rationale presented in Table C-2 and on the applicable LDR requirements found within IDAPA 58.01.05.011 and 40 CFR § 268 or process knowledge. If the waste is determined to be subject to the LDR requirements, facility personnel determine if the waste is a wastewater or non-wastewater and also determine applicable subcategories. Total organic carbon (TOC) and total suspended solids (TSS) analyses may be used to conduct wastewater/non-wastewater determinations, in cases where process knowledge is not adequate. Additional information on the characterization process is found in Sections C-1 and C-2.

Waste generated at the ILWMS from activities such as maintenance and spill cleanup will undergo a hazardous waste determination based on testing and/or process knowledge as outlined within this document before it is returned to the ILWMS or managed elsewhere. If the waste is determined to be subject to LDR requirements, facility personnel will determine if the waste is a wastewater or non-wastewater and applicable subcategories using the parameters shown in Table C-2 or process knowledge.

C-3b Sampling and Analytical Procedures

Sampling and analysis will follow the same approach as outlined within Sections C-2 through C-2c. Test methods used to assess LDR treatment standards will be based on total analysis unless otherwise specified in IDAPA 58.01.05.011 (40 CFR §§ 268.40 through 268.48).

C-3c Frequency of Analysis

Compliance with applicable LDR requirements will be demonstrated and documented prior to disposal of the final waste form. All LDR compliance documentation will be maintained in the facility operating record.

C-3d Additional requirements for treatment facilities

C-3d(2) Analysis of treatment residues

Treatment residues produced by the units described in this permit include: 1) PEWE overhead condensate that is subsequently processed in the LET&D facility; 2) PEWE bottoms that are returned to the TFF; 3) LET&D bottoms that are primarily comprised of recovered nitric acid and used elsewhere at the INTEC in lieu of purchasing commercial-grade nitric acid, 4) ETS overhead condensate that is subsequently processed in the PEWE, 5) ETS bottoms that are returned to the TFF, and 6) IWTU treatment product collected in IWTU reformers and filtration devices. Analyses of many of these treatment residuals for the purposes of RCRA characterization are conducted infrequently because the PEWE, LET&D, and ETS are part of an overall treatment train. The PEWE was constructed of materials compatible with ETS overheads. Since the PEWE is the next step in the overall treatment process, characterization of ETS overhead condensate is not routinely performed. Similarly, the LET&D facility was specifically designed and constructed of materials to process PEWE overhead condensate. Since the LET&D is the next step in the treatment train, characterization of PEWE overhead condensate is not routinely performed. However, process sampling of treatment residuals is normally conducted to ensure optimum operation of the overall treatment process.

Complete RCRA characterization of IWTU treatment product and ILWMS secondary wastes is completed as required by the ultimate disposal facility and is performed as described in C-2a(2) of this permit. Treatment residuals produced from this process will be analyzed for all applicable LDR treatment standards. Compliance with appropriate LDR requirements will be documented prior to land disposal. LDR documentation will be maintained in the facility operating record.

C-3d(3) Sampling and analytical procedures

Sampling and analysis will follow the same approach as outlined within Sections C-2 through C-2c. Test methods used to assess LDR treatment standards will be based on total analysis unless otherwise specified in IDAPA 58.01.05.011 (40 CFR §§ 268.40 through 268.48).

C-3d(4) Frequency of analysis

Compliance with applicable LDR requirements will be demonstrated and documented prior to disposal of the final waste form. All LDR compliance documentation will be maintained in the facility operating record.

C-4 SUBPART AA, SUBPART BB AND SUBPART CC APPLICABILITY [IDAPA 58.01.05.008; 40 CFR §§ 264.1030, 264.1050, AND 264.1080]

40 CFR 264 Subpart AA Applicability

40 CFR 264 Subpart AA requires owners or operators of facilities with process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations managing hazardous wastes with organic concentrations of at least 10 ppmw to either: 1) reduce total organic emissions from all affected process vents at the facility below 1.4 kg/hr (3 lb/hr) and 2.8 Mg/yr (3.1 tons/yr); or 2) reduce, by use of a control device, total organic emissions from all affected process vents at the facility by 95 weight percent. A process vent is defined in 40 CFR 264.1031 as any open-ended pipe or stack that is vented to the atmosphere either directly, through a vacuum-producing system, or through a tank associated with hazardous waste distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations.

The IWTU does not involve distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations. As such, the IWTU stack does not meet the definition of a process vent in IDAPA 58.01.05.008 (40 CFR § 264.1031) and the requirements specified in 40 CFR 264 Subpart AA do not apply.

The PEWE and ETS offgas is processed through vessel offgas systems in Buildings CPP-604 and CPP-659 respectively and then sent to the APS in Building 649, prior to discharge to the main stack. Therefore, the PEWE and ETS vents do not meet the definition of a process vent and IDAPA 58.01.05.008 [40 CFR § 264.1031] does not apply.

Wastes in the process condensate collection tanks (VES-WL-106, -107, and -163) are sampled for TOC before being transferred to the LET&D facility. Historical sample results of the LET&D feed have been in the range of 30 to 200 ppm for TOC. Therefore 40 CFR Subpart AA is applicable to the LET&D facility.

The LET&D facility offgas system TOC emissions are controlled per the following calculations and methodology:

3 lbs/hr (454 g/lb) = 1362 g/hr = 1,362,000 mg/hr;

maximum feed rate = 550 gal/hour;

(550 gal/hr) (3.785 liters/gal) = 2,079 L/hr

(1,362,000 mg/hr) / (2,079 L/hr) = 655.1 milligrams/L = 655.1 ppm

To account for any potential sampling problems or analysis deviation, the LET&D feed limit has been set at 550 ppm. The maximum feed rate is 550 gallons per hour, and the minimum feed rate is design-limited to 275 gallons per hour, which would allow up to 800 ppm organics in the feed, assuming that all the organics are carried out in the offgas.

If sample analyses for TOC were greater than 800 ppm, the solution would not be fed to the LET&D and would be blended with other feed streams and recycled back to the PEWE system for reprocessing. The maximum TOC sample analysis of 800 ppm limits the feed rate of the LET&D to 275 gallons per hour. A TOC sample analysis of 550 ppm allows the LET&D to operate at 550 gallons per hour. The feed rate is adjusted linearly between 550 ppm and 800 ppm. If the feed rate is adjusted to less than the LET&D minimum feed rate of 275 gal/hr, based upon the TOC content of the feed, the system recycles the solution back to the PEWE system.

The feed rate in the LET&D is maintained to ensure TOC emissions are less than 3 lb/hr to ensure compliance with this regulation.

40 CFR 264 Subpart BB Applicability

IDAPA 58.01.05.008 (40 CFR 264 Subpart BB) applies to equipment that contains or contacts hazardous wastes with organic concentrations of at least 10% by weight. Sampling of the PEWE, ETS, and IWTU inputs have shown the maximum TOC contained in the waste to be less than 800 ppm.

Since the TOC is less than 10 percent by weight, the requirements of 40 CFR 264 Subpart BB do not apply.

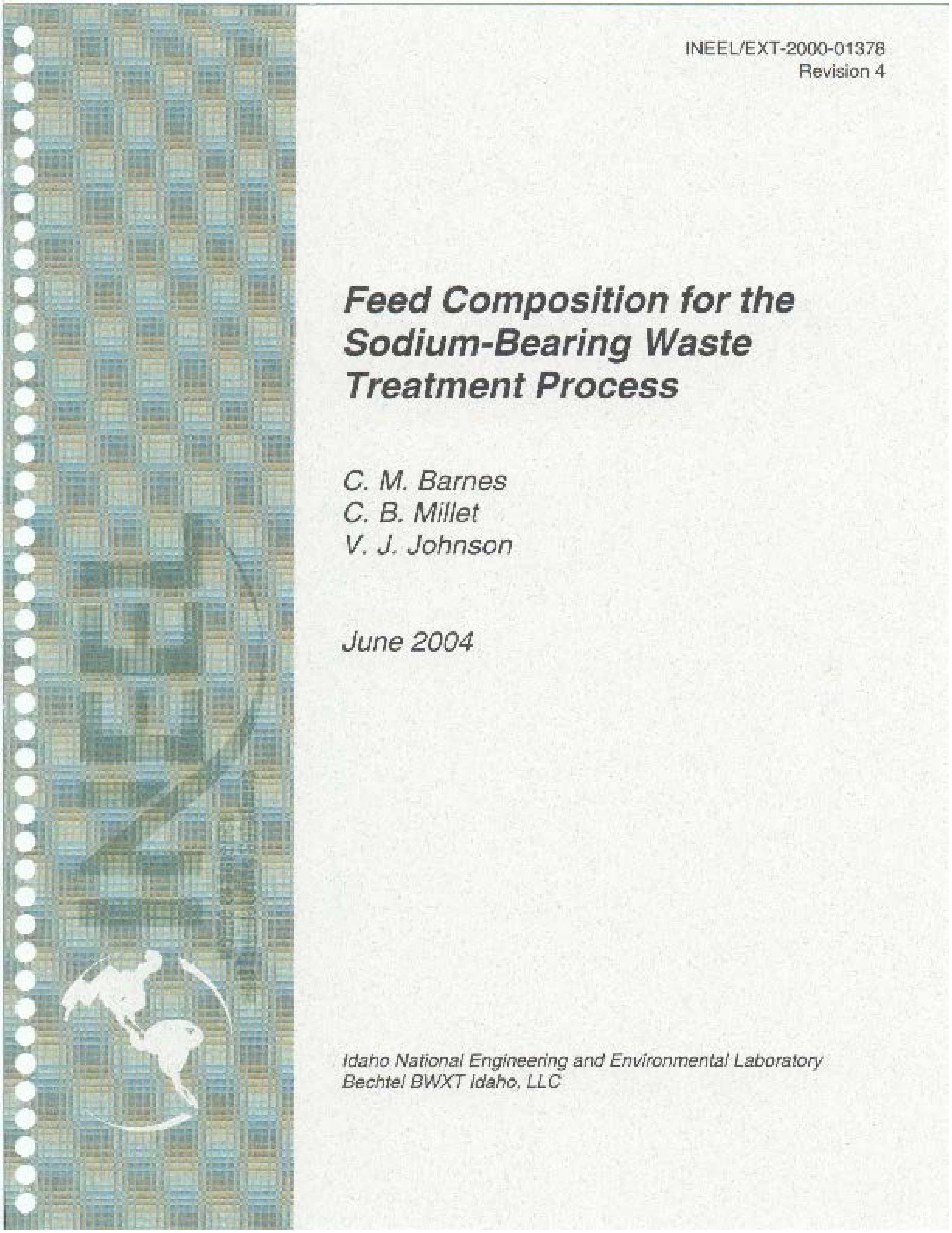
40 CFR 264 Subpart CC Applicability

40 CFR 264.1080(b)(6) exempts from applicability a waste management unit that is used solely for the management of radioactive mixed waste in accordance with all applicable regulations under the authority of the Atomic Energy Act and the Nuclear Waste Policy Act.

Process liquids associated with the ILWMS are radioactive mixed waste and are exempt from regulation under Subpart CC.

APPENDIX C-1

Feed Composition for the SBW Waste Treatment Process



INEEL/EXT-2000-01378
Revision 4

Feed Composition for the Sodium-Bearing Waste Treatment Process

C. M. Barnes
C. B. Millet
V. J. Johnson

June 2004

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

Double click on the icon to display the document

INEEL/EXT-2000-01378
Revision 4

Feed Composition for the Sodium-Bearing Waste Treatment Process

C. M. Barnes
C. B. Millet
V. J. Johnson

June 2004

Idaho National Engineering and Environmental Laboratory
Bechtel BWXT Idaho, LLC

INEEL/EXT-2000-01378
Revision 4

Feed Composition for the Sodium-Bearing Waste Treatment Process

C. M. Barnes
C. B. Millet
V. J. Johnson

June 2004

Idaho National Engineering and Environmental Laboratory
High-Level Waste Program Division
Idaho Falls, Idaho 83415

Prepared for the
U.S. Department of Energy
Under DOE Idaho Operations Office
Contract DE-AC07-99ID13727

ABSTRACT

A settlement agreement between the State of Idaho and the United States Department of Energy mandates that all sodium-bearing waste at the Idaho Nuclear Technology and Engineering Center, within the Idaho National Engineering and Environmental Laboratory, be treated by December 31, 2012. Detailed feed compositions are needed to design a facility to treat this waste. This report presents the expected volumes and compositions of these feed streams and the sources and assumptions used in determining them.

SUMMARY

A sodium-bearing waste (SBW) treatment facility will treat liquids and solids contained in existing tanks at the Idaho Nuclear Technology and Engineering Center (INTEC). The treatment facility will also treat additional liquid waste, called newly generated liquid waste (NGLW) that will be generated after 2005 and stored in separate tanks from the SBW.

This report presents the most recent compilation of volumes and compositions of the feed streams to the treatment processes. This report also identifies the assumptions and source documents used in calculating the treatment process feed compositions and the uncertainties in these compositions. Feeds to the treatment process will include SBW from Tanks WM-187, WM-188, and WM-189, and NGLW from Tanks WM-100, WM-101, and WM-102.

Tank WM-189 presently contains waste near its administrative capacity and no additions to this tank are expected. As of June 1, 2004, Tank WM-188 contained about 259,000 gallons of waste. Approximately 26,000 gallons of additional waste will be added to Tank WM-188 by the end of FY 2005. The composition presented in this report for waste in Tank WM-189 is based on sample analyses. The projected composition of waste in Tank WM-188 (when full) is based on analyses of a sample taken when the tank was approximately 75% full, analyses of wastes added to the tank since that time and estimated compositions of wastes that will be added to the tank.

Tank WM-187 presently contains heels that have been flushed from six other Tank Farm Facility (TFF) tanks. The dilute liquid waste in the tank is presently being evaporated to make room for concentrated waste from Tank WM-180. Transfers in and out of Tank WM-187 are expected to be complete by the end of FY 2005. A projected composition of the final waste in WM-187 is contained in this report, and is based on compositions of the different wastes that make up the final tank contents. Because of the tank heels collected in Tank WM-187, this tank has the highest undissolved solids content of any of the tanks.

Based on projections of the volumes of NGLW streams generated between now and the end of 2012, a composition of the total NGLW as of 2012 has been calculated and is presented in this report. For some NGLW streams, chemical composition data are available and have been used in generating the treatment facility feed composition. However, data for radionuclide concentrations in NGLW are extremely limited. Thus, radionuclide concentrations in NGLW are based on data for SBW. Starting in FY 2006, NGLW will be collected in tanks WM-100, WM-101, and WM-102.

Supplemental feed characterization data presented in this report includes liquid and solids properties, analysis data for past tank solids samples, estimates of uncertainties in tank compositions, and concentrations of organic species in SBW.

Analyses have been performed on 11 samples of tank solids from eight TFF tanks. These analyses provide data of both the chemical and physical properties of the solids. Tank solids have been found to be largely amorphous and contain high concentrations of Si, P, Zr, O, and Al. Equipment limitations have prevented obtaining a well-mixed sample of solids in Tank WM-187. Analysis data of solids from Tank WM-187 reflects this fact and suggests that compositional changes may occur during transfer of solids from one tank to another.

CONTENTS

FIGURES

TABLES

ACRONYMS

CMACT	Calcination with MACT upgrade SBW treatment alternative
DEA	diethanolamine
EDF	engineering design file
ETS	Evaporator Tank System (formerly the High-Level Liquid Waste Evaporator)
ICPP	Idaho Chemical Processing Plant
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDUA	light-duty utility arm
LET&D	Liquid Effluent Treatment and Disposal (facility)
MACT	maximum achievable control technology
NGLW	newly generated liquid waste
NWCF	New Waste Calcining Facility
PEW	process equipment waste
PEWE	Process Equipment Waste Evaporator
PSD	particle size distribution
RCRA	Resource Conservation and Recovery Act
SBW	sodium-bearing waste
SG	specific gravity
SVOCs	semi-volatile organic compounds
TEA	triethanolamine
TFF	Tank Farm Facility
TIC	total inorganic carbon
TOC	total organic carbon
TRU	transuranic
UDS	undissolved solids
VOCs	volatile organic compounds
WCF	Waste Calcining Facility
WIR	Waste Incidental to Reprocessing

GLOSSARY

Alternative: A holistic solution for sodium-bearing waste (SBW) treatment, including the process/technologies used, and in the larger context, the program/project and its cost, schedule, and regulatory and stakeholder environment.

Calcine/MACT or "CMACT": An SBW treatment alternative that includes upgrades to the calciner in the NWCF, a new Maximum Achievable Control Technology (MACT) compliance facility, a scrub treatment process, and possibly a new calcine packaging facility.

CsIX or Cesium Ion Exchange/TRU Grout: An SBW treatment alternative that includes filtration of solids, cesium removal by ion exchange and one of several possible methods for stabilization of the cesium-free contact-handled transuranic (TRU) waste, namely, grouting, absorption on silica gel or absorption on another sorbent. The baseline process is grouting and the name would change if another stabilization method were chosen.

Direct Evaporation: An SBW treatment alternative involving concentration of SBW by evaporation to the extent that it solidifies upon cooling into a disposable waste.

Heels: The initial residual volume left in the Tank Farm tanks consisting of concentrated SBW liquid and tank solids after removal of the liquid waste by existing steam jets.

Newly Generated Liquid Waste: Liquid waste from a variety of sources that in the past has been evaporated and added to the liquid waste in the below-grade tanks at INTEC. Sources include leachates from treating contaminated high efficiency particulate air filters, decontamination liquids from INTEC operations that may or may not be associated with INTEC waste management activities, and liquid wastes from other INEEL facilities. INTEC has historically used this term to refer to liquid waste streams (past and future) that were not part of spent fuel reprocessing. NGLW will be stored along with SBW in the TFF tanks until September 2005 whereupon present plans call for its segregated storage. Since it is mixed with the existing SBW in the TFF tanks it does not formally exist as a separate entity and will not until segregation starts in 2005.

Sludge: The mixture of tank solids and interstitial liquid.

Sodium-bearing waste: The term is non-specific and can range in meaning from SBW liquid minus tank solids to all Tank Farm tank contents (SBW liquid and all tank solids). SBW is mixed hazardous, radioactive waste generated as a by-product of spent nuclear fuel reprocessing. It consists in minor part of second and third cycle extraction wastes but is mostly made up of decontamination solutions used over the years in support of operations. It is relatively high in sodium and potassium content from the solutions used for decontamination. Hence the name, SBW, and its separate tracking and management at INTEC. SBW is high in transuranics (TRU) and is best characterized as mixed transuranic waste.

Steam Reforming: An SBW treatment alternative involving heating SBW with additives and steam to form a solid particulate waste.

Tank solids: Any and all solids contained in the Tank Farm tanks.

Tank solids, settled: Heavier tank solids that lay at the bottom of the tanks.

Tank solids, entrained: Tank solids, both suspended and settled, that are sucked up by the steam jets and transported with the liquid SBW to further treatment.

Feed Composition for the Sodium-Bearing Waste Treatment Process

1. INTRODUCTION

Radioactive liquid waste has been generated over the last five decades at the Idaho Nuclear Technology and Engineering Center (INTEC), formerly called the Idaho Chemical Processing Plant, as a result of nuclear fuel reprocessing activities. From December 1963 until June 2000, the Waste Calcining Facility (WCF) and the New Waste Calcining Facility (NWCF) processed the liquid waste into a granular, solid form. As of June 1, 2004, approximately 960,000 gallons of waste remained in Tank Farm tanks at INTEC.[a] Waste in the Tank Farm is referred to as sodium-bearing waste (SBW). Additional liquid waste, called newly generated liquid waste (NGLW), is being generated and will be generated in the future as a result of filter leach operations, equipment and building decontamination activities, Resource Conservation and Recovery Act (RCRA) closure activities, and other operations at INTEC.

Five processes have been developed and evaluated for treating these wastes (Barnes 2004).

- Cesium ion exchange (CsIX) followed by immobilization of the ion exchange effluent
- Calcination using the NWCF with an upgraded off-gas treatment system to comply with Maximum Achievable Control Technology (MACT) standards
- Steam reforming
- Direct evaporation
- Vitrification.

Feasibility studies have been performed on each of these treatment alternatives. To perform conceptual and detailed designs, feed compositions, volumes, and properties are needed. This report presents a compilation of SBW and NGLW feed characterization data.

Based on present Tank Farm management plans, the feed to any SBW/NGLW treatment process is expected to be stored in six tanks. SBW will be stored in three Tank Farm tanks – WM-187, WM-188, and WM-189. These tanks each have a capacity of 300,000 gallons. NGLW will be stored in three 18,400-gal tanks – WM-100, WM-101, and WM-102. Solids contained in heels from other Tank Farm tanks have been flushed to tank WM-187. Thus, Tank WM-187 contains a relatively high proportion (~7 wt %) of solids. Waste in WM-188 and WM-189 have a lower proportion (<1 wt %) of solids.

1.1 Source Characterization Data and Documents

Over the years, numerous compilations of Tank Farm waste compositions have been prepared for different purposes. Documents that contain information relevant to present or future tank compositions are briefly described below.

[a] This volume excludes about 35,000 gallons of flush water remaining in Tanks WM-181, -182, -183, -184, -185 and -186.

1.1.1 Historical and Present Tank Farm Liquid Composition

Engineering Design File (EDF) 1598 contains a brief review of previous documents containing Tank Farm composition data, a compilation of Tank Farm liquid composition analytical data up through January 2000, estimates of Tank Farm solids volume, and an estimate of NGLW composition.

1. M. D. Staiger, C. B. Millet, R. A. Nickelson, R. A. Wood, A. Chambers, 2001, "Tank Farm Facility, Tank and Waste Data*," Engineering Design File EDF-1598*, February 27, 2001.

EDF-1598 compiles analytical results of samples taken from each of the Tank Farm tanks consistent with the liquid waste present in the tanks as of late 2000. In addition, a waste composition for each tank is presented based on averages of analytical results, for those species for which data are available, and estimates for other chemical and radionuclide species. Estimates were based on calculations by Doug Wenzel using ORIGEN2 assuming concentrations in SBW are proportional to all the fuel processes at INTEC over the life of the plant. The results of these calculations for a theoretical average SBW were used to estimate individual species and tank concentrations by assuming that the ratio of the individual species to ^{137}Cs in the waste is proportional to the ratio of the individual species to ^{137}Cs in the "Average SBW". Wenzel's calculations are documented in the following reports:

2. D. R. Wenzel, 1997, "Evaluation of Radionuclide Inventory for Sodium-Bearing Waste," *Engineering Design File EDF-FDO-006/CPP-97080*, November 26, 1997.
3. D. R. Wenzel, 1999, "Calculation of July 1999 Radionuclide Inventory for Sodium-Bearing Waste," *INEEL Interoffice Correspondence*, Wen-20-99, May 18, 1999.
4. D. R. Wenzel, 2000, "Calculation of July 1999 Inventories for INTEC Wastes," *INEEL Interoffice Memorandum*, Wen-27-99, originally issued November 7, 1999 and reissued with corrections August 2000.
5. D. R. Wenzel, 2002, "Relative Inventories of Reactor-Produced Species in INTEC Waste Types," *Engineering Design File EDF-CRPD-001*, November 4, 2002.

Clark Millet maintains a spreadsheet known as the "Tank Farm Composition Database" that includes sample analyses data as well as summary concentrations for each Tank Farm tank. The tables contained in EDF-1598 (Staiger 2001) of both analyses data and summary averages and estimates reflect the Tank Farm Composition Database spreadsheet that was current at the time EDF-1598 was being prepared. A later documentation of summary tank compositions is given in:

6. C. B. Millet, 2003, "Composition of Tank Farm Waste as of October 2002," *INEEL Interoffice Memorandum* Mil-07-02, December 12, 2002 (reissued with one correction September 24, 2003).

Updates to the Tank Farm Composition Database continued after publication of EDF-1598 as described in:

7. D. R. Tyson, 2002, "Validation of the Radionuclide Mass Balance Used in the INTEC SBW WIR Determination Report," *Engineering Design File EDF-1920*, Revision 4, August 29, 2002.
8. M. C. Swenson, 2003, "Validation of the Radionuclide Inventory and Mass Balance Used in the INTEC SBW and Tank Farm Residuals WIR Determination Reports," *Engineering Design File EDF-1920 INEEL/EXT-2001-534*, Revision 5, October 24, 2003.

For the Tank Farm, EDF-1920 reports only radionuclide inventories, and although updated as of late 2003, reports the waste radionuclide inventories as of July 1, 1999.

In early FY 2003 the Tank Farm Composition Database was again updated to:

- Incorporate analysis data from samples taken from Tank WM-180 in 2000
- Incorporate analysis data from samples taken from Tank WM-189 in 2002
- Update the waste volumes and radionuclide decay basis from July 1, 1999 to January 1, 2003
- Adjust the waste compositions in WM-182 and WM-183 due to water flushes of these tanks
- Adjust the WM-185 waste composition due to additions of water and waste from WM-183 transferred in 2000 and 2001
- Adjust the waste composition of WM-187 due to additions of waste to the tank in 2002
- Incorporate additional updates by Doug Wenzel of ORIGEN2 calculations of SBW radionuclide inventories.

The Tank Farm Composition Database serves as the common source and control point for all estimates of present Tank Farm liquid waste composition. The composition will be updated again when all the waste is contained in the three Tanks WM-187, -188, and -189 and the other tanks have been rinsed.

Jerry Christian evaluated data from samples taken in 2000 of Tank WM-180 waste and recommended a surrogate composition for waste from this tank. A comparison of the Tank WM-180 liquid composition based on 2000 sample analyses with analyses of samples taken in 1993 is given in Table 34 (see Section 3.3). Christian's report also contains compositional data for the solids in WM-180, both analytical data and results of thermodynamic modeling, and a recommended composition for simulating WM-180 waste.

9. J. D. Christian, 2001, *Composition and Simulation of Tank WM-180 Sodium-Bearing Waste at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-2001-00600, May 2001.

The SBW in Tank WM-180 will be concentrated by evaporation in late 2004, and the concentrate sent to Tank WM-187. The analysis reported by Christian was used to simulate the evaporation of this waste and calculate the expected future composition of Tank WM-187. The simulation was performed using Aspen Plus, with ASPEN property models tuned to data from historical evaporation of INTEC wastes.

10. J. A. Nenni, 2004, "ETS Process Parameter and Outlet Stream Predictions for WM-180 Feed," *INEEL Interoffice Memeorandum to J. P. Law,* JAN-04-04, February 16, 2004.

Tom Batcheller and Dean Taylor evaluated liquid and solids analytical data from FY 2002 WM-189 samples and present their results in the document below. In addition to a recommended composition for Tank WM-189 waste, Batcheller and Taylor present uncertainties associated with each component concentration. No additional waste has been or will be added to Tank WM-189; hence the composition for this tank at the time of treatment will be the same as the analyses reported by Batcheller and Taylor.

11. T. A. Batcheller, D. D. Taylor, 2003, *Characterization of Tank WM-189 Sodium-Bearing Waste at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-02-01171 Rev. 1, July 2003.

Samples from Tank WM-188 were taken in late November 2002 and analyzed in 2003. The reference below contains the results of the analyses for both liquids and solids from the tank. In contrast to the procedure used for Tank WM-189 solids, the solids from WM-188 were washed with water prior to analysis. Tank WM-188 was approximately 75% full when sampled, and additional waste has been and will continue to be added to WM-188 through FY 2005

12. V. J. Johnson, R. L. Demmer, T. A. Batcheller, 2003a, Characterization of Tank WM-188 Sodium-Bearing Waste at the Idaho Nuclear Technology and Engineering Center, INEEL/EXT-03-00478, June 2003.

1.1.2 Tank Solids Compositions

Samples of undissolved solids have been taken from Tank Farm tanks on eleven occasions. Christian (2001), Batcheller (2003) and Johnson (2003a) report analyses of solids from Tanks WM-180, WM-189 and WM-188 respectively. Waste from each of these tanks was transferred by steam jet to a tank in the NWCF blend and hold cell, where it was sampled. Solids contained in the samples were thus solids entrained with the liquid waste during jet transfer.

Samples of the heel in Tanks WM-182, WM-183, and WM-188 were taken directly using the Light Duty Utility Arm (LDUA) sample end effector. Results of the analyses of these samples are contained in the following reports:

13. M. Patterson, 1999, *Light Duty Utility Arm Deployment in Tank WM-188*, INEEL/EXT-99-01302, December 1999.
14. *Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for Idaho Nuclear Technology and Engineering Center Tanks WM-182 and WM-183*, DOE/IC-10802, (2001) Appendix B, "Data Summary for Tanks WM-182 and WM-183," DOE/ID-10802, November 2001.
15. A. Poloski, 2000a, "Solids Characterization," *Engineering Design File EDF-TST-001*, September 20, 2000.

The above two references contain chemical and physical property data for solids that were present in the heels of Tanks WM-182 and WM-183 when sampled in 2000. Solids from these two tanks have since been flushed to Tank WM-187.

Revision 4 of EDF-1920 (Tyson 2002) includes a summary of the inventory of radionuclides in each tank, and makes a significant correction to the ^{137}Cs concentration of WM-182 solids reported by Poloski. The radionuclide inventories shown by Tyson for tanks other than WM-182, WM-183, and WM-188 are estimates.

Johnson and Demmer report the results of analyses of a sample taken from Tank WM-181 in 2003. Solids in WM-181 were flushed to Tank WM-187 in mid-2004.

16. V. J. Johnson, R. L. Demmer, 2003b, *Characterization of Tank WM-181 Sodium-Bearing Waste Solids at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-03-00979, September 2003.

Mike Swenson compiled some older analyses of tank solids, includes a description of sources of solids that went into the Tank Farm tanks and also includes some data that show how solids composition varies with particle size. While the analyses he reports do not represent solids in any present tank, the data is useful in determining the potential range of solids composition.

17. M. C. Swenson, 1992, "Historical Tank Farm Sample Results," *INEL Correspondence*, MCS-27-92, December 17, 1992.

WM-187 was sampled multiple times in late 2003 and early 2004, and results of the analysis of solids from these samples are reported in Section 3.2 of this report. Characterization of solids from Tank WM-186 was performed in 2003 as part of work to develop a tank solids simulant, and the results reported in Revision 3 of this report (Barnes 2003). A summary composition is retained in this report (see Table 28). Techniques used to characterize the solids included transmission electron microscopy, scanning electron microscopy, x-ray fluorescence, and x-ray diffraction. Some of these analyses were repeated for a sample of Tank WM-187 solids taken in late 2003; some of these results will be contained Wendt, 2004 (see #20 below). Additional results from these analyses will be discussed in a report to be written by Stuart Janikowski and published later this year.

1.1.3 Tank Solids Mass Estimates and Properties

EDF-TST-001 (Poloski 2002a) gives estimates of the volume of "sludge" (the solids/liquid residual in a tank after removing liquid waste) in each tank. Poloski used these estimated tank sludge volumes plus a solids concentration as documented in EDF-15722-040 (see the reference below) to derive estimates of the mass of tank solids present in each tank.

18. A. P. Poloski, 2000b, "INTEC Tank Farm Sludge Density Measurements/Calculations," *Engineering Design File 15722-040*, July 12, 2000.

Poloski's estimates of the mass of tank solids have been used in INTEC Waste Incidental to Reprocessing (WIR Determination) documents and various SBW treatment mass balances made in previous years. New estimates are proposed in Section 3.1 of this report for use in Conceptual Designs for SBW treatment alternatives.

Poloski (2002b) also documents the volume fraction of solids in WM-183 sludge and the solids particle density from measurements of the mass and volume of the sludge sample, the weight fraction of water in the sludge, and the density of water. EDF-TST-001 (Poloski 2002a) includes particle size distribution data for solids from Tanks WM-182 and WM-183 and settling rate data for solids from Tank WM-182. Christian (2001) includes particle size distribution data for Tank WM-180 solids. Batcheller (2003) presents particle size distribution data for solids from WM-189 as well as other solids and sludge properties. A summary of solids property data including that for the most recent sample from Tank WM-187 is presented in Section 3.5 of this report. Additional solids property data has been obtained in conjunction with the development of simulants for SBW solids. The initial stimulant development work was performed at the Savannah River Technical Center and is reported by John Harbor:

19. J. R. Harbour, R. F. Schumacher, A. Choi, A. K. Hansen, 2002, *Development of an Initial Simulant for the Idaho Tank Farm Solids*, WSRC-TR-2002-00436, November 11, 2002.

Continued characterization of physical properties of tank sludges for the purpose of stimulant development has been performed and reported by Dan Wendt. Wendt includes data for sludge density, viscosity, and settling rates for different sludge solids concentrations as well as actual waste.

20. D. Wendt, 2004, *INTEC SBW Solid Sludge Surrogate Recipe and Validation*, ICP/EXT-04-00415 Rev. 0, June 2004.

1.1.4 NGLW Stream Volumes and Compositions

Joe Nenni compiled compositional data for NGLW streams based on analysis of samples taken from FY-1999 through FY-2002. He includes compositional data for cations, anions, pH or acidity, undissolved solids (UDS), total inorganic carbon (TIC), total organic carbon (TOC), semi volatile organic compounds, and volatile organic compounds. No radionuclide compositional data are included.

21. J. A. Nenni, 2002, "Balance-of-Plant Sample Data Compilation," *Engineering Design File,* EDF-2506, September 2002.

Julia Tripp compiled NGLW compositional data from sample analysis prior to FY-1999. Compositions are provided by NGLW stream and include, when available, radionuclide activities.

22. J. L. Tripp, 1998, *Supporting Information for the INEEL Liquid Waste Management Plan*, Appendix B, INEEL/EXT-98-00730, July 1998.

The latest projections of the volumes of wastes that will be generated by various operations at INTEC are given in the following document:

23. R. Demmer, 2002, *INTEC Waste Minimization Plan*, PLN-225, October 15, 2002.

Demmer also includes a comparison of projections with actual generation rates for NGLW streams in each of the years 1998-2001. Following the guidelines of PLN-225, volumes of waste projected to be generated from 2004-2012 are summarized in Tables 11 and 12 of Section 2.4 of this report.

1.1.5 Present and Future Liquid Volumes

Present Tank Farm tank volumes are based on tank level measurements. A web-based monthly update of tank volumes is available at http://icpweb.inel.gov/intec/tank-farm-data/. An Excel spreadsheet model (see Palmer 2000) is used to project future tank volumes. This model includes volumes of NGLW generated each year, volumes of NGLW after concentration by evaporation, and volumes of Tank Farm tanks by month. As Tank Farm management plans and assumptions change, the model is updated. The most recent update was made by Clark Millet in early March 2004 to incorporate the consolidation of SBW into the three tanks, WM-187, WM-188, and WM-189. Portions of the data in this unpublished spreadsheet ("2012 Model – Barnes7," March 8, 2004) are contained in this report.

1.1.6 Tank Farm Background Information

Brent Palmer has documented the history and discussed operation of the INTEC Tank Farm, INTEC waste management equipment, and SBW and NGLW management plans. While the plans and waste compositions in the report below are no longer current, the history and discussion of equipment and INTEC operations is useful.

24. W. B. Palmer, C. B. Millet, M. D. Staiger, M. C. Swenson, W. B. McNaught, F. S. Ward, 2000, *INTEC Waste Management Through 2070,* INEEL/EXT-2000-01005, December 2000.

1.2 Feeds to the Alternative Treatment Processes

Waste to be treated by the SBW Treatment Facility includes:

1. SBW stored in Tank WM-187, including solids and liquid. Heel solids from Tanks WM-181, WM-182, WM-183, WM-184, WM-185, and WM-186 have been collected in Tank WM-187. Following collection of these heels, much of the liquid content of the tank will be removed. Concentrate from evaporation of Tank WM-180 SBW will then be added to the tank. Small additions of other wastes generated in 2004 and 2005 are expected to fill this tank.
2. SBW stored in Tank WM-188, including liquid and a relatively small amount of undissolved solids. Tank WM-188 is presently about 90% full; waste will continue to be added through FY 2005.
3. SBW stored in Tank WM-189, including liquid and a relatively small amount of undissolved solids. Tank WM-189 is presently full (near its administrative limit) and no changes in waste composition are expected for this tank.
4. NGLW that will be collected in Tanks WM-100, WM-101, and WM-102 from FY 2006 through the end of SBW treatment. Transfers into and out of these tanks will be made until (and possibly during) the period of SBW treatment. Should NGLW generation prior to the start-up of the SBW treatment facility exceed the capacity of these tanks, other INTEC tanks would also be used to store NGLW.

The following sections discuss differences in the feeds to each of the treatment processes. Additional discussion of possible tank mixing scenarios is given in Section 3.4.

1.2.1 CsIX/TRU Grout

Several strategies for processing the waste in the CsIX/ treatment alternative are possible. One strategy would be to sequentially process the waste by tank. For example, waste from Tank WM-187 could be processed first, then waste from WM-188, followed by waste from WM-189, and finally NGLW. Other strategies would involve changing the order of tanks processed or blending wastes from different SBW and/or NGLW tanks in the treatment facility receiving tank prior to feeding to treatment operations. If processed tank by tank, the feed to the treatment process would vary from the relatively high solid waste of WM-187 to the low solids waste of the other tanks. In addition to processing the bulk volume of waste from each tank, the heel will also need to be processed. The heels would be flushed to the treatment facility using water.

The CsIX/TRU Grout process will generate small amounts of dilute aqueous wastes that can be processed in existing INTEC evaporators and the concentrate returned to the treatment process. These wastes include water from rinsing tank solids and/or spent ion exchange media, condensate from drying tank solids and spent ion exchange media, and vent gas condensate.

1.2.2 Calcination/MACT

If calcination is selected for SBW treatment, decontamination of NWCF cells could begin as early as 2005 or 2006, resulting in waste not generated for the other options. This NWCF cell decontamination waste would be concentrated and added to WM-188 through FY 2005 or WM-100, WM-101, and WM-102 after 2005. Unlike the CsIX process, no dilute liquid wastes are expected to be generated continually during operation, but wastes would be generated intermittently during scheduled and unscheduled shutdowns, and also from decontamination activities after SBW processing is complete.

A separate study (Wood 2002) has recommended that solids be mixed with liquid tank waste in TFF tanks and processed together (co-processed) in the calciner. The present plan for Tank Farm management includes the addition of concentrated SBW, primarily from Tank WM-180, to Tank WM-187. Mixing pumps would need to be installed in WM-187 to maintain a homogeneous blend of solids and liquid to be fed to treatment. Mixing pumps could be installed WM-188 and/or WM-189 as well, and waste transfers made between the four tanks WM-187, WM-188, WM-189, and WM-190 to produce a feed with a more consistent solids content than if all the solids remain in WM-187. A discussion of possible tank mixing scenarios is given is Section 3.4.

1.2.3 Steam Reforming

The waste feed to the Steam Reforming process would be nearly identical to the feed for the Calcination/MACT alternative. Minor differences in NGLW composition between these two alternatives, because of differences in NGLW streams, would cause very minor differences in feed composition. Like calcination, solids would be co-processed.

1.2.4 Direct Evaporation

Co-processing of solids has also been recommended and demonstrated for the Direct Evaporation process (Packer 2003; Griffith 2003). Feeds to the process would essentially be the same as the feeds for the calcination and steam reforming alternatives, with only small differences due to differences in NGLW composition and volume between what would be generated for the direct evaporation alternative and the calcination or steam reforming alternative. No NGLW is expected to be generated by the Direct Evaporation process.

1.2.5 Vitrification

A mass balance was prepared in 2001 assuming separate vitrification of SBW liquids and solids (Quigley 2001). No glass formulation tests have been performed with simulants for tank solids either alone or with SBW liquid. The high phosphate content of SBW solids will severely limit its waste loading in a borosilicate glass. Further evaluations would be needed to determine whether to coprocess tank solids with SBW liquid or process the two wastes separately.

1.3 Tank Farm Management

Figure 1 illustrates management of INTEC wastes from February 2004 through June 2004. During this time, Tank WM-187 received dilute wastes. Figure 2 illustrates management of INTEC wastes from July 2004 through September 2005. During this period, waste will be received into Tanks WM-187 and WM-188, but Tank WM-187 will contain concentrated waste. After September 2005, no changes will be made to the waste in Tanks WM-187, WM-188, and WM-189, and all waste generated will be stored in Tanks WM-100, WM-101, and WM-102, as illustrated in Figure 3.

As of January 31, 2004, Tank WM-187 contained 150,900 gallons of SBW solids plus dilute aqueous waste. In early-2004, Tanks WM-103, WM-104, WM-105, WM-106, and WM-181 were washed, with the wash water added to Tank WM-187. Flushes from WM-103, WM-104, WM-105 and WM-106 were very dilute, but the flush from WM-181 contained approximately 15,000 gallons of heel, both solids and concentrated liquid. In mid-2004, most of the liquid waste in WM-187 will then be sent to the Evaporator Tank System (ETS), reducing the volume of waste in WM-187 to an estimated 45,000 gallons.[b] Then concentrate from evaporation of Tank WM-180 waste will be added to Tank WM-187. The total waste from WM-180 is expected to amount to about 230,000 gallons, including both the evaporator concentrate and heel flush. An additional 10,000 gallons of NGLW generated in 2004 and 2005 is expected to be added to WM-187, filling the remaining tank capacity.

The volume of waste in Tank WM-188 as of January 31, 2004 was 241,000 gallons. Evaporator concentrates have been and will be added in 2004 and 2005 to fill this tank. Tank WM-189 presently contains 279,700 gallons of waste. No changes are anticipated in the waste contained in Tank WM-189.

---

[b] The estimate of 45,000 gallons was made in March 2004 and is shown in the Tank Farm management scenario spreadsheet. However, evaporation of Tank WM-187 was stopped in April when the level was at 58,000 gallons. Hence it is likely the minimum volume of the tank after the next evaporation will be around 60,000 gallons.

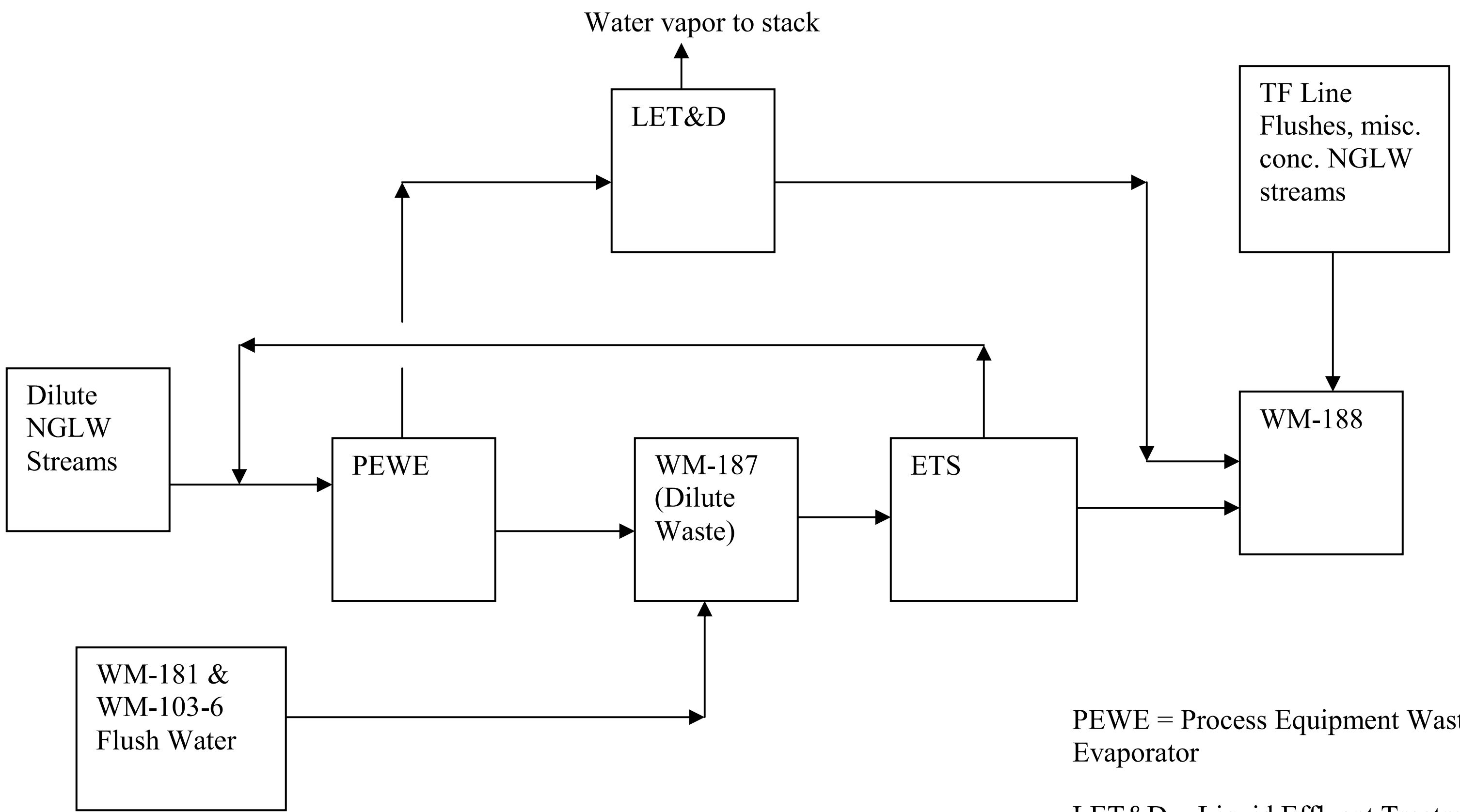


Figure 1. Tank Farm Management February 2004 – June 2004.

PEWE = Process Equipment Waste Evaporator

LET&D = Liquid Effluent Treatment and Disposal Facility (includes a waste fractionator)

ETS = Evaporator Tank System (formerly called the High Level Liquid Waste Evaporator)

NGLW = Newly Generated Liquid Waste

TF = INTEC Tank Farm

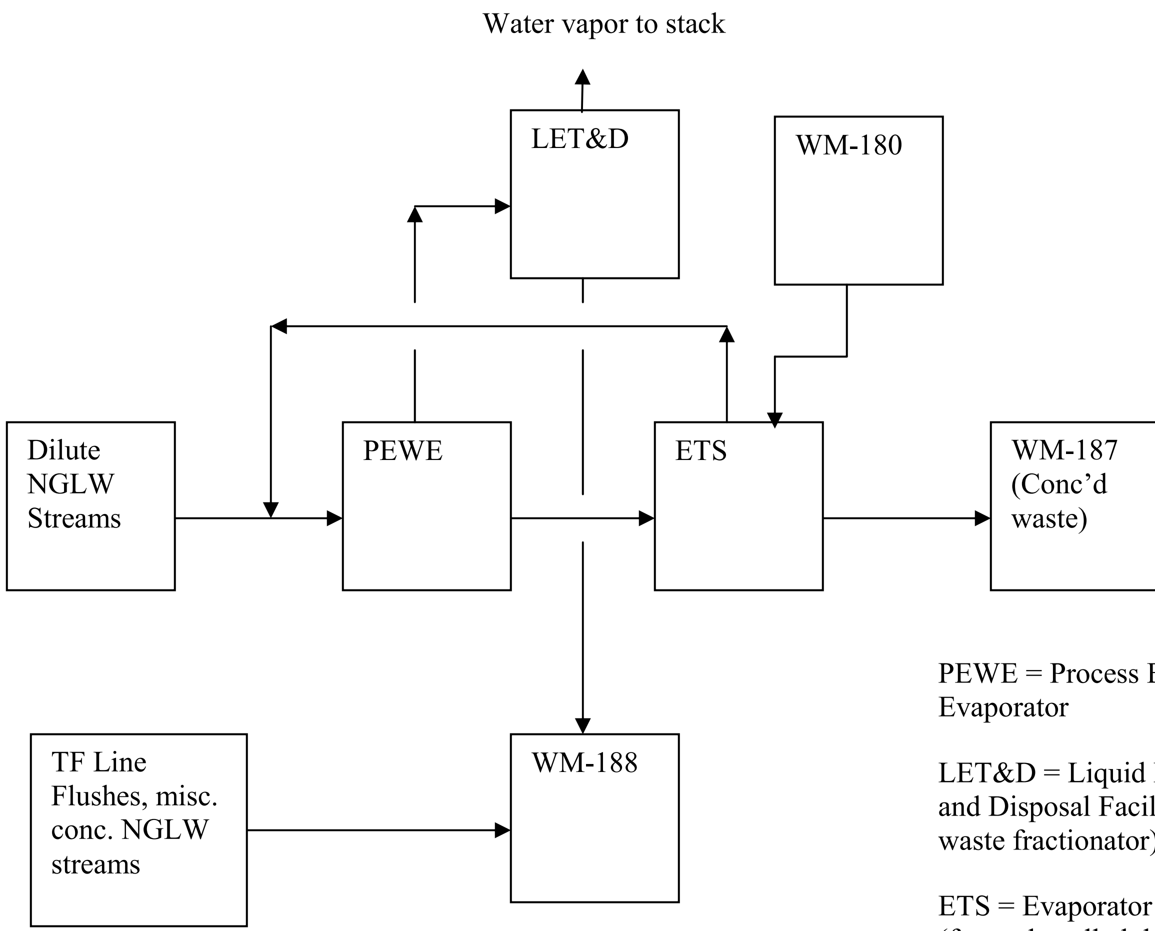


Figure 2. Tank Farm Management, July 2004 – September 2005.

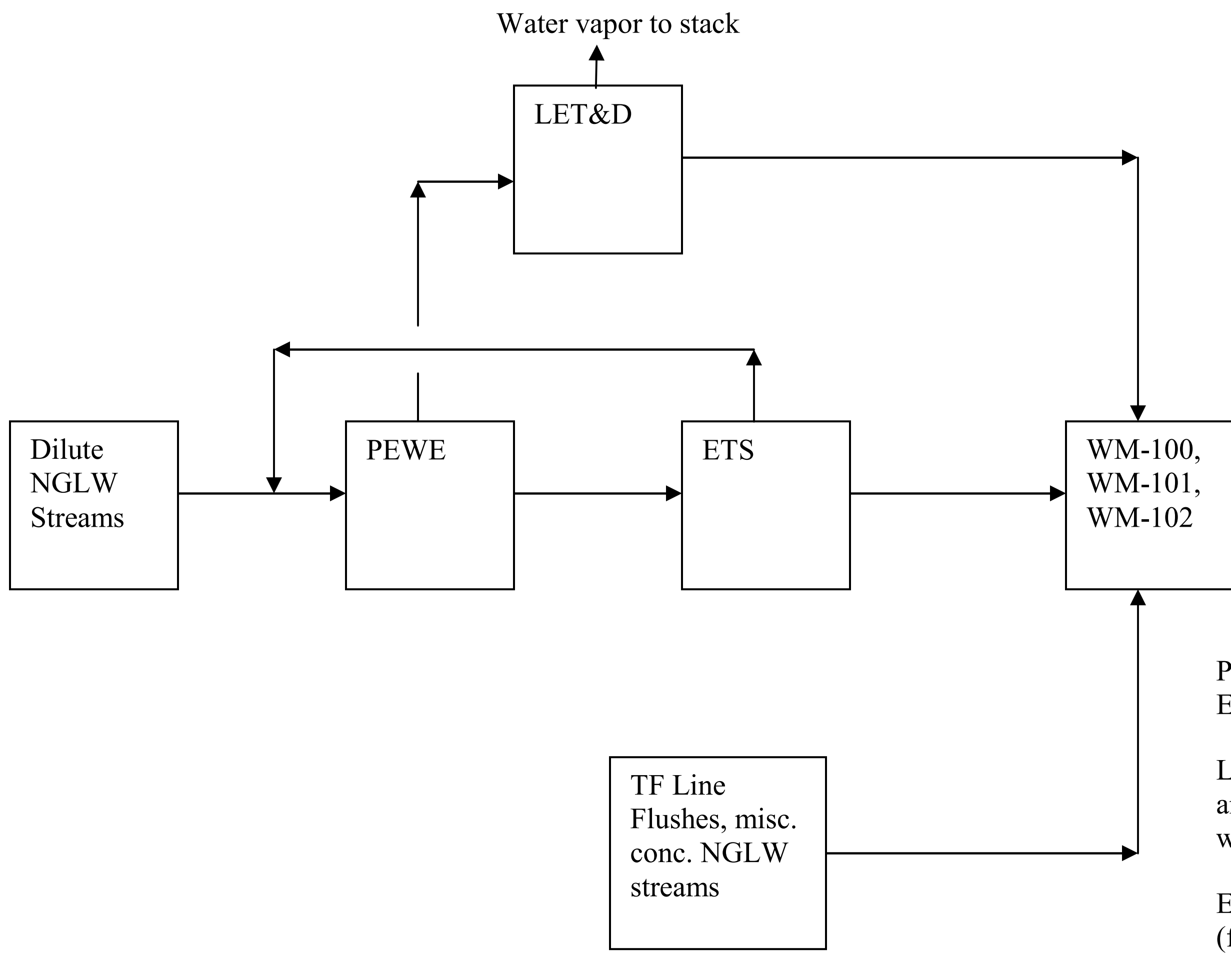
PEWE = Process Equipment Waste Evaporator

LET&D = Liquid Effluent Treatment and Disposal Facility (includes a waste fractionator)

ETS = Evaporator Tank System (formerly called the High Level Liquid Waste Evaporator)

NGLW = Newly Generated Liquid Waste

TF = INTEC Tank Farm



PEWE = Process Equipment Waste Evaporator

LET&D = Liquid Effluent Treatment and Disposal Facility (includes a waste fractionator)

ETS = Evaporator Tank System (formerly called the High Level Liquid Waste Evaporator)

NGLW = Newly Generated Liquid Waste

TF = INTEC Tank Farm

Figure 3. INTEC Waste Management after September 2005.

2. PROJECTED WASTE COMPOSITIONS

This section identifies the sources and amounts of wastes that will be in tanks fed to the treatment process. It also projects compositions of the liquids, solids, and combined liquids and solids in these tanks and discusses the basis for calculating these compositions.

2.1 WM-187 Composition

The starting point for calculation of the future composition of WM-187 waste is the composition as of September 2002 as documented by Clark Millet (Millet 2003). Table 1 summarizes the path from the September 2002 composition to the future composition in September 2005. No changes in the tank waste are anticipated after September 2005.

Table 1. Basis for Tank WM-187 waste composition.

	Gallons	**Composition ID**
Volume Sept 30, 2002	137,300	WM-187-0
Transfer of WM-183 waste	15,400	WM-183-0
Water with WM-183 flush	77,100	Water
Subtotal	229,800	WM-187-1
Sent to Evaporator	212,300	WM-187-1
Remaining in WM-187	17,500	WM-187-1
Waste from WM-184	5,100	WM-184-0
Waste from WM-185	12,900	WM-185-0
Waste from WM-186	19,700	WM-186-0
Waste from WM-181	23,000	WM-181-0
Water with WM-181/4/5/6 flushes	152,700	Water
NGLW added through June 2004	3,606	NGLW-1
Subtotal	234,506	WM-187-2
Sent to Evaporator	189,546	WM-187-2
Remaining in WM-187	44,960	WM-187-2

	Liquid (Gallons)	Composition ID	**Solids** (Gallons)	Composition ID	**Total** (Gallons)	Composition ID
Initial WM-187 waste	31,750	WM-187-2	13,210	WM-187-S1	44,960	
Added from WM-180 evaporation	203,913	WM-180-C	87	WM-180-S	204,000	
WM-180 heel	5,625	WM-180-0	661	WM-180-S	6,286	
Water from WM-180 heel flush	20,000	Water			20,000	
WM-190	500	WM-190-0			500	
Water from WM-190 transfer	300	Water			300	
NGLW, July 2005 - March 2005	8,874	NGLW-2			8,874	
Final WM-187 Volume	**270,963**	**WM-187-L**	**13,958**	**WM-187-S**	**284,920**	**WM-187**

The composition of the waste in Tank WM-187 after Tank WM-183 flushes were added was calculated by adding the initial tank contents (WM-187-0, as reported by Millet 2003), the waste heel from WM-183 (WM-183-0, also as reported by Millet 2003), and the amount of water used to flush WM-183. The resulting composition was named "WM-187-1." Seven wastes were then added together to calculate the composition of the Tank WM-187 waste after flushing Tanks WM-184, WM-185, WM-186, and WM-181. These seven streams included 17,500 gallons of waste initially in the tank (composition "WM-187-1"), heels from the four tanks flushed (compositions as reported by Millet, 2003), 152,700 gallons of water used in flushing, and 3,606 gallons of NGLW. The calculation of the NGLW composition is described in Section 2.4. The resulting composition was called "WM-187-2". Of the 234,506 gallons of WM-187-2 waste, 189,546 gallons of the liquid is expected to be drawn off to the evaporator, leaving 44,960 gallons in the tank. It was assumed that the waste remaining in the tank contained all the solids present in the full volume.

Based on an estimate of 100,000 kg of solids in WM-187 (see Section 3.1), and a solids particle density of 2 kg/liter (Poloski 2000b), the volume of solids in the tank equates to 13,210 gallons, and implies that the tank sludge contains 31,730 gallons of interstitial liquid. This volume of liquid, of composition "WM-187-2," was combined with the volumes of six other wastes as shown in Table 1 to obtain the final composition of Tank WM-187 liquid waste. The sources for the compositions of the other wastes include Nenni (2004) for concentrated waste from WM-180; Millet (2003) for the WM-180 heel liquid and WM-190 heel liquid; and calculation of the NGLW-2 composition as described in Section 2.4.

The composition of the final solids in Tank WM-187 was calculated based on an initial Tank WM-187 solids composition, prior to the addition of WM-180 waste, and adding to these the solids from WM-180. The composition of the WM-180 heel solids was assumed to be the same as the entrained WM-180 solids, which were analyzed in 2000 (Christian 2000).

Because of the uncertainty in the amount of solids in Tank WM-187, compositions were calculated based on the expected amount of solids, 70% of the expected amount, and 130% of the expected amount. Table 2 shows the composition of Tank WM-187 liquid only and liquid plus the expected solids. Table 3 shows the composition of waste in Tank WM-187 waste at the low and high ends of the estimated solids quantity.

The concentrations of nitrates shown in Tables 2-3 have been adjusted from measured values to achieve an overall charge balance in the total composition. The specific gravity and concentrations for total organic carbon (TOC) shown in Tables 2 and 3 are estimates. The TOC concentrations are based on TOC analysis of waste samples from Tanks WM-188 and WM-189. The specific gravity is based on a correlation of specific gravity for historic tank samples and total dissolved solids.

The composition of solids only is shown in Table 4. The solids composition is based in part on the analytical results of the most recent sample from Tank WM-187, but where these results significant diverge from previous samples, it is based on solids analyses data averages. Uncertainties in the liquid and solids compositions are discussed in Section 3.3.

Table 2. Tank WM-187 composition.

	Liquid only	With solids		Liquid only	With solids		Liquid only	With solids		Liquid only	With solids
Gal	270,963	284,920		mol/liter	mol/liter		Ci/liter	Ci/liter		Ci/liter	Ci/liter
SG	1.30	1.32	PO_4^{-3}	1.38E-02	3.22E-01	Th-232	4.26E-16	4.26E-16	Tc-98	1.55E-12	1.55E-12
			Pu^{+4}	6.32E-06	2.30E-05	Th-234	1.25E-08	1.25E-08	Tc-99	1.06E-05	6.43E-05
	mol/liter	mol/liter	K^+	2.23E-01	2.24E-01	Pa-231	5.38E-11	5.38E-11	Ru-106	5.60E-07	1.72E-06
H+	1.09E+00	1.04E+00	Pr^{+4}	5.21E-06	4.96E-06	Pa-233	1.76E-06	1.76E-06	Rh-102	5.19E-10	5.19E-10
Al^{+3}	6.73E-01	7.08E-01	Pm^{+3}	7.63E-10	2.21E-07	Pa-234m	1.25E-08	1.25E-08	Rh-106	5.60E-07	1.72E-06
Am^+	9.41E-08	1.30E-07	Rh^{+4}	2.25E-06	2.14E-06	U-232	1.20E-09	4.03E-09	Pd-107	9.95E-09	9.95E-09
Sb^{+5}	5.36E-07	3.24E-05	Rb^+	3.46E-06	3.29E-06	U-233	4.81E-11	9.70E-11	Cd-113m	2.00E-06	2.00E-06
As^{+5}	4.92E-04	5.53E-04	Ru^{+3}	1.28E-04	1.10E-03	U-234	1.18E-06	1.51E-06	In-115	6.06E-17	6.06E-17
Ba^{+2}	5.54E-05	1.20E-04	Sm^{+3}	3.43E-06	3.36E-06	U-235	4.38E-08	7.49E-08	Sn-121m	4.03E-08	4.03E-08
Be^{+2}	7.81E-06	1.79E-05	Se^{+4}	1.11E-05	1.24E-04	U-236	6.38E-08	1.17E-07	Sn-126	2.47E-07	7.54E-07
B^{+3}	1.26E-02	1.35E-02	Si^{+4}	5.37E-05	5.93E-01	U-237	3.87E-09	3.87E-09	Sb-125	8.03E-06	8.18E-04
Br^-	1.90E-07	1.81E-07	Ag^+	5.43E-06	9.11E-04	U-238	2.76E-08	3.36E-08	Sb-126m	2.47E-07	2.47E-07
Cd^{+2}	8.03E-04	8.62E-04	Na^+	2.20E+00	2.13E+00	Np-237	1.76E-06	4.07E-16	Sb-126	3.46E-08	3.46E-08
Ca^{+2}	4.98E-02	4.95E-02	Sr^{+2}	1.22E-04	1.22E-04	Np-238	5.91E-11	1.54E-06	Te-123	2.31E-19	2.31E-19
Ce^{+4}	4.83E-05	9.53E-05	SO_4^{-2}	7.04E-02	7.32E-02	Np-239	1.67E-08	4.58E-11	Te-125m	1.90E-06	1.90E-06
Cs^+	1.17E-05	8.31E-05	Tc^{+7}	6.30E-06	3.83E-05	Pu-236	1.65E-09	5.89E-09	I-129	2.83E-08	9.39E-08
Cl^-	3.34E-02	3.99E-02	Te^{+4}	1.85E-06	1.76E-06	Pu-238	6.28E-04	2.15E-03	Cs-134	8.52E-06	7.41E-05
Cr^{+3}	3.67E-03	4.34E-03	Tb^{+4}	1.32E-09	1.25E-09	Pu-239	8.98E-05	3.26E-04	Cs-135	5.18E-07	1.46E-06
Co^{+2}	1.97E-05	3.44E-05	Tl^{+3}	1.00E-07	4.25E-05	Pu-240	6.08E-06	2.24E-05	Cs-137	3.04E-02	8.25E-02
Cu^{+2}	6.93E-04	7.91E-04	Th^{+4}	7.28E-07	6.92E-07	Pu-241	1.66E-04	1.56E-03	Ba-137m	2.87E-02	7.80E-02
Eu^{+3}	3.15E-07	3.02E-07	Sn^{+4}	1.05E-06	3.48E-03	Pu-242	4.84E-09	1.72E-08	La-138	1.15E-16	1.15E-16
F^-	5.06E-02	7.40E-02	Ti^{+4}	6.09E-05	1.91E-03	Pu-244	4.08E-16	1.29E-15	Ce-142	1.80E-11	1.80E-11
Gd^{+3}	1.82E-04	1.86E-04	U^{+4}	4.36E-04	5.76E-04	Am-241	7.76E-05	1.07E-04	Ce-144	3.77E-07	1.16E-06
Ge^{+4}	5.48E-09	5.22E-09	V^{+5}	9.69E-04	9.48E-04	Am-242m	9.16E-09	9.16E-09	Pr-144	3.77E-07	3.92E-07
In^{+3}	8.63E-07	8.63E-07	Y^{+3}	4.27E-06	4.06E-06	Am-242	9.11E-09	9.11E-09	Nd-144	9.68E-16	9.68E-16
I^-	1.58E-06	4.38E-06	Zn^{+2}	1.05E-03	1.22E-03	Am-243	1.29E-08	2.37E-08	Pm-146	3.06E-08	3.06E-08
Fe^{+3}	2.17E-02	3.57E-02	Zr^{+4}	1.70E-04	5.41E-02	Cm-242	8.04E-09	1.34E-08	Pm-147	1.03E-04	3.11E-04
La^{+3}	5.73E-06	5.45E-06	O-2		9.29E-01	Cm-243	1.71E-08	6.24E-08	Sm-146	1.66E-13	1.66E-13
Pb^{+2}	1.34E-03	1.35E-03	H2O	4.74E+01	4.53E+01	Cm-244	1.04E-06	5.06E-06	Sm-147	4.43E-12	4.43E-12
Li^+	3.96E-04	6.43E-04				Cm-245	1.80E-10	8.60E-10	Sm-148	2.28E-17	2.28E-17
Mg^{+2}	1.30E-02	1.41E-02		g/liter	g/liter	Cm-246	1.18E-11	5.60E-11	Sm-149	2.02E-18	2.02E-18
Mn^{+4}	1.52E-02	1.59E-02	TOC	0.53	0.50				Sm-151	2.02E-04	6.18E-04
Hg^{+2}	2.07E-03	2.23E-03	UDS	0	93	H-3	1.99E-05	1.99E-05	Eu-150	8.66E-12	8.66E-12
Mo^{+6}	2.00E-04	5.05E-04				Be-10	1.81E-12	1.81E-12	Eu-152	1.52E-06	2.52E-06
Nd^{+3}	1.85E-05	1.76E-05		Ci/liter	Ci/liter	C-14	7.23E-11	2.21E-10	Eu-154	5.92E-05	9.24E-05
Np^{+4}	1.06E-05	1.10E-05		(Jan, 2003)	(Jan, 2003)	Se-79	2.63E-07	8.77E-07	Eu-155	9.56E-05	1.61E-04
Ni^{+2}	1.48E-03	1.80E-03	Ra-226	4.93E-12	4.93E-12	Rb-87	1.76E-11	1.76E-11	Gd-152	8.56E-19	8.56E-19
Nb^{+5}	3.39E-06	1.66E-03	Ac-227	2.32E-11	2.32E-11	Sr-90	2.38E-02	2.53E-02	Ho-166m	2.77E-11	2.77E-11
NO_3^-	5.60E+00	5.44E+00	Th-230	4.95E-10	1.88E-09	Y-90	2.38E-02	2.53E-02	Co-60	6.57E-06	1.18E-05
Pd^{+4}	5.86E-06	2.19E-03	Th-231	1.26E-08	1.26E-08	Zr-93	1.33E-06	1.33E-06	Ni-63	2.80E-05	6.61E-05

Table 3. Tank WM-187 composition with minimum and maximum solids.

	Min Solids	**Max solids**		**Min Solids**	**Max solids**		**Min Solids**	**Max solids**		**Min Solids**	**Max solids**
Gallon	284,920	284,920		mol/liter	mol/liter		Ci/liter	Ci/liter		Ci/liter	Ci/liter
SG	1.31	1.32	PO_4^{-3}	2.31E-01	4.13E-01	Th-232	4.23E-16	4.30E-16	Tc-98	1.54E-12	1.57E-12
			Pu^{+4}	1.92E-05	2.68E-05	Th-234	1.24E-08	1.26E-08	Tc-99	4.81E-05	8.05E-05
	mol/liter	mol/liter	K^{+}	2.21E-01	2.26E-01	Pa-231	5.33E-11	5.43E-11	Ru-106	1.37E-06	2.07E-06
H+	1.05E+00	1.03E+00	Pr^{+4}	4.99E-06	4.93E-06	Pa-233	1.75E-06	1.78E-06	Rh-102	5.15E-10	5.23E-10
Al^{+3}	6.91E-01	7.24E-01	Pm^{+3}	1.55E-07	2.88E-07	Pa-234m	1.24E-08	1.26E-08	Rh-106	1.37E-06	2.07E-06
Am^{+4}	1.19E-07	1.42E-07	Rh^{+4}	2.15E-06	2.12E-06	U-232	3.19E-09	4.87E-09	Pd-107	9.86E-09	1.00E-08
Sb^{+5}	2.32E-05	4.16E-05	Rb^{+}	3.31E-06	3.27E-06	U-233	8.22E-11	1.12E-10	Cd-113m	1.98E-06	2.02E-06
As^{+5}	5.27E-04	5.78E-04	Ru^{+3}	8.11E-04	1.39E-03	U-234	1.41E-06	1.62E-06	In-115	6.01E-17	6.11E-17
Ba^{+2}	1.00E-04	1.40E-04	Sm^{+3}	3.35E-06	3.37E-06	U-235	6.51E-08	8.47E-08	Sn-121m	3.99E-08	4.06E-08
Be^{+2}	1.50E-05	2.08E-05	Se^{+4}	1.09E-04	1.39E-04	U-236	1.01E-07	1.34E-07	Sn-126	6.03E-07	9.06E-07
B^{+3}	1.32E-02	1.39E-02	Si^{+4}	4.16E-01	7.70E-01	U-237	3.84E-09	3.91E-09	Sb-125	5.75E-04	1.06E-03
Br^{-}	1.82E-07	1.80E-07	Ag^{+}	6.40E-04	1.18E-03	U-238	3.17E-08	3.55E-08	Sb-126m	2.45E-07	2.49E-07
Cd^{+2}	8.42E-04	8.82E-04	Na^{+}	2.12E+00	2.13E+00	Np-237	4.04E-16	1.88E-06	Sb-126	3.43E-08	3.49E-08
Ca^{+2}	4.92E-02	4.98E-02	Sr^{+2}	1.20E-04	1.23E-04	Np-238	1.48E-06	5.40E-11	Te-123	2.29E-19	2.33E-19
Ce^{+4}	8.09E-05	1.10E-04	SO_4^{-2}	7.17E-02	7.48E-02	Np-239	4.54E-11	1.52E-08	Te-125m	1.88E-06	1.91E-06
Cs^{+}	6.63E-05	9.99E-05	Tc^{+7}	2.87E-05	4.80E-05	Pu-236	4.81E-09	6.96E-09	I-129	7.44E-08	1.13E-07
Cl^{-}	3.75E-02	4.22E-02	Te^{+4}	1.77E-06	1.75E-06	Pu-238	1.80E-03	2.50E-03	Cs-134	5.45E-05	9.37E-05
Cr^{+3}	4.12E-03	4.56E-03	Tb^{+4}	1.26E-09	1.25E-09	Pu-239	2.73E-04	3.80E-04	Cs-135	1.18E-06	1.75E-06
Co^{+2}	3.01E-05	3.88E-05	Tl^{+3}	3.77E-05	4.74E-05	Pu-240	1.83E-05	2.66E-05	Cs-137	6.69E-02	9.80E-02
Cu^{+2}	7.54E-04	8.27E-04	Th^{+4}	6.97E-07	6.87E-07	Pu-241	1.27E-03	1.85E-03	Ba-137m	6.33E-02	9.27E-02
Eu^{+3}	3.03E-07	3.00E-07	Sn^{+4}	2.46E-03	4.50E-03	Pu-242	1.40E-08	2.03E-08	La-138	1.14E-16	1.16E-16
F^{-}	6.65E-02	8.14E-02	Ti^{+4}	1.38E-03	2.44E-03	Pu-244	1.02E-15	1.56E-15	Ce-142	1.78E-11	1.82E-11
Gd^{+3}	1.83E-04	1.89E-04	U^{+4}	5.32E-04	6.20E-04	Am-241	9.80E-05	1.17E-04	Ce-144	9.30E-07	1.40E-06
Ge^{+4}	5.25E-09	5.18E-09	V^{+5}	9.41E-04	9.54E-04	Am-242m	9.08E-09	9.24E-09	Pr-144	3.89E-07	3.95E-07
In^{+3}	8.56E-07	8.71E-07	Y^{+3}	4.09E-06	4.04E-06	Am-242	9.04E-09	9.19E-09	Nd-144	9.60E-16	9.76E-16
I^{-}	3.52E-06	5.23E-06	Zn^{+2}	1.16E-03	1.28E-03	Am-243	2.05E-08	2.70E-08	Pm-146	3.04E-08	3.09E-08
Fe^{+3}	3.16E-02	3.97E-02	Zr^{+4}	3.83E-02	6.99E-02	Cm-242	1.17E-08	1.51E-08	Pm-147	2.49E-04	3.73E-04
La^{+3}	5.48E-06	5.42E-06	O-2	6.53E-01	1.21E+00	Cm-243	4.98E-08	7.51E-08	Sm-146	1.65E-13	1.68E-13
Pb^{+2}	1.33E-03	1.36E-03	H2O	4.61E+01	4.45E+01	Cm-244	3.91E-06	6.21E-06	Sm-147	4.40E-12	4.47E-12
Li^{+}	5.91E-04	6.95E-04				Cm-245	6.66E-10	1.05E-09	Sm-148	2.26E-17	2.30E-17
Mg^{+2}	1.37E-02	1.45E-02		g/liter	g/liter	Cm-246	4.34E-11	6.86E-11	Sm-149	2.01E-18	2.04E-18
Mn^{+4}	1.56E-02	1.63E-02	TOC	0.51	0.50				Sm-151	4.94E-04	7.42E-04
Hg^{+2}	2.21E-03	2.26E-03	UDS	65	121	H-3	1.97E-05	2.02E-05	Eu-150	8.58E-12	8.73E-12
Mo^{+6}	4.15E-04	5.94E-04				Be-10	1.79E-12	1.82E-12	Eu-152	2.21E-06	2.83E-06
Nd^{+3}	1.77E-05	1.75E-05		Ci/liter	Ci/liter	C-14	1.77E-10	2.66E-10	Eu-154	8.25E-05	1.02E-04
Np^{+4}	1.08E-05	1.12E-05		(Jan, 2003)	(Jan, 2003)	Se-79	7.17E-07	1.04E-06	Eu-155	1.41E-04	1.82E-04
Ni^{+2}	1.69E-03	1.91E-03	Ra-226	4.89E-12	4.97E-12	Rb-87	1.75E-11	1.78E-11	Gd-152	8.49E-19	8.63E-19
Nb^{+5}	1.29E-03	2.03E-03	Ac-227	2.30E-11	2.34E-11	Sr-90	2.47E-02	2.59E-02	Ho-166m	2.75E-11	2.80E-11
NO_3^{-}	5.43E+00	5.45E+00	Th-230	1.47E-09	2.29E-09	Y-90	2.47E-02	2.59E-02	Co-60	1.03E-05	1.33E-05
Pd^{+4}	1.54E-03	2.84E-03	Th-231	1.25E-08	1.27E-08	Zr-93	1.32E-06	1.35E-06	Ni-63	2.78E-05	2.83E-05

Table 4. Tank WM-187 composition of solids.

	Weight percent		Weight percent		Ci/kg		Ci/kg
Al^{+3}	1.72E+00	Ni^{+2}	2.36E-02	C-14	1.58E-09	Eu-155	6.96E-04
Sb^{+5}	4.02E-03	Nb^{+5}	1.23E-01	Co-60	5.60E-05	Th-230	1.47E-08
As^{+5}	6.82E-03	NO_3^-	5.65E+00	Ni-59	4.98E-05	U-232	3.00E-08
Ba^{+2}	9.81E-03	Pd^{+4}	2.48E-01	Ni-63	4.11E-04	U-233	5.16E-10
Be^{+2}	9.35E-05	PO_4^{-3}	3.10E+01	Se-79	5.68E-06	U-234	3.35E-06
B^{+3}	1.61E-02	K^+	4.51E-01	Sr-90	1.42E-02	U-235	3.31E-07
Cd^{+2}	1.11E-02	Ru^{+3}	1.05E-01	Y-90	1.42E-02	U-236	5.68E-07
Ca^{+2}	7.20E-02	Se^{+4}	4.21E-03	Tc-99	5.78E-04	U-238	6.32E-08
Ce^{+4}	7.29E-03	Si^{+4}	1.79E+01	Ru-106	1.23E-05	Np-237	1.73E-06
Cs^+	8.08E-03	Ag^+	1.05E-01	Rh-106	1.23E-05	Pu-236	3.82E-08
Cl^-	3.05E-01	Na^+	3.92E-01	Sn-126	5.37E-06	Pu-238	1.23E-02
Cr^{+3}	4.44E-02	Sr^{+2}	4.95E-04	Sb-125	8.72E-03	Pu-239	1.88E-03
Co^{+2}	9.35E-04	SO_4^{-2}	5.89E-01	I-129	6.94E-07	Pu-240	1.47E-04
Cu^{+2}	8.42E-03	Tl^{+3}	3.56E-03	Cs-134	7.07E-04	Pu-241	1.05E-02
F^-	5.29E-01	Sn^{+4}	4.36E-01	Cs-135	1.00E-05	Pu-242	1.11E-07
Gd^{+3}	1.82E-03	Ti^{+4}	9.16E-02	Cs-137	5.51E-01	Pu-244	9.52E-15
Fe^{+3}	8.19E-01	U^{+4}	2.22E-02	Ba-137m	5.21E-01	Am-241	3.05E-04
Pb^{+2}	1.34E-02	V^{+5}	1.40E-03	Ce-144	8.33E-06	Am-243	1.14E-07
Li^+	1.31E-03	Zn^{+2}	1.48E-02	Pr-144	8.33E-06	Cm-242	5.77E-08
Mg^{+2}	3.88E-02	Zr^{+4}	5.19E+00	Pm-147	2.21E-03	Cm-243	4.50E-07
Mn^{+4}	7.88E-02	O-2	1.59E+01	Sm-151	4.40E-03	Cm-244	4.09E-05
Hg^{+2}	1.95E-02	H2O	1.80E+01	Eu-152	1.06E-05	Cm-245	6.93E-09
Mo^{+6}	3.10E-02	Total	1.00E+02	Eu-154	3.48E-04	Cm-246	4.49E-10
assumed specific gravity	2.0						

2.2 WM-188 Composition

In October 2002, Tank WM-188 contained 211,100 gallons of waste. The tank was sampled and both liquid and solids were analyzed (Johnson 2003a). An estimated 5,000 kg of solids, equivalent to a volume of about 660 gallons, are contained in the tank. Additions to the tank from October 2002 to March 31, 2004 have amounted to 47,000 gallons. An estimated additional 1,600 gallons will be added in April and May 2004. Then, starting in June 2004, Tank WM-187 waste (mostly the heel and wash water from Tank WM-181) will be evaporated and the concentrate added to Tank WM-188. Other additions to WM-188 include NGLW generated from June 2004 through September 2005, and a small amount of waste from the dilute heel in Tank WM-180.

Table 5. Basis for Tank WM-188 waste composition.

	Gallons	Stream Name
Liquid waste in tank October 2002	210,440	WM-188-0
Estimated solids in tank October 2002	660	WM-188-S
Concentrate added through May 2004	48,600	ETS-1
NGLW added June 2004 through Sept 2005	5,500	NGLW-3
Evaporator concentrate from WM-181	16,400	WM-181-0
Evaporator concentrate from final WM-180 heel	70	WM-180-H
Final volume	**281,670**	**WM-188**
Gallons solids	660	WM-188-S
Gallons liquid	281,010	WM-188-L

Table 6 shows the composition of waste in Tank WM-188 waste assuming 5,000 kg of solids. As for Tank WM-187, there is uncertainty in the amount of solids in Tank WM-188. Thus, Table 7 shows composition for the case of no solids (equivalent to the composition of the liquid only), and the case of twice as many solids as shown in Table 6.

In 1999 when Tank WM-188 was last at heel level, the tank was inspected by video and very few solids (~1/4-in) were seen in the tank (Patterson 2000). Since then, the waste that has been added to the tank has been SBW from other tanks that has undergone further concentration by evaporation.

A 236-ml portion of the 2002 WM-188 sample was allowed to settle, and after 7 days, the solids had settled into a sludge layer of about 3.6 ml. The concentration of solids in the sample may not necessarily equal that in the tank, but if they were equal, the sludge in the tank would amount to about 11,000 gallons. Assuming a solids particle density of 2 kg/liter, 5000 kg would occupy about 6% of this volume. The volume fraction of the WM-188 sludge was not measured, but was found to be about 7% for sludge from Tank WM-189.[c]

As was done for Tank WM-187, the concentrations of nitrates shown in Tables 6 and 7 have been adjusted from measured values to achieve an overall charge balance in the total composition. The specific gravity and TOC are based on sample analysis (Johnson, 2003a).

[c] Batcheller (2003, see Section 3.3.2) calculates the interstitial liquid volume of a 15 ml sample of WM-189 sludge to be 14 ml. Hence the volume of the undissolved solids is approximately 1 ml and the volume fraction of undissolved solids 1/15 = 6.7%. Unpublished results for the February 2004 WM-187 sample show the sludge to be 11 vol % solids, and two measurements of an earlier WM-187 sample give results of 9.4 and 10.5 vol % solids in the sludge.

Table 6. Tank WM-188 waste composition, liquids and solids.

Gallons	**281,670**		**mol/liter**		**Ci/liter**		**Ci/liter**
SG	1.32	PO_4^{-3}	1.38E-02	Th-232	9.75E-16	Tc-98	3.55E-12
		Pu^{+4}	5.37E-06	Th-234	2.85E-08	Tc-99	2.49E-05
	mol/liter	K^{+}	1.77E-01	Pa-231	1.23E-10	Ru-106	1.31E-06
H+	2.68E+00	Pr^{+4}	1.19E-05	Pa-233	4.03E-06	Rh-102	1.19E-09
Al^{+3}	6.77E-01	Pm^{+3}	1.74E-09	Pa-234m	2.85E-08	Rh-106	1.31E-06
Am^{+4}	8.32E-08	Rh^{+4}	5.14E-06	U-232	2.95E-09	Pd-107	2.27E-08
Sb^{+5}	5.82E-06	Rb^{+}	7.91E-06	U-233	1.18E-10	Cd-113m	4.57E-06
As^{+5}	1.04E-05	Ru^{+3}	2.29E-04	U-234	1.29E-06	In-115	1.39E-16
Ba^{+2}	7.92E-05	Sm^{+3}	7.83E-06	U-235	1.08E-07	Sn-121m	9.20E-08
Be^{+2}	1.88E-05	Se^{+4}	6.92E-06	U-236	5.01E-08	Sn-126	5.77E-07
B^{+3}	2.19E-02	Si^{+4}	1.45E-02	U-237	9.42E-09	Sb-125	2.45E-05
Br^{-}	4.35E-07	Ag^{+}	1.87E-05	U-238	1.53E-08	Sb-126m	5.65E-07
Cd^{+2}	3.32E-03	Na^{+}	1.52E+00	Np-237	4.03E-06	Sb-126	7.91E-08
Ca^{+2}	6.55E-02	Sr^{+2}	9.88E-05	Np-238	8.08E-10	Te-123	5.27E-19
Ce^{+4}	3.50E-05	SO_4^{-2}	3.76E-02	Np-239	2.28E-07	Te-125m	4.33E-06
Cs^{+}	3.66E-05	Tc^{+7}	1.48E-05	Pu-236	3.99E-09	I-129	7.49E-08
Cl^{-}	3.06E-02	Te^{+4}	4.66E-06	Pu-238	6.43E-04	Cs-134	7.62E-05
Cr^{+3}	5.42E-03	Tb^{+4}	3.01E-09	Pu-239	7.31E-05	Cs-135	1.20E-06
Co^{+2}	4.88E-05	Tl^{+3}	3.07E-06	Pu-240	1.47E-05	Cs-137	7.06E-02
Cu^{+2}	7.73E-04	Th^{+4}	3.27E-05	Pu-241	4.08E-04	Ba-137m	6.68E-02
Eu^{+3}	7.21E-07	Sn^{+4}	1.82E-04	Pu-242	1.18E-08	La-138	2.63E-16
F^{-}	3.53E-02	Ti^{+4}	1.39E-04	Pu-244	3.13E-17	Ce-142	4.11E-11
Gd^{+3}	1.86E-04	U^{+4}	4.07E-04	Am-241	6.82E-05	Ce-144	8.80E-07
Ge^{+4}	1.25E-08	V^{+5}	4.16E-05	Am-242m	2.37E-08	Pr-144	8.80E-07
In^{+3}	1.97E-06	Y^{+3}	9.76E-06	Am-242	2.36E-08	Nd-144	2.21E-15
I^{-}	3.61E-06	Zn^{+2}	9.43E-04	Am-243	3.36E-08	Pm-146	7.00E-08
Fe^{+3}	2.56E-02	Zr^{+4}	5.93E-03	Cm-242	4.66E-08	Pm-147	2.39E-04
La^{+3}	1.31E-05	O-2	2.16E-02	Cm-243	3.92E-08	Sm-146	3.80E-13
Pb^{+2}	1.03E-03	H2O	4.55E+01	Cm-244	1.09E-06	Sm-147	1.01E-11
Li^{+}	3.63E-04			Cm-245	4.12E-10	Sm-148	5.21E-17
Mg^{+2}	2.58E-02		g/liter	Cm-246	2.71E-11	Sm-149	4.62E-18
Mn^{+4}	1.66E-02	TOC	0.40			Sm-151	4.71E-04
Hg^{+2}	7.10E-03	UDS	4.69	H-3	1.68E-05	Eu-150	1.98E-11
Mo^{+6}	2.85E-04			Be-10	4.13E-12	Eu-152	3.49E-06
Nd^{+3}	4.22E-05		Ci/liter	C-14	1.69E-10	Eu-154	2.54E-04
Np^{+4}	2.41E-05		(Jan, 2003)	Se-79	7.09E-07	Eu-155	2.26E-04
Ni^{+2}	2.59E-03	Ra-226	1.15E-11	Rb-87	4.03E-11	Gd-152	1.96E-18
Nb^{+5}	1.80E-04	Ac-227	5.42E-11	Sr-90	5.25E-02	Ho-166m	6.33E-11
NO_3^{-}	6.71E+00	Th-230	1.18E-09	Y-90	5.25E-02	Co-60	5.85E-05
Pd^{+4}	3.98E-04	Th-231	2.95E-08	Zr-93	3.05E-06	Ni-63	4.60E-05

Table 7. Tank WM-188 composition without solids and with twice the expected solids.

	No Solids	Max solids		No Solids	Max solids		No Solids	Max solids		No Solids	Max solids
Gal	281,670	281,670		mol/liter	mol/liter		Ci/liter	Ci/liter		Ci/liter	Ci/liter
SG	1.31	1.32	PO_4^{-3}	1.21E-03	2.68E-02	Th-232	9.77E-16	9.95E-16	Tc-98	3.56E-12	3.62E-12
			Pu^{+4}	5.39E-06	5.49E-06	Th-234	2.86E-08	2.91E-08	Tc-99	2.39E-05	2.64E-05
	mol/liter	mol/liter	K^+	1.76E-01	1.83E-01	Pa-231	1.23E-10	1.26E-10	Ru-106	1.28E-06	1.36E-06
H+	2.68E+00	2.73E+00	Pr^{+4}	1.19E-05	1.22E-05	Pa-233	4.04E-06	4.12E-06	Rh-102	1.19E-09	1.21E-09
Al^{+3}	6.74E-01	6.95E-01	Pm^{+3}	1.75E-09	1.78E-09	Pa-234m	2.86E-08	2.91E-08	Rh-106	1.28E-06	1.36E-06
Am^{+4}	8.34E-08	8.49E-08	Rh^{+4}	5.15E-06	5.25E-06	U-232	2.89E-09	3.07E-09	Pd-107	2.28E-08	2.32E-08
Sb^{+5}	4.71E-06	7.04E-06	Rb^+	7.93E-06	8.07E-06	U-233	1.16E-10	1.22E-10	Cd-113m	4.58E-06	4.67E-06
As^{+5}	7.86E-06	1.30E-05	Ru^{+3}	1.71E-04	2.91E-04	U-234	1.27E-06	1.34E-06	In-115	1.39E-16	1.41E-16
Ba^{+2}	7.78E-05	8.24E-05	Sm^{+3}	7.85E-06	7.99E-06	U-235	1.06E-07	1.11E-07	Sn-121m	9.22E-08	9.40E-08
Be^{+2}	1.78E-05	2.02E-05	Se^{+4}	4.37E-06	9.57E-06	U-236	4.91E-08	5.24E-08	Sn-126	5.67E-07	6.00E-07
B^{+3}	2.17E-02	2.26E-02	Si^{+4}	7.79E-04	2.83E-02	U-237	9.34E-09	9.72E-09	Sb-125	1.91E-05	3.04E-05
Br^-	4.36E-07	4.44E-07	Ag^+	5.80E-06	3.18E-05	U-238	1.51E-08	1.59E-08	Sb-126m	5.67E-07	5.77E-07
Cd^{+2}	3.31E-03	3.40E-03	Na^+	1.52E+00	1.57E+00	Np-237	4.04E-06	4.12E-06	Sb-126	7.93E-08	8.08E-08
Ca^{+2}	6.53E-02	6.74E-02	Sr^{+2}	9.79E-05	1.02E-04	Np-238	8.15E-10	8.20E-10	Te-123	5.29E-19	5.38E-19
Ce^{+4}	3.41E-05	3.67E-05	SO_4^{-2}	3.68E-02	3.92E-02	Np-239	2.30E-07	2.31E-07	Te-125m	4.35E-06	4.43E-06
Cs^+	3.53E-05	3.87E-05	Tc^{+7}	1.42E-05	1.45E-05	Pu-236	4.05E-09	4.03E-09	I-129	7.36E-08	7.79E-08
Cl^-	2.99E-02	3.20E-02	Te^{+4}	4.67E-06	4.76E-06	Pu-238	6.46E-04	6.54E-04	Cs-134	7.56E-05	7.86E-05
Cr^{+3}	5.35E-03	5.62E-03	Tb^{+4}	3.02E-09	3.08E-09	Pu-239	7.32E-05	7.47E-05	Cs-135	1.19E-06	1.25E-06
Co^{+2}	4.81E-05	5.07E-05	Tl^{+3}	1.92E-06	4.27E-06	Pu-240	1.49E-05	1.48E-05	Cs-137	6.96E-02	7.33E-02
Cu^{+2}	7.69E-04	7.96E-04	Th^{+4}	3.28E-05	3.34E-05	Pu-241	4.09E-04	4.17E-04	Ba-137m	6.58E-02	6.94E-02
Eu^{+3}	7.23E-07	7.36E-07	Sn^{+4}	4.70E-05	3.17E-04	Pu-242	1.20E-08	1.19E-08	La-138	2.63E-16	2.68E-16
F^-	3.54E-02	3.61E-02	Ti^{+4}	6.65E-05	2.14E-04	Pu-244	3.20E-17	3.13E-17	Ce-142	4.12E-11	4.20E-11
Gd^{+3}	1.85E-04	1.91E-04	U^{+4}	4.02E-04	4.23E-04	Am-241	6.84E-05	6.96E-05	Ce-144	8.64E-07	9.17E-07
Ge^{+4}	1.26E-08	1.28E-08	V^{+5}	4.05E-05	4.36E-05	Am-242m	2.39E-08	2.41E-08	Pr-144	8.64E-07	9.17E-07
In^{+3}	1.98E-06	2.01E-06	Y^{+3}	9.79E-06	9.97E-06	Am-242	2.38E-08	2.40E-08	Nd-144	2.22E-15	2.26E-15
I^-	3.62E-06	3.69E-06	Zn^{+2}	9.37E-04	9.71E-04	Am-243	3.37E-08	3.43E-08	Pm-146	7.02E-08	7.15E-08
Fe^{+3}	2.51E-02	2.67E-02	Zr^{+4}	3.34E-03	8.59E-03	Cm-242	4.68E-08	4.76E-08	Pm-147	2.35E-04	2.49E-04
La^{+3}	1.31E-05	1.34E-05	O-2		4.32E-02	Cm-243	3.92E-08	4.02E-08	Sm-146	3.80E-13	3.88E-13
Pb^{+2}	1.03E-03	1.06E-03	H2O	4.56E+01	4.50E+01	Cm-244	1.08E-06	1.12E-06	Sm-147	1.02E-11	1.03E-11
Li^+	3.52E-04	3.82E-04				Cm-245	4.12E-10	4.22E-10	Sm-148	5.22E-17	5.32E-17
Mg^{+2}	2.57E-02	2.65E-02		g/liter	g/liter	Cm-246	2.71E-11	2.78E-11	Sm-149	4.63E-18	4.72E-18
Mn^{+4}	1.66E-02	1.70E-02	TOC	0.40	0.41				Sm-151	4.63E-04	4.91E-04
Hg^{+2}	7.12E-03	7.25E-03	UDS	0	9.4	H-3	1.69E-05	1.72E-05	Eu-150	1.98E-11	2.02E-11
Mo^{+6}	2.69E-04	3.06E-04				Be-10	4.14E-12	4.22E-12	Eu-152	3.47E-06	3.60E-06
Nd^{+3}	4.23E-05	4.31E-05		Ci/liter	Ci/liter	C-14	1.66E-10	1.75E-10	Eu-154	2.53E-04	2.60E-04
Np^{+4}	2.42E-05	2.46E-05		(Jan, 2003)	(Jan, 2003)	Se-79	6.03E-07	8.29E-07	Eu-155	2.25E-04	2.33E-04
Ni^{+2}	2.55E-03	2.69E-03	Ra-226	1.13E-11	1.15E-11	Rb-87	4.04E-11	4.12E-11	Gd-152	1.96E-18	2.00E-18
Nb^{+5}	3.11E-05	3.30E-04	Ac-227	5.32E-11	5.42E-11	Sr-90	5.24E-02	5.39E-02	Ho-166m	6.35E-11	6.47E-11
NO_3^-	6.71E+00	6.87E+00	Th-230	1.13E-09	1.16E-09	Y-90	5.24E-02	5.39E-02	Co-60	5.83E-05	6.01E-05
Pd^{+4}	3.75E-04	4.30E-04	Th-231	2.89E-08	2.95E-08	Zr-93	3.06E-06	3.11E-06	Ni-63	4.62E-05	4.70E-05

Table 8. Tank WM-188 solids composition.

	Weight percent		Weight percent		Ci/kg		Ci/kg
Al^{+3}	2.28E+00	Ni^{+2}	5.56E-02	C-14	7.27E-10	Eu-155	4.50E-04
Sb^{+5}	2.91E-03	Nb^{+5}	2.96E-01	Co-60	7.75E-05	Th-230	2.71E-09
As^{+5}	4.02E-03	NO_3^-	1.68E+01	Ni-59	2.30E-05	U-232	7.25E-09
Ba^{+2}	4.56E-03	Pd^{+4}	5.40E-02	Ni-63	3.81E-04	U-233	1.25E-10
Be^{+2}	2.01E-04	PO_4^{-3}	2.64E+01	Se-79	2.62E-06	U-234	1.18E-06
B^{+3}	6.47E-02	K^+	1.93E+00	Sr-90	5.51E-02	U-235	8.89E-08
Cd^{+2}	3.38E-02	Ru^{+3}	1.26E-01	Y-90	5.51E-02	U-236	1.35E-07
Ca^{+2}	3.75E-01	Se^{+4}	4.31E-03	Tc-99	2.23E-04	U-238	2.09E-08
Ce^{+4}	3.01E-03	Si^{+4}	8.23E+00	Ru-106	5.66E-06	Np-237	6.41E-07
Cs^+	3.93E-03	Ag^+	2.97E-02	Rh-106	5.66E-06	Pu-236	7.97E-09
Cl^-	5.88E-01	Na^+	5.52E+00	Sn-126	2.47E-06	Pu-238	2.45E-03
Cr^{+3}	9.73E-02	Sr^{+2}	2.20E-03	Sb-125	1.17E-03	Pu-239	3.36E-04
Co^{+2}	1.10E-03	SO_4^{-2}	1.69E+00	I-129	3.20E-07	Pu-240	3.07E-05
Cu^{+2}	8.64E-03	Tl^{+3}	5.03E-03	Cs-134	1.70E-04	Pu-241	1.89E-03
F^-	0.00E+00	Sn^{+4}	3.41E-01	Cs-135	4.61E-06	Pu-242	2.32E-08
Gd^{+3}	3.93E-03	Ti^{+4}	7.47E-02	Cs-137	2.62E-01	Pu-244	1.99E-15
Fe^{+3}	6.86E-01	U^{+4}	3.30E-02	Ba-137m	2.47E-01	Am-241	5.31E-05
Pb^{+2}	2.73E-02	V^{+5}	1.20E-03	Ce-144	3.84E-06	Am-243	2.59E-08
Li^+	1.68E-03	Zn^{+2}	1.15E-02	Pr-144	3.84E-06	Cm-242	5.29E-11
Mg^{+2}	7.20E-02	Zr^{+4}	5.04E+00	Pm-147	1.02E-03	Cm-243	2.71E-08
Mn^{+4}	9.07E-02	O-2	7.36E+00	Sm-151	2.03E-03	Cm-244	1.70E-06
Hg^{+2}	0.00E+00	H2O	2.16E+01	Eu-152	6.89E-06	Cm-245	2.88E-10
Mo^{+6}	3.24E-02	Total	100.00	Eu-154	2.12E-04	Cm-246	1.87E-11
assumed specific gravity		2.0					

The solids composition shown in Table 8 is based on analyses data from a sample of WM-188 waste taken in FY 2003 (see Johnson 2003a). The sample was allowed to settle, the sludge layer then filtered, the solids washed with water and isopropyl alcohol and then dried. The dried solids were fused, dissolved in nitric acid or water and then analyzed using the same techniques as used for the tank liquid.

The elements Sb, As, Be, Ce, Cs, Li, Se, Tl, U and V were not detected in the sample; values shown above are based on detection limits. No analyses for Cl, F or Hg were performed for this sample; values shown above were based on the average of analyses of other tank solids samples. The concentration of water shown in Table 8 is meant to be all hydrated water. No analysis for hydrated water was performed, the value of 21.6% is an estimate based primarily on the concentration of sulfates and phosphates and some assumed hydrate compounds. The concentration of oxides in the solids was calculated by charge balance. Finally, the concentrations of all chemical species except hydrated water were normalized to arrive at the values shown above.

The solids sample was analyzed for twenty radionuclides. Of these twenty, two were not detected (^{59}Ni and ^{95}Zr), and the analytical result for one (^{242}Cm) was negative. Concentrations shown in Table 8 for radionuclides other than these 17 were derived from activities for solids from Tanks WM-182 and WM-183 as published by Swenson (MCS-06-02, 2002). To arrive at these estimates, the activities shown in Table A of MCS-06-02 for Tanks WM-182 and WM-183 were first decayed to January, 2003. The averages of the decayed activity for each radionuclide in the two tanks were then used to calculate ratios. These ratios were then used to estimate activities for Tank WM-188 radionuclides. For example, the activity of ^{135}Cs in WM-188 solids was estimated by multiplying the measured activity of ^{137}Cs in the WM-188 sample by the ratio of ^{135}Cs to ^{137}Cs in Tank WM-182 and WM-183 solids.

2.3 WM-189 Composition

Samples were taken from Tank WM-189 in March 2002. No waste has been added to this tank since that time or is expected to be in the future. Three separate samples of the liquid were taken via airlifting tank waste to the NWCF, where it could be sampled. A sample of tank waste near the bottom of the tank was then taken using the tank steam jet. The sampling procedure, analysis methods and results were reported by Batcheller and Taylor (2003). Table 9 shows the composition of waste in WM-189 with an estimated amount of solids. Table 10 shows the composition of the waste with no solids and with twice the expected amount.

Table 9. WM-189 waste composition, liquids and solids.

Gallons	**279,800**		**mol/liter**		**mol/liter**		**Ci/liter**		**Ci/liter**
SG	1.34	Hg^{+2}	6.45E-03	Y^{+3}	7.01E-06	Pu-238	4.08E-04	Sn-121m	6.61E-08
		Mo^{+6}	3.11E-04	Zn^{+2}	1.08E-03	Pu-239	4.65E-05	Sn-126	4.29E-07
	mol/liter	Nd^{+3}	3.03E-05	Zr^{+4}	5.57E-03	Pu-240	1.03E-05	Sb-125	2.38E-05
H+	2.86E+00	Np^{+4}	1.73E-05	O-2	4.34E-02	Pu-241	4.14E-04	Sb-126m	4.06E-07
Al^{+3}	7.24E-01	Ni^{+2}	2.41E-03	H2O	4.27E+01	Pu-242	8.04E-09	Sb-126	5.69E-08
Am^{+4}	8.94E-08	Nb^{+5}	5.48E-04			Pu-244	6.88E-16	Te-123	3.79E-19
Sb^{+5}	9.81E-06	NO_3^-	7.53E+00		g/liter	Am-241	7.36E-05	Te-125m	3.11E-06
As^{+5}	1.06E-05	Pd^{+4}	5.15E-05	TOC	0.58	Am-242m	1.50E-08	I-129	5.58E-08
Ba^{+2}	5.91E-05	PO_4^{-3}	2.65E-02	UDS	9.4	Am-242	1.50E-08	Cs-134	4.17E-05
Be^{+2}	2.22E-05	Pu^{+4}	3.86E-06			Am-243	2.14E-08	Cs-135	8.93E-07
B^{+3}	2.16E-02	K^+	2.29E-01		Ci/liter	Cm-242	2.97E-08	Cs-137	5.23E-02
Br^-	3.12E-07	Pr^{+4}	8.56E-06		(Jan, 2003)	Cm-243	2.83E-08	Ba-137m	4.95E-02
Cd^{+2}	3.92E-03	Pm^{+3}	1.31E-09	Ra-226	8.10E-12	Cm-244	1.06E-06	La-138	1.89E-16
Ca^{+2}	7.36E-02	Rh^{+4}	3.69E-06	Ac-227	3.81E-11	Cm-245	2.98E-10	Ce-142	2.96E-11
Ce^{+4}	3.73E-05	Rb^+	5.68E-06	Th-230	8.39E-10	Cm-246	1.96E-11	Ce-144	6.56E-07
Cs^+	2.95E-05	Ru^{+3}	2.89E-04	Th-231	2.07E-08			Pr-144	6.56E-07
Cl^-	2.22E-02	Sm^{+3}	5.63E-06	Th-232	7.00E-16	H-3	9.61E-06	Nd-144	1.59E-15
Cr^{+3}	5.84E-03	Se^{+4}	9.76E-06	Th-234	2.05E-08	Be-10	2.97E-12	Pm-146	5.03E-08
Co^{+2}	4.84E-05	Si^{+4}	2.80E-02	Pa-231	8.83E-11	C-14	1.26E-10	Pm-147	1.78E-04
Cu^{+2}	9.70E-04	Ag^+	2.80E-05	Pa-233	2.90E-06	Se-79	6.49E-07	Sm-146	2.73E-13
Eu^{+3}	5.18E-07	Na^+	2.07E+00	Pa-234m	2.05E-08	Rb-87	2.90E-11	Sm-147	7.28E-12
F^-	1.37E-02	Sr^{+2}	1.43E-04	U-232	2.03E-09	Sr-90	3.91E-02	Sm-148	3.74E-17
Gd^{+3}	1.37E-04	SO_4^{-2}	1.08E-01	U-233	8.02E-11	Y-90	3.91E-02	Sm-149	3.32E-18
Ge^{+4}	9.01E-09	Tc^{+7}	7.16E-06	U-234	1.75E-06	Zr-93	2.19E-06	Sm-151	3.51E-04
In^{+3}	1.42E-06	Te^{+4}	7.22E-06	U-235	6.07E-08	Tc-98	2.55E-12	Eu-150	1.42E-11
I^-	2.59E-06	Tb^{+4}	2.17E-09	U-236	7.90E-08	Tc-99	1.20E-05	Eu-152	2.55E-06
Fe^{+3}	2.81E-02	Tl^{+3}	4.34E-06	U-237	6.36E-09	Ru-106	9.73E-07	Eu-154	1.85E-04
La^{+3}	9.41E-06	Th^{+4}	3.48E-05	U-238	4.35E-08	Rh-102	8.52E-10	Eu-155	1.67E-04
Pb^{+2}	1.17E-03	Sn^{+4}	3.12E-04	Np-237	2.90E-06	Rh-106	9.73E-07	Gd-152	1.41E-18
Li^+	4.04E-04	Ti^{+4}	2.20E-04	Np-238	4.71E-10	Pd-107	1.63E-08	Ho-166m	4.55E-11
Mg^{+2}	2.23E-02	U^{+4}	6.69E-04	Np-239	1.33E-07	Cd-113m	3.28E-06	Co-60	3.68E-05
Mn^{+4}	1.95E-02	V^{+5}	2.74E-05	Pu-236	2.78E-09	In-115	9.95E-17	Ni-63	3.13E-05

Table 10. Tank WM-189 composition without solids and with twice the expected solids.

	No Solids	Max solids		No Solids	Max solids		No Solids	Max solids		No Solids	Max solids
Gallons	279,800	279,800		mol/liter	mol/liter		Ci/liter	Ci/liter		Ci/liter	Ci/liter
SG	1.34	1.34	PO_4^{-3}	2.07E-03	5.27E-02	Th-232	7.04E-16	6.97E-16	Tc-98	2.56E-12	2.54E-12
			Pu^{+4}	3.88E-06	3.84E-06	Th-234	2.06E-08	2.04E-08	Tc-99	9.96E-06	1.41E-05
	mol/liter	mol/liter	K^{+}	2.25E-01	2.32E-01	Pa-231	8.88E-11	8.79E-11	Ru-106	9.24E-07	1.02E-06
H+	2.88E+00	2.85E+00	Pr^{+4}	8.60E-06	8.52E-06	Pa-233	2.91E-06	2.88E-06	Rh-102	8.56E-10	8.48E-10
Al^{+3}	7.19E-01	7.28E-01	Pm^{+3}	1.26E-09	1.37E-09	Pa-234m	2.06E-08	2.04E-08	Rh-106	9.24E-07	1.02E-06
Am^{+4}	8.92E-08	8.96E-08	Rh^{+4}	3.71E-06	3.67E-06	U-232	1.97E-09	2.09E-09	Pd-107	1.64E-08	1.63E-08
Sb^{+5}	7.59E-06	1.20E-05	Rb^{+}	5.71E-06	5.65E-06	U-233	7.94E-11	8.10E-11	Cd-113m	3.30E-06	3.27E-06
As^{+5}	5.55E-06	1.56E-05	Ru^{+3}	1.72E-04	4.05E-04	U-234	1.75E-06	1.76E-06	In-115	1.00E-16	9.91E-17
Ba^{+2}	5.62E-05	6.20E-05	Sm^{+3}	5.65E-06	5.60E-06	U-235	6.01E-08	6.12E-08	Sn-121m	6.64E-08	6.58E-08
Be^{+2}	2.02E-05	2.42E-05	Se^{+4}	4.62E-06	1.49E-05	U-236	7.81E-08	7.99E-08	Sn-126	4.08E-07	4.51E-07
B^{+3}	2.12E-02	2.21E-02	Si^{+4}	3.09E-04	5.57E-02	U-237	6.39E-09	6.33E-09	Sb-125	1.28E-05	3.48E-05
Br^{-}	3.14E-07	3.11E-07	Ag^{+}	2.05E-06	5.40E-05	U-238	4.35E-08	4.35E-08	Sb-126m	4.08E-07	4.04E-07
Cd^{+2}	3.91E-03	3.93E-03	Na^{+}	2.06E+00	2.08E+00	Np-237	2.91E-06	2.88E-06	Sb-126	5.71E-08	5.66E-08
Ca^{+2}	7.31E-02	7.42E-02	Sr^{+2}	1.42E-04	1.45E-04	Np-238	4.79E-10	4.62E-10	Te-123	3.81E-19	3.77E-19
Ce^{+4}	3.55E-05	3.92E-05	SO_4^{-2}	1.07E-01	1.10E-01	Np-239	1.35E-07	1.30E-07	Te-125m	3.13E-06	3.10E-06
Cs^{+}	2.68E-05	3.21E-05	Tc^{+7}	5.94E-06	8.39E-06	Pu-236	2.72E-09	2.84E-09	I-129	5.30E-08	5.85E-08
Cl^{-}	2.07E-02	2.37E-02	Te^{+4}	7.26E-06	7.19E-06	Pu-238	3.87E-04	4.30E-04	Cs-134	4.03E-05	4.31E-05
Cr^{+3}	5.69E-03	5.99E-03	Tb^{+4}	2.18E-09	2.16E-09	Pu-239	4.35E-05	4.94E-05	Cs-135	8.54E-07	9.33E-07
Co^{+2}	4.68E-05	4.99E-05	Tl^{+3}	2.03E-06	6.66E-06	Pu-240	1.01E-05	1.06E-05	Cs-137	5.01E-02	5.46E-02
Cu^{+2}	9.62E-04	9.78E-04	Th^{+4}	3.50E-05	3.46E-05	Pu-241	3.98E-04	4.30E-04	Ba-137m	4.74E-02	5.16E-02
Eu^{+3}	5.20E-07	5.15E-07	Sn^{+4}	4.14E-05	5.83E-04	Pu-242	7.85E-09	8.22E-09	La-138	1.90E-16	1.88E-16
F^{-}	1.37E-02	1.36E-02	Ti^{+4}	7.29E-05	3.67E-04	Pu-244	6.73E-16	7.04E-16	Ce-142	2.97E-11	2.94E-11
Gd^{+3}	1.35E-04	1.39E-04	U^{+4}	6.68E-04	6.70E-04	Am-241	7.34E-05	7.37E-05	Ce-144	6.23E-07	6.89E-07
Ge^{+4}	9.05E-09	8.96E-09	V^{+5}	2.53E-05	2.96E-05	Am-242m	1.51E-08	1.50E-08	Pr-144	6.23E-07	6.89E-07
In^{+3}	1.42E-06	1.41E-06	Y^{+3}	7.05E-06	6.98E-06	Am-242	1.50E-08	1.49E-08	Nd-144	1.60E-15	1.58E-15
I^{-}	2.61E-06	2.58E-06	Zn^{+2}	1.07E-03	1.09E-03	Am-243	2.13E-08	2.16E-08	Pm-146	5.05E-08	5.01E-08
Fe^{+3}	2.70E-02	2.91E-02	Zr^{+4}	3.56E-04	1.08E-02	Cm-242	2.98E-08	2.95E-08	Pm-147	1.69E-04	1.87E-04
La^{+3}	9.45E-06	9.37E-06	O-2		8.69E-02	Cm-243	2.82E-08	2.85E-08	Sm-146	2.74E-13	2.71E-13
Pb^{+2}	1.16E-03	1.18E-03	H2O	4.29E+01	4.25E+01	Cm-244	1.05E-06	1.07E-06	Sm-147	7.32E-12	7.25E-12
Li^{+}	3.83E-04	4.25E-04				Cm-245	2.96E-10	2.99E-10	Sm-148	3.76E-17	3.72E-17
Mg^{+2}	2.21E-02	2.24E-02		g/liter	g/liter	Cm-246	1.95E-11	1.97E-11	Sm-149	3.34E-18	3.31E-18
Mn^{+4}	1.95E-02	1.96E-02	TOC	0.59	0.58				Sm-151	3.33E-04	3.69E-04
Hg^{+2}	6.48E-03	6.42E-03	UDS	0	18.9	H-3	9.66E-06	9.57E-06	Eu-150	1.43E-11	1.41E-11
Mo^{+6}	2.80E-04	3.41E-04				Be-10	2.98E-12	2.95E-12	Eu-152	2.50E-06	2.61E-06
Nd^{+3}	3.05E-05	3.02E-05		Ci/liter	Ci/liter	C-14	1.19E-10	1.32E-10	Eu-154	1.84E-04	1.86E-04
Np^{+4}	1.74E-05	1.73E-05		(Jan, 2003)	(Jan, 2003)	Se-79	4.34E-07	8.63E-07	Eu-155	1.63E-04	1.70E-04
Ni^{+2}	2.33E-03	2.49E-03	Ra-226	8.14E-12	8.06E-12	Rb-87	2.91E-11	2.88E-11	Gd-152	1.41E-18	1.40E-18
Nb^{+5}	2.49E-04	8.47E-04	Ac-227	3.83E-11	3.80E-11	Sr-90	3.88E-02	3.95E-02	Ho-166m	4.57E-11	4.53E-11
NO_3^{-}	7.53E+00	7.52E+00	Th-230	8.17E-10	8.60E-10	Y-90	3.88E-02	3.95E-02	Co-60	3.62E-05	3.73E-05
Pd^{+4}	3.61E-06	9.94E-05	Th-231	2.08E-08	2.06E-08	Zr-93	2.20E-06	2.18E-06	Ni-63	3.14E-05	3.11E-05

Based on recent analyses (Batcheller 2003), Tank WM-189 waste has a TOC content of 0.6 g/liter, including 0.16 mg/liter volatile organics and 1.1 mg/liter semi-volatile organics.

Compositions shown in Tables 9 and 10 assume a solids composition equal to that of Tank WM-188, shown in Table 8. A large fraction of the waste in Tanks WM-188 and WM-189 was from the same source, hence it is reasonable that the solids should be similar in composition. Analyses were performed of a solids sample from Tank WM-189 (Batcheller 2003), but the solids were not washed prior to drying and hence included a large fraction (estimated to be about 78% of the total solids) of dissolved solids that crystallized upon drying. A comparison of the tank composition based on the WM-189 solids analysis to what is shown in Table 9 is given in Table 35.

2.4 Newly Generated Liquid Waste (NGLW)

Waste from 24 different sources are projected to be added to Tank Farm tanks or to WM-100, WM-101, and WM-102 as NGLW over the next nine years. Table 11 shows the projected volumes of waste that will be generated from 2004 to 2012. These estimated volumes do not include any dilute aqueous waste generated by a SBW treatment process, or decontamination wastes generated prior to treatment in preparing the NWCF should it be selected as the treatment method. A description of each stream can be found in the Waste Minimization Plan (Demmer 2002).

Table 12 shows typical concentration factors for each of these waste streams and expected volumes after concentration. Table 12 also shows that after concentration only a few streams account for the majority of the waste volume (4 streams account for 79% of the total, 10 streams for 96%, and 14 streams for 99%).

In this section, the composition of eleven streams, amounting to 96.8% of the total as concentrated waste, is first presented. Then, using these compositions, results of modeling the evaporation of these dilute wastes are presented which define compositions and volumes that will need to be treated in the SBW treatment facility.

Table 11. Projected dilute NGLW volumes.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Dilute
Waste Stream	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons	Gallons
NWCF operations (ETS)	500	500	500	500	0	0	0	0	0	2,000
Tank Farm Vessel Flushes	171,000	0	0	0	0	100,000	50,000	50,000	0	371,000
Tank Farm Line Flushes	3,400	3,400	3,400	3,400	500	500	500	500	500	16,100
Vault Flush	0	0	0	0	14,400	14,400	14,400	14,400	14,400	72,000
Filter Leach (1st leach)	2,389	2,389	2,389	2,389	2,389	2,389	2,389	2,389	2,389	21,504
Filter Leach	9,558	9,558	9,558	9,558	9,558	9,558	9,558	9,558	9,558	86,018
PBF D&D	30,000	0	0	0	0	0	0	0	0	30,000
FAST Operations	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	315,000
CPP-603 Basin Water	600,000	900,000	0	0	0	0	0	0	0	1,500,000
CPP-603 Operations	10,000	10,000	0	0	0	0	0	0	0	20,000
TAN Pool Water	0	0	750,000	0	0	0	0	0	0	750,000
MTR Canal Water	0	0	0	125,000	0	0	0	0	0	125,000
TAN V-Tank	0	0	0	0	6,000	0	0	0	0	6,000
NWCF Utility Tunnel	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	13,500
CPP-604 Sumps	15,000	15,000	15,000	15,000	3,000	3,000	3,000	3,000	3,000	75,000
Tank Farm Sumps	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	0	240,000
LET&D	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	11,700
LET&D Bottoms	2,500	2,500	2,500	2,500	2,500	2,500	2,500	0	0	17,500
CPP-601 (Lab Drains)	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	180,000
NWCF Decon Facility	32,500	32,500	32,500	32,500	32,500	32,500	32,500	32,500	32,500	292,500
CPP-601/627/640 Deactivation	0	0	0	0	45,000	0	0	0	0	45,000
Misc. Deactivation Rinses	0	0	0	0	0	0	0	4,000	5,000	9,000
TRA-689 Decon Solution	0	0	0	0	0	0	0	35,000	0	35,000
PEW Descale	1,200	1,200	1,200	1,200	400	400	400	400	400	6,800
Misc. Balance of Plant	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	180,000
Total gallons	**814,847**	**1,084,847**	**924,847**	**299,847**	**224,047**	**173,047**	**173,047**	**209,547**	**145,547**	**4,420,622**

Table 12. Initial estimates of concentrated NGLW volumes.

Waste Stream	Typical Concentration Factors PEWE	ETS	Total Volume Dilute	Volume after PEWE	Volume after ETS	% of total concentrated	Rank
			gal	gal	gal		
NWCF Operations (ETS)	1	1	2,000	2,000	2,000	2.48%	8
Tank Farm Vessel Flushes	1	200	371,000	371,000	1,855	2.30%	9
Tank Farm Line Flushes	1	1	16,100	16,100	16,100	20.00%	2
Vault Flush	20	2	72,000	3,600	1,800	2.24%	10
Filter Leach (1st leach)	1	2	21,504	21,504	10,752	13.36%	3
Filter Leach	10	2	86,018	8,602	4,301	5.34%	3
PBF D&D	1000	2	30,000	30	15	0.02%	21
FAST Operations	1000	2	315,000	315	158	0.20%	17
CPP-603 Basin Water	1000	2	1,500,000	1,500	750	0.93%	12
CPP-603 Operations	1000	2	20,000	20	10	0.01%	22
TAN Pool Water	1000	2	750,000	750	375	0.47%	14
MTR Canal Water	1000	2	125,000	125	63	0.08%	19
TAN V-Tank	1000	2	6,000	6	3	0.004%	24
NWCF Utility Tunnel	1000	2	13,500	14	7	0.01%	23
CPP-604 Sumps	1000	2	75,000	75	38	0.05%	20
Tank Farm Sumps	1000	2	240,000	240	120	0.15%	18
LET&D	35	2	11,700	334	167	0.21%	16
LET&D Bottoms	1	1	17,500	17,500	17,500	21.74%	1
CPP-601 (Lab Drains)	35	2	180,000	5,143	2,571	3.19%	6
NWCF Decon Facility	10	2	292,500	29,250	14,625	18.17%	4
CPP-601/627/640 Deactivation	10	2	45,000	4,500	2,250	2.80%	7
Misc. Deactivation Rinses	20	2	9,000	450	225	0.28%	15
TRA-689 Decon Solution	35	2	35,000	1,000	500	0.62%	13
PEW Descale	1	2	6,800	6,800	3,400	4.22%	5
Misc. Balance of Plant	100	2	180,000	1,800	900	1.12%	11
Total gallons			**4,420,622**	**492,658**	**80,484**	**100.00%**	

2.4.1 Compositions of Individual Waste Streams

This section details compositions of individual waste streams.

2.4.1.1 LET&D Bottoms. The Liquid Effluent Treatment and Disposal Facility (LET&D) processes the overhead from the PEW evaporator by fractionation. The fractionator overheads are filtered and released to the atmosphere. The fractionator bottoms is concentrated nitric acid with small concentrations of halides and metals. Samples of LET&D bottoms were taken in 1999 and 2000 from the LET&D bottoms tank, WLL-195, and are reported in the Balance of Plant Analysis Report (Nenni 2002). The composition of LET&D bottoms, shown in Table 13, is largely based on these analyses.

Table 13. Estimated LET&D bottoms composition.

	Mol/liter	
H+	1.21E+01	
Al^{+3}	5.61E-02	
Sb^{+5}	6.92E-07	1
As^{+5}	1.62E-06	1
Ba^{+2}	9.77E-07	
Be^{+2}	8.65E-07	
B^{+3}	2.10E-04	2
Cd^{+2}	1.89E-07	1
Ca^{+2}	7.44E-04	2
Cl^{-}	6.57E-03	2
Cr^{+3}	1.70E-03	
Co^{+2}	1.75E-04	
Cu^{+2}	8.54E-05	
F^{-}	7.16E-03	1
Fe^{+3}	2.92E-04	2
Pb^{+2}	4.62E-07	1
Mn^{+4}	5.83E-05	
Hg^{+2}	2.34E-04	
Ni^{+2}	1.94E-03	
NO_3^{-}	1.23E+01	3
PO_4^{-3}	7.49E-05	2
K^{+}	2.51E-03	2
Se^{+4}	1.27E-06	1
Ag^{+}	1.91E-07	1
Na^{+}	2.40E-02	2
S^{+6}	1.09E-03	2
Tl^{+3}	5.75E-07	1
U^{+4}	5.68E-07	1
V^{+5}	1.67E-06	
Zn^{+2}	1.50E-05	
Zr^{+4}	2.91E-06	2
	g/liter	
UDS	2.22E-02	
TIC	4.47E-02	
TOC	1.41E-02	

1. Gray shading indicates data contains flags, typically below detection limits or detected in blank

2. Red shading indicates value was estimated based on concentrations of other known species and the concentration of the unknown species in SBW

3. Blue shading indicates that value was obtained by charge balance

No shading indicates the average of analytical data for three samples. Data points with qualifying flags were excluded from the averages.

Estimates of species that were not analyzed were obtained by multiplying the ratio of the concentration of a given species in SBW by the average ratio of a representative species in the LET&D bottoms to the concentration of these same species in SBW. To estimate the concentration of chloride, the fluoride ratio was used. The other estimated species are all nonvolatile and the average ratio for barium, manganese, and zinc was used to estimate the nonvolatile species.

If the calciner is in operation, the LET&D bottoms can be used as make-up acid for scrub solution. It can also be used in the filter leach operation.

2.4.1.2 Tank Farm Line Flushes. This waste is generated when Tank Farm lines are flushed to reduce radiation fields to allow hands-on maintenance work. This waste continues to be generated during regular maintenance and testing of line integrity, and prior to valve box upgrades. This waste stream should be reduced to a minimum after the valve box upgrades are completed in FY 2006. The composition of Tank Farm line flushes was assumed equal to the average SBW composition as of September 30, 2002.

2.4.1.3 Filter Leach. This waste is generated from preparing spent HEPA filters for disposal. As of 2004, approximately 50 filters await treatment. The filter leach composition, shown in Table 14, is based on the analyses of five samples from NWCF Decontamination Tanks NCD-123 and NCD-129 taken in 1999 and 2001. The data for these samples is compiled in the Balance of Plant Analysis Report (Nenni 2002). Concentrations shown in Table 14 are averages of data and estimates for species not analyzed. The ratio of concentration of a species in the filter leach waste to the concentration of the same species in SBW, averaged for all species measured in filter leach samples, was used to estimate concentrations of non-analyzed species.

Table 14. Estimated filter leach composition.

	Mol/liter		
H+	5.45E-01		
Al^{+3}	1.83E-03		
Sb^{+5}	5.54E-06		1. Gray shading indicates data contains flags, typically below detection limits or detected in blank
As^{+5}	1.49E-06	1	
Ba^{+2}	8.49E-06		
Be^{+2}	1.33E-07	1	
B^{+3}	6.35E-04	2	2. Red shading indicates value was estimated based on concentrations of other known species and the concentration of the unknown species in SBW
Cd^{+2}	1.34E-06		
Ca^{+2}	2.25E-03	2	
Cl^-	8.54E-04	2	
Cr^{+3}	6.08E-05		
Co^{+2}	3.75E-07	1	3. Blue shading indicates that value was obtained by charge balance
Cu^{+2}	1.96E-05		
F^-	2.15E-03	1	
Fe^{+3}	8.84E-04	2	No shading indicates the average of analytical data for five samples. Data points with qualifying flags were excluded from the averages.
Pb^{+2}	8.45E-06		
Mn^{+4}	2.11E-04		
Hg^{+2}	4.13E-06		
Ni^{+2}	2.86E-05		
NO_3^-	6.57E-01	3	
PO_4^{-3}	2.26E-04	2	
K^+	7.60E-03	2	
Se^{+4}	1.33E-06	1	
Ag^+	7.12E-07	1	
Na^+	7.26E-02	2	
S^{+6}	3.31E-03	2	
Tl^{+3}	5.79E-07	1	
U^{+4}	1.16E-06	1	
V^{+5}	8.42E-07	1	
Zn^{+2}	1.38E-04		
Zr^{+4}	8.79E-06	2	
	g/liter		
UDS	1.50E-02		
TIC	5.88E-02		
TOC	7.03E-01		

2.4.1.4 NWCF Decon Facility. The NWCF Decon Facility waste is generated from decontamination of equipment, treatment of debris, and collection of Utility Tunnel water. Compositional data from 1997 for the NWCF Decon Facility Waste is contained in *Supporting Information for the INEEL Liquid Waste Management Plan* (Tripp 1998). The data include low, average, and high concentration values for six chemical species plus TIC, TOC and UDS. Averages are based on 6 to 20 data points depending on the component. Table 15 shows these averages plus estimates for other species. Estimates were based either on the average SBW or the Process Equipment Waste Evaporator (PEWE) descale composition. Estimates based on SBW were calculated by multiplying the SBW concentration for that specie by the average ratio of decon facility Al and U concentration to SBW Al and U concentration. Since the makeup NWCF Decon solution uses the same chemicals as the PEWE descale (see Section

2.4.1.5), concentrations of the major metal species in the chemicals (Na, K, Cr, and Mn) were assumed the same for the NWCF Decon Facility waste as for the PEWE Descale waste. Table 15 shows the estimated composition of the NWCF Decon Facility waste.

Table 15. Estimated NWCF Decon Facility composition.

	Mol/liter	
H+	7.41E-01	
Al^{+3}	1.23E-02	
Sb^{+5}	4.29E-07	2
As^{+5}	2.80E-06	2
Ba^{+2}	8.47E-07	2
Be^{+2}	2.36E-07	2
B^{+3}	2.71E-04	2
Cd^{+2}	4.14E-05	2
Ca^{+2}	9.59E-04	2
Cl^{-}	1.34E-03	
Cr^{+3}	1.16E-03	1
Co^{+2}	5.48E-07	2
Cu^{+2}	1.30E-05	2
F^{-}	6.21E-03	
Fe^{+3}	3.77E-04	2
Pb^{+2}	1.84E-05	2
Mn^{+4}	6.12E-03	1
Hg^{+2}	2.17E-05	
Ni^{+2}	3.03E-05	2
NO_3^{-}	1.45E+00	3
PO_4^{-3}	9.65E-05	
K^{+}	1.17E-01	1
Se^{+4}	8.19E-07	2
Ag^{+}	2.97E-08	2
Na^{+}	5.25E-01	1
S^{+6}	9.99E-04	
Tl^{+3}	2.29E-07	2
U^{+4}	5.55E-06	
V^{+5}	5.42E-06	2
Zn^{+2}	1.61E-05	2
Zr^{+4}	3.75E-06	2
	g/liter	
UDS	0.79	
TIC		
TOC	0.67	

1. Green shading indicates estimate based on PEWE descale makeup formulation.

2. Red shading indicates value was estimated based on concentrations of other known species and the concentration of the unknown species in SBW

3. Blue shading indicates that value was obtained by charge balance

No shading indicates the average of analytical data.

2.4.1.5 PEWE Descale. During operation of the PEWE, a silicate scale builds up on the reboiler heating surface. PEWE descale waste is generated when this scale is removed. The PEWE descale waste composition is based on the following make-up formulation given in *Supporting Information for the INEEL Liquid Waste Management Plan* (Tripp 1998):

- 300 gallons TURCO ARR diluted with water to 2 lb/gal (TURCO ARR assumed to be 70 wt % NaOH, 15 wt % triethanolamine, 5 wt % diethanolamine and 5 wt % kerosene)
- 300 gallons TURCO 4502 diluted with water to 0.5 lb/gal (TURCO 4502 assumed to be 77 wt % KOH, 20 wt % $KMnO_4$, 3 wt % K_2CrO_3)

- 300 gal oxalic acid solution at 0.5 lb oxalic acid per gallon
- 300 gal 6 N HNO_3.

Table 16 lists the composition calculated using the above formulation.

Table 16. PEWE descale composition.

	mol/liter
H^+	1.22E-01
NO_3^-	7.92E-01
K^+	1.17E-01
Mn^{+7}	6.12E-03
Cr^{+6}	1.16E-03
Na^+	5.25E-01
	g/liter
Oxalic acid	7.50
Kerosene	1.50
TEA	4.50
DEA	1.50
TOC	14.99

2.4.1.6 CPP-601 – Lab Drains. This waste is generated by Analytical Laboratory operations, CPP-601 sumps, and pilot plant operations. Nenni (2002) reports analytical data for sixteen samples from the CPP-601 Deep Tanks, and averages of these data are shown in Table 17. Additional data from earlier samples are available in Tripp (1998) but were not used in calculating the composition below. Table 17 also shows the composition range of this waste stream.

Table 17. CPP-601 Deep Tank waste composition.

	Mol/liter	Range of concentration Relative to average: Max/Ave	Min/Ave	
H+	3.57E-01	+96%	-63%	1
Al^{+3}	4.28E-03	+340%	-81%	
Sb^{+5}	3.30E-07	+159%	-90%	1
As^{+5}	2.61E-07	+205%	-80%	1
Ba^{+2}	1.35E-06	+270%	-62%	
Be^{+2}	5.89E-07	+354%	-81%	
B^{+3}	1.15E-04			2
Cd^{+2}	1.54E-06	+323%	-77%	
Ca^{+2}	4.08E-04			2
Cl^{-}	2.97E-03	+20%	-20%	
Cr^{+3}	1.77E-05	+111%	-53%	
Co^{+2}	1.13E-06	+173%	-47%	
Cu^{+2}	1.11E-05	+60%	-59%	
F^{-}	1.15E-03	+111%	-40%	1
Fe^{+3}	1.60E-04			2
Pb^{+2}	3.28E-06	+306%	-80%	
Mn^{+4}	1.46E-05	+103%	-54%	
Hg^{+2}	1.14E-05	+206%	-89%	
Ni^{+2}	9.09E-06	+60%	-44%	
NO_3^{-}	3.86E-01			3
PO_4^{-3}	4.11E-05			2
K^{+}	1.38E-03			2
Se^{+4}	1.73E-07	+96%	-77%	1
Ag^{+}	5.15E-07	+640%	-92%	1
Na^{+}	1.32E-02			2
S^{+6}	5.99E-04			2
Tl^{+3}	7.87E-08	+77%	-72%	1
U^{+4}	1.06E-06	+97%	-44%	
V^{+5}	1.92E-07	+139%	-79%	1
Zn^{+2}	2.99E-05	+382%	-68%	
Zr^{+4}	1.59E-06			2
	g/liter			
UDS	1.05E-01	+185%	-97%	
TIC	1.90E-02	+145%	-82%	1
TOC	1.24E-01	+113%	-65%	

1. Gray shading indicates data contains flags, typically below detection limits or detected in blank

2. Red shading indicates value was estimated based on concentrations of other known species and the concentration of the unknown species in SBW

3. Blue shading indicates that value was obtained by charge balance

No shading indicates the average of analytical data for sixteen samples. Data points with qualifying flags were excluded from the averages.

2.4.1.7 CPP-601/627/640 Deactivation Waste. Table 18 shows the composition of deactivation wastes from CPP-601, CPP-627, and CPP-640. Concentrations are taken from *Supporting Information for the INEEL Liquid Waste Management Plan* (Tripp, 1998) and are averages of 4 to 26 data points, depending on the chemical specie.

Table 18. CPP-601/627/640 deactivation waste composition.

	Mol/liter	
H+	4.58E-02	
Al^{+3}	7.18E-04	
Sb^{+5}	4.27E-08	Red shading indicates value was estimated based on concentrations of other known species and the concentration of the unknown species in SBW.
As^{+5}	2.02E-08	
Ba^{+2}	2.92E-08	
Be^{+2}	1.28E-08	
B^{+3}	2.69E-05	
Cd^{+2}	3.85E-07	No shading indicates the average of analytical data for 4-26 samples.
Ca^{+2}	9.53E-05	
Cl^{-}	1.24E-04	
Cr^{+3}	1.06E-06	
Co^{+2}	5.45E-08	
Cu^{+2}	1.29E-06	
F^{-}	7.53E-05	
Fe^{+3}	3.75E-05	
Pb^{+2}	1.51E-07	
Mn^{+4}	2.63E-05	
Hg^{+2}	6.48E-07	
Ni^{+2}	3.12E-06	
NO_3^{-}	4.92E-02	
PO_4^{-3}	9.60E-06	
K^{+}	9.44E-05	
Se^{+4}	2.18E-08	
Ag^{+}	2.19E-08	
Na^{+}	6.26E-04	
S^{+6}	5.62E-05	
Tl^{+3}	2.28E-08	
U^{+4}	2.24E-09	
V^{+5}	5.39E-07	
Zn^{+2}	1.60E-06	
Zr^{+4}	3.73E-07	
	g/liter	
UDS	1.75E-02	
TIC		
TOC	8.51E-03	

2.4.1.8 NWCF Operations – ETS. This waste has been called "Deep Recycle" in the past. When the calciner is not operating, the waste is generated by the Evaporator Tank System, primarily as condensate from ETS off-gas. Table 19 shows an estimated composition of this waste. The composition is based on analysis of 13 samples from the NWCF Fluoride Hot Sump Tank, NCC-119, taken from December 1998 to March 2000, plus daily logs of NWCF scrub composition from May 14, 1998 to April 8, 1999 and from March 7, 2000 to May 28, 2000. This composition may not be applicable to waste generation in the future if the calciner is not operating. For concentrations derived solely from NCC-119 analyses, Table 19 shows the standard deviation of the data points.

Table 19. Estimated NWCF Operation – deep recycle waste composition.

	Mol/liter	Standard deviation Mol/liter	Note
H+	2.74		4
Al^{+3}	8.41E-01		4
Sb^{+5}	6.12E-06		2
As^{+5}	5.17E-05	4.8E-05	1
Ba^{+2}	6.63E-06	5.5E-06	1
Be^{+2}	7.73E-06	6.7E-06	1
B^{+3}	3.86E-03		2
Cd^{+2}	3.84E-04	4.3E-04	
Ca^{+2}	1.37E-02		2
Cl^{-}	0.0615		4
Cr^{+3}	9.24E-04	8.3E-04	
Co^{+2}	9.33E-06	9.2E-06	1
Cu^{+2}	5.16E-05	4.0E-05	1
F^{-}	6.11E-02	6.4E-02	1
Fe^{+3}	5.37E-03		2
Pb^{+2}	1.38E-04	1.7E-04	
Mn^{+4}	1.48E-03	1.4E-03	
Hg^{+2}	8.74E-02	4.9E-02	4
Ni^{+2}	2.30E-04	1.5E-04	
NO_3^{-}	5.99		3
PO_4^{-3}	1.38E-03		2
K^{+}	4.62E-02		2
Se^{+4}	1.17E-05		2
Ag^{+}	1.48E-06	1.0E-06	1
Na^{+}	4.41E-01		2
S^{+6}	2.01E-02		2
Tl^{+3}	3.27E-06		2
U^{+4}	2.91E-05	2.5E-05	
V^{+5}	2.75E-06	7.9E-07	
Zn^{+2}	1.32E-04	1.0E-04	1
Zr^{+4}	5.34E-05		2
	g/liter		
UDS	6.31		
TIC			
TOC	0.13		

1. Gray shading indicates data contains flags, typically below detection limits or detected in blank

2. Red shading indicates value was estimated based on concentrations of other known species and the concentration of the unknown species in SBW

3. Blue shading indicates that value was obtained by charge balance

4. Green shading indicates value is an average based on logs of scrub composition

No shading indicates the average of analytical data for thirteen samples.

2.4.1.9 Tank Farm Vessel Flushes. The composition of Tank Farm vessel flush is equivalent to the composition of waste in the vessel being flushed diluted by the volume of water used to flush the tank. Tanks WM-180, WM-181, WM-103, WM-104, WM-105, and WM-106 are scheduled to be flushed in 2004. Then in the 2010-2012 time period, Tanks WM-187, WM-188, and WM-189 will be flushed after being emptied of waste.

2.4.1.10 *Vault Flush.* The composition of vault flush waste, after concentration by a factor of 40, was assumed equal to the average composition of SBW as of September 30, 2002.

2.4.1.11 *CPP-603 Basin Water.* This waste stream is created from emptying the water in the CPP-603 basins when they are taken out of service. Concentrations for most species are taken from Supporting Information for the INEEL Liquid Waste Management Plan (Tripp 1998); others were estimated based on the average SBW composition and the ratio of total dissolved solids in the CPP-603 basin water to that in SBW.

Table 20. Estimated CPP-603 Basin water composition.

	Mol/liter	
H+	1.00E-08	
Al^{+3}	4.15E-06	
Sb^{+5}	2.12E-09	2
As^{+5}	8.47E-08	2
Ba^{+2}	4.28E-11	
Be^{+2}	7.65E-09	2
B^{+3}	4.25E-06	
Cd^{+2}	6.06E-11	
Ca^{+2}	3.37E-04	
Cl^{-}	1.35E-03	
Cr^{+3}	1.45E-07	1
Co^{+2}	4.46E-08	1
Cu^{+2}	7.43E-08	1
F^{-}	1.10E-05	
Fe^{+3}	3.92E-07	
Pb^{+2}	1.45E-11	
Mn^{+4}	1.91E-08	
Hg^{+2}	2.49E-06	2
Ni^{+2}	9.85E-08	1
NO_3^{-}	2.56E-03	
PO_4^{-3}	2.86E-06	2
K^{+}	7.55E-05	
Se^{+4}	7.26E-11	
Ag^{+}	2.65E-09	2
Na^{+}	3.91E-03	4
S^{+6}	3.45E-05	2
Tl^{+3}	2.39E-11	
U^{+4}	2.99E-11	
V^{+5}	2.00E-11	
Zn^{+2}	1.67E-07	
Zr^{+4}	6.70E-07	2
	g/liter	
UDS	1.40E-03	2
TIC	5.91E-02	3
TOC	2.64E-06	

1. Gray shading indicates data contains flags, typically below detection limits or detected in blank

2. Red shading indicates value was estimated based on the average SBW concentration and the ratio of total dissolved solids (TDS) in the waste to TDS in SBW

3. Blue shading indicates that value was obtained by charge balance

4. Green shading indicates value was determined by the measured TDS in the waste

No shading indicates results from samples taken in 1995 and 1998.

2.4.2 Composition of Combined Newly Generated Liquid Waste

The compositions shown in Section 2.4.1 for NGLW streams were used along with results of ASPEN simulations of evaporation of these streams to calculate NGLW added to Tank Farm tanks in 2004-5 and collected in WM-100, WM-101, and WM-102 in 2005-2012.

Tables 1 and 5 show three additions of NGLW to Tanks WM-187 and WM-188. "NGLW-1" includes NGLW streams generated February through June 2004. Five NGLW streams make up 96 volume percent of this waste. Using the dilute compositions shown in Section 2.4.1 for these five streams, evaporation of the combined waste was simulated using an Aspen Plus model. The simulation showed that the waste could be concentrated by a factor of 79. The resulting concentrate composition was expanded in components by assuming the average SBW concentration, adjusted by the ratio of total dissolved solids in the concentrated NGLW to total dissolved solids in average SBW, for species not shown in NGLW composition slates, such as radionuclides. The simulation feed volume was based on $5/12^{ths}$ (5 months) of the 2004 NGLW generation rate. The simulation concentrate volume was divided by the factor 0.96 to account for the other NGLW streams that will be part of this waste.

A similar procedure was used to calculate the composition of stream "NGLW-2." NGLW-2 includes the same streams as NGLW-1 generated July 2004 through September 2005. The 2005 generation volumes of these streams was used to determine a combined composition, and the 2005 volume adjusted by the factor 15/12. Simulation of evaporation of this waste showed that a concentration factor of 153 could be obtained. This factor is higher than that obtained for NGLW-1 because it contains a higher fraction of CPP-603 basin water, a more dilute waste.

The third NGLW waste added to the Tank Farm, "NGLW-3," is a blend of NGLW streams that are not concentrated by evaporation. This waste consists of about 4,800 gal of Tank Farm line flushes and 700 gal of NWCF Operations waste.

Compositions and volumes of the above three NGLW streams were used in the calculation of the final composition of Tanks WM-187 and WM-188. Additional calculations were made to estimate the composition of NGLW generated after 2005. The steps involved in these calculations are outlined below:

1. Based on projected waste generation volumes and compositions for these wastes shown in Section 2.4.1, a blended composition was calculated for each year, 2005 through 2012.
2. These blended compositions and dilute volumes were input into an Aspen Plus evaporation model, simulating concentration of the waste for each year to a 1.3 specific gravity endpoint.
3. Based on the predicted simulation condensate volume and acid content, the amount of LET&D bottoms that would be generated was calculated.
4. The predicted bottoms volume was adjusted to account for minor NGLW streams not included in the simulation.
5. The calculated LET&D bottoms, simulated evaporator concentrate, and estimated quantities of NGLW streams that are not evaporated were combined to obtain total, concentrated NGLW volumes and compositions for each year.

These NGLW compositions are shown in Table 21. Also shown in Table 21 is an estimate of the composition of the present waste in WM-100, WM-101 and WM-102. This estimate is based on compositions and volumes of dilute NGLW waste streams generated 1998-2003. Table 22 shows the composition of NGLW as of the end of 2010 and 2012.

Table 21. Estimated NGLW composition by year.

Year	Initial Inventory	2006	2007	2008	2009	2010	2011	2012
Gallons	12,100	11,348	10,855	6,974	7,285	7,285	9,218	7,116
	mol/liter	mol/liter	mol/liter	mol/liter	mol/liter	mol/liter	mol/liter	mol/liter
H^{+}	2.85E+00	3.41E+00	3.38E+00	3.89E+00	3.92E+00	3.92E+00	3.53E+00	4.06E+00
Al^{+3}	3.70E-01	3.06E-01	3.15E-01	1.66E-01	1.50E-01	1.50E-01	2.50E-01	1.31E-01
Sb^{+5}	1.07E-05	9.67E-06	9.54E-06	1.31E-05	1.20E-05	1.20E-05	1.18E-05	1.24E-05
As^{+5}	3.25E-05	6.02E-05	6.22E-05	2.78E-05	2.61E-05	2.61E-05	2.28E-05	2.70E-05
Ba^{+2}	1.90E-05	3.46E-05	3.50E-05	2.96E-05	2.77E-05	2.77E-05	3.56E-05	2.66E-05
Be^{+2}	5.53E-06	7.11E-06	7.26E-06	4.95E-06	4.56E-06	4.56E-06	6.63E-06	4.20E-06
B^{+3}	3.54E-03	7.77E-03	7.97E-03	5.00E-03	4.55E-03	4.55E-03	7.16E-03	4.06E-03
Cd^{+2}	3.15E-04	9.96E-04	1.03E-03	5.12E-04	4.82E-04	4.82E-04	8.73E-04	4.04E-04
Ca^{+2}	1.25E-02	2.61E-02	2.67E-02	1.72E-02	1.56E-02	1.56E-02	2.42E-02	1.40E-02
Cl^{-}	4.25E-02	1.65E-02	1.69E-02	1.04E-02	1.01E-02	1.01E-02	1.22E-02	9.67E-03
Cr^{+3}	4.46E-03	5.54E-03	5.51E-03	6.44E-03	5.98E-03	5.98E-03	6.41E-03	6.04E-03
Co^{+2}	9.16E-06	3.29E-05	3.29E-05	4.30E-05	3.30E-05	3.30E-05	4.30E-05	3.23E-05
Cu^{+2}	1.23E-04	3.49E-04	3.57E-04	2.42E-04	2.18E-04	2.18E-04	3.34E-04	1.97E-04
F^{-}	4.84E-02	3.39E-02	3.38E-02	3.67E-02	3.57E-02	3.57E-02	3.21E-02	3.53E-02
Fe^{+3}	4.92E-03	1.05E-02	1.08E-02	6.85E-03	6.23E-03	6.23E-03	9.73E-03	5.58E-03
Pb^{+2}	1.44E-04	4.61E-04	4.74E-04	2.50E-04	2.35E-04	2.35E-04	4.11E-04	2.01E-04
Mn^{+4}	2.18E-02	2.47E-02	2.45E-02	3.09E-02	2.89E-02	2.89E-02	2.94E-02	2.95E-02
Hg^{+4}	3.02E-02	5.48E-03	5.71E-03	6.83E-04	6.64E-04	6.64E-04	1.23E-03	5.31E-04
Ni^{+2}	2.66E-04	9.86E-04	1.00E-03	8.27E-04	6.83E-04	6.83E-04	1.03E-03	6.27E-04
NO_3^{-}	6.70E+00	7.51E+00	7.49E+00	8.09E+00	7.84E+00	7.84E+00	7.95E+00	7.97E+00
PO_4^{-3}	1.25E-03	2.46E-03	2.51E-03	1.67E-03	1.51E-03	1.51E-03	2.29E-03	1.37E-03
K^{+}	4.31E-01	4.44E-01	4.37E-01	5.86E-01	5.51E-01	5.51E-01	5.42E-01	5.66E-01
Se^{+4}	9.01E-06	6.97E-06	6.97E-06	7.62E-06	6.98E-06	6.98E-06	7.55E-06	7.03E-06
Ag^{+}	2.88E-06	3.55E-06	3.57E-06	3.56E-06	3.22E-06	3.22E-06	3.81E-06	3.16E-06
Na^{+}	2.09E+00	2.37E+00	2.35E+00	2.83E+00	2.65E+00	2.65E+00	2.76E+00	2.69E+00
S^{+6}	1.67E-02	3.01E-02	3.08E-02	2.03E-02	1.87E-02	1.87E-02	2.81E-02	1.71E-02
Tl^{+3}	2.83E-06	2.11E-06	2.09E-06	2.66E-06	2.34E-06	2.34E-06	2.40E-06	2.39E-06
U^{+4}	3.83E-05	1.58E-04	1.63E-04	8.09E-05	7.65E-05	7.65E-05	1.40E-04	6.39E-05
V^{+5}	2.46E-05	1.28E-04	1.32E-04	7.12E-05	6.40E-05	6.40E-05	1.15E-04	5.39E-05
Zn^{+2}	3.48E-04	5.85E-04	5.92E-04	5.22E-04	4.82E-04	4.82E-04	6.08E-04	4.65E-04
Zr^{+4}	6.13E-05	4.42E-04	4.58E-04	1.92E-04	1.80E-04	1.80E-04	3.75E-04	1.39E-04
	g/liter	g/liter	g/liter	g/liter	g/liter	g/liter	g/liter	g/liter
UDS	5.3	3.7	3.7	4.3	4.0	4.0	3.8	4.1
TOC	4.5	4.9	4.8	5.6	5.2	5.2	4.9	5.4

Table 22. Estimated composition of combined generated waste.

Year	2010	2012		2010	2012		2010	2012		2010	2012
Gal	55,850	72,180		mol/liter	mol/liter		Ci/liter	Ci/liter		Ci/liter	Ci/liter
SG	1.33	1.34	PO_4^{-3}	6.87E-03	6.96E-03	Th-232	8.97E-16	9.10E-16	Tc-98	2.29E-12	2.32E-12
			Pu^{+4}	5.11E-06	5.18E-06	Th-234	2.62E-08	2.66E-08	Tc-99	1.30E-05	1.31E-05
	mol/liter	mol/liter	K^{+}	4.85E-01	5.01E-01	Pa-231	1.13E-10	1.15E-10	Ru-106	1.18E-06	1.19E-06
H+	3.48E+00	3.54E+00	Pr^{+4}	1.10E-05	1.11E-05	Pa-233	3.71E-06	3.76E-06	Rh-102	1.09E-09	1.11E-09
Al^{+3}	2.63E-01	2.49E-01	Pm^{+3}	1.60E-09	1.63E-09	Pa-234m	2.62E-08	2.66E-08	Rh-106	1.18E-06	1.19E-06
Am^{+4}	7.65E-08	7.76E-08	Rh^{+4}	4.73E-06	4.79E-06	U-232	2.52E-09	2.55E-09	Pd-107	2.09E-08	2.12E-08
Sb^{+5}	1.09E-05	1.12E-05	Rb^{+}	7.28E-06	7.38E-06	U-233	1.01E-10	1.03E-10	Cd-113m	4.21E-06	4.27E-06
As^{+5}	4.17E-05	3.78E-05	Ru^{+3}	1.89E-04	1.92E-04	U-234	1.73E-06	1.75E-06	In-115	1.28E-16	1.29E-16
Ba^{+2}	2.89E-05	2.95E-05	Sm^{+3}	7.21E-06	7.31E-06	U-235	8.07E-08	8.18E-08	Sn-121m	8.47E-08	8.59E-08
Be^{+2}	5.86E-06	5.79E-06	Se^{+4}	7.50E-06	7.46E-06	U-236	7.88E-08	7.99E-08	Sn-126	5.20E-07	5.28E-07
B^{+3}	5.71E-03	5.73E-03	Si^{+4}	5.62E-04	5.70E-04	U-237	8.15E-09	8.27E-09	Sb-125	1.71E-05	1.73E-05
Br^{-}	4.00E-07	4.06E-07	Ag^{+}	3.33E-06	3.37E-06	U-238	4.01E-08	4.07E-08	Sb-126m	5.20E-07	5.28E-07
Cd^{+2}	6.60E-04	6.62E-04	Na^{+}	2.44E+00	2.50E+00	Np-237	3.71E-06	3.76E-06	Sb-126	7.28E-08	7.39E-08
Ca^{+2}	1.94E-02	1.95E-02	Sr^{+2}	1.46E-04	1.48E-04	Np-238	2.96E-10	3.00E-10	Te-123	4.85E-19	4.92E-19
Ce^{+4}	4.82E-05	4.89E-05	SO_4^{-2}	2.32E-02	2.32E-02	Np-239	8.34E-08	8.46E-08	Te-125m	3.99E-06	4.05E-06
Cs^{+}	3.07E-05	3.12E-05	Tc^{+7}	7.72E-06	7.83E-06	Pu-236	2.89E-09	2.93E-09	I-129	6.64E-08	6.73E-08
Cl^{-}	1.98E-02	1.78E-02	Te^{+4}	5.81E-06	5.89E-06	Pu-238	5.66E-04	5.74E-04	Cs-134	5.17E-05	5.24E-05
Cr^{+3}	5.53E-03	5.69E-03	Tb^{+4}	2.77E-09	2.81E-09	Pu-239	7.06E-05	7.16E-05	Cs-135	1.09E-06	1.10E-06
Co^{+2}	2.90E-05	3.11E-05	Tl^{+3}	2.39E-06	2.39E-06	Pu-240	1.07E-05	1.08E-05	Cs-137	6.39E-02	6.48E-02
Cu^{+2}	2.54E-04	2.59E-04	Th^{+4}	2.69E-05	2.73E-05	Pu-241	3.42E-04	3.46E-04	Ba-137m	6.04E-02	6.13E-02
Eu^{+3}	6.63E-07	6.73E-07	Sn^{+4}	3.51E-05	3.56E-05	Pu-242	8.54E-09	8.66E-09	La-138	2.42E-16	2.45E-16
F^{-}	3.79E-02	3.69E-02	Ti^{+4}	8.33E-05	8.45E-05	Pu-244	2.29E-17	2.32E-17	Ce-142	3.79E-11	3.84E-11
Gd^{+3}	2.15E-04	2.18E-04	U^{+4}	1.02E-04	1.03E-04	Am-241	6.30E-05	6.39E-05	Ce-144	7.94E-07	8.05E-07
Ge^{+4}	1.15E-08	1.17E-08	V^{+5}	8.27E-05	8.40E-05	Am-242m	1.36E-08	1.38E-08	Pr-144	7.94E-07	8.05E-07
In^{+3}	1.82E-06	1.84E-06	Y^{+3}	8.99E-06	9.11E-06	Am-242	1.35E-08	1.37E-08	Nd-144	2.04E-15	2.06E-15
I^{-}	3.32E-06	3.37E-06	Zn^{+2}	5.00E-04	5.10E-04	Am-243	1.92E-08	1.94E-08	Pm-146	6.45E-08	6.54E-08
Fe^{+3}	7.79E-03	7.82E-03	Zr^{+4}	2.63E-04	2.65E-04	Cm-242	3.41E-08	3.45E-08	Pm-147	2.16E-04	2.19E-04
La^{+3}	1.21E-05	1.22E-05	O-2			Cm-243	3.60E-08	3.65E-08	Sm-146	3.49E-13	3.54E-13
Pb^{+2}	3.10E-04	3.12E-04	H2O	4.35E+01	4.32E+01	Cm-244	1.44E-06	1.46E-06	Sm-147	9.33E-12	9.46E-12
Li^{+}	4.53E-04	4.60E-04				Cm-245	3.78E-10	3.83E-10	Sm-148	4.79E-17	4.86E-17
Mg^{+2}	2.49E-02	2.53E-02		g/liter	g/liter	Cm-246	2.49E-11	2.53E-11	Sm-149	4.26E-18	4.32E-18
Mn^{+4}	2.59E-02	2.67E-02	TOC	4.9	5.0				Sm-151	4.25E-04	4.31E-04
Hg^{+2}	9.03E-03	7.20E-03	UDS	4.2	4.1	H-3	1.94E-05	1.97E-05	Eu-150	1.82E-11	1.85E-11
Mo^{+6}	3.11E-04	3.15E-04				Be-10	3.80E-12	3.85E-12	Eu-152	3.19E-06	3.23E-06
Nd^{+3}	3.89E-05	3.94E-05		Ci/liter	Ci/liter	C-14	1.52E-10	1.54E-10	Eu-154	2.09E-04	2.12E-04
Np^{+4}	2.22E-05	2.25E-05		(Jan, 2003)	(Jan, 2003)	Se-79	5.53E-07	5.61E-07	Eu-155	1.92E-04	1.95E-04
Ni^{+2}	7.34E-04	7.62E-04	Ra-226	1.04E-11	1.05E-11	Rb-87	3.71E-11	3.76E-11	Gd-152	1.80E-18	1.83E-18
Nb^{+5}	1.19E-04	1.20E-04	Ac-227	4.89E-11	4.95E-11	Sr-90	5.01E-02	5.08E-02	Ho-166m	5.83E-11	5.91E-11
NO_3^{-}	7.35E+00	7.45E+00	Th-230	1.04E-09	1.06E-09	Y-90	5.01E-02	5.08E-02	Co-60	4.13E-05	4.19E-05
Pd^{+4}	1.40E-04	1.42E-04	Th-231	2.66E-08	2.70E-08	Zr-93	2.81E-06	2.85E-06	Ni-63	4.37E-05	4.43E-05

2.5 SBW Treatment Facility Feed Compositions

Compositions for both SBW and NGLW wastes have been presented in Sections 2.1-2.4. Table 23 shows a summary of the volumes of waste to be treated and tables containing compositions for these wastes.

Table 23. Summary of waste to be processed.

	CsIX		**Other Processes**
	gal liquid	kg solid	gal liquid plus solids
WM-187	270,963	105,000	284,920
WM-188	281,670	5,000	281,670
WM-189	279,800	10,000	279,800
NGLW	72,180	1,130	72,180
Total	**904,613**	**121,130**	**918,570**
	Composition		Composition
WM-187	Table 2, "Liquid only" Table 4 (solids)		Table 2. "With solids"
WM-188	Table 7, "No solids" Table 8 (solids)		Table 6
WM-189	Table 10, "No solids" Table 8 (solids)		Table 9
NGLW	Table 22		Table 22

Volumes in Table 23 do not show any steam jet dilution to blend the wastes or transfer wastes to the treatment facility. Water to transfer heels to treatment is also not shown. Existing steam jets typically add about 5% to the volume of tank waste in transfers to the NWCF. Possible blend scenarios and blend compositions are discussed in Section 3.4. Liquid volumes shown in Table 23 for the CsIX process for Tanks WM-188 and WM-189 neglect the small volume of solids in these tanks.

Concentrations shown in Tables 2, 3, 6, 7, 9 and 10 have been adjusted to ensure charge balance and consistency between radionuclide activities and chemical concentrations. Nitrate concentrations were adjusted to obtain charge balance.

To check for consistency between radionuclide activities and chemical concentrations, activities of radionuclides were converted to molar concentrations and compared to concentrations measured or estimated for the respective chemical species. If the sum of the concentrations of all isotopes of an element, converted from activities, was greater than the chemical concentration for that element, the chemical concentration was replaced by that sum.[d] For example, if the concentration of Americium (as calculated by converting ^{241}Am, ^{242m}Am, ^{242}Am, and ^{243}Am concentrations in curies per liter to moles per liter and summing) was greater than the molar concentration of Am reported as a chemical species, then the sum of the isotopes was used as the chemical concentration. If the chemical concentration was greater than the sum of the radionuclide concentrations, and no non-radioactive isotopes occur for that element, the radionuclide concentrations were increased to be consistent with the chemical concentration. Adjustments were made for the elements U, Np, Am, Pu, Tc, and In.

[d] In most cases, the chemical concentration is greater than that of the same species calculated from isotopic concentrations because of nonradioactive isotopes.

Chemical species present in concentrations less than 10^{-9} mol/liter and isotopes having concentrations less than 10^{-15} mol/liter were not included in Table 18.[e] For the generated waste, concentrations of species for which no analytical data or other estimates were available were assumed equal to the average concentration in the SBW tanks for that species.

[e] If the activity was greater than 10^{-8} Ci/liter, the radionuclide was retained even if its molar concentration was less than 10^{-15}.

3. SUPPLEMENTAL FEED CHARACTERIZATION INFORMATION

This section provides more detail and discussion regarding the quantity of solids in the Tank Farm, the composition of tank solids, uncertainties in the waste compositions shown in this report, possible tank blending scenarios and resulting tank compositions, waste physical properties, and organics in the waste.

3.1 Tank Solids Quantity

Light Duty Utility Arm (LDUA) video evidence of the height of tank sludge layers, along with measurement of sludge samples from these tanks, provided good estimates of solids quantities for three tanks. Tank WM-188 was sampled using the LDUA in 1998 (Patterson 1999); and WM-182 and WM-183 in 2000 (Poloski 2000a). Based on the videos, the sludge layers in Tanks WM-188, WM-182, and WM-183 were estimated to be 0.25-inch, 4 inches, and 8 inches respectively. Using the history of each tank as a guide, and measurements from WM-183 samples that showed the sludge was approximately 25 vol % solids and that the solids had a particle density of 2 kg/liter, Poloski estimated sludge volumes (Poloski 2000a) and Tyson estimated the corresponding mass of solids in each tank in the Tank Farm (Tyson 2002). These sludge volume and mass estimates, shown in Table 24, have been widely used since they were developed for SBW treatment studies, (Barnes 2002) the SBW Waste Incidental to Reprocessing (WIR) evaluation (Tyson 2002), and the basis for the radiological source term for Tank Farm safety analyses (Swenson 2002).

Table 24. Estimated solids quantities based on LDUA samples and videos.

Tank	Sludge Height (in.)	Sludge on Walls (equiv. in.)	Total Sludge (equiv. in.)	Total Solids (kg)
WM-180 (like WM-182)	4.00	0.50	4.5	10,452
WM-181 (like WM-182)	4.00	0.50	4.5	10,452
WM-182	4.00	0.50	4.5	10,452
WM-183	8.00	0.50	8.5	19,743
WM-184 (like WM-182)	4.00	0.50	4.5	10,452
WM-185 (like WM-182)	4.00	0.50	4.5	10,452
WM-186 (like WM-182)	4.00	0.50	4.5	10,452
WM-187 (like WM-188)	0.25	0.25	0.5	1,161
WM-188	0.25	0.25	0.5	1,161
WM-189 (like WM-188)	0.25	0.25	0.5	1,161
Total	**32.75**	**4.25**	**37.0**	**85,941**

Since the estimates listed in Table 24 were made, the following tank farm changes have occurred: (1) wastes from Tanks WM-181, WM-184, WM-186, and WM-185 have been evaporated to heel level and the concentrate added to Tanks WM-188 and WM-189, (2) Tanks WM-189, WM-188, WM-181, and WM-187 have been sampled, and (3) solids in Tanks WM-181, WM-182, WM-183, WM-184, WM-185, and WM-186 have been flushed to WM-187. Because of these changes, solids remain only in Tanks WM-187, WM-180, WM-188, and WM-189. The solids in WM-180 are scheduled to be flushed to WM-187 later in 2004.

During evaporation of waste from Tank WM-186, as the waste was lowered to about the 15,000 gallon level, severe plugging problems were experienced in ETS instrument probes and some other lines (Swenson 2001). Evaporation of waste from Tanks WM-181 and WM-185, in addition to WM-186, was stopped when high undissolved solids caused plugging in instrument probes.[f] The heel level of each of these three tanks when processing by evaporation was stopped was between 13,000 and 23,000 gallons. The solids seen in the evaporator probes suggest that there may be more solids in these tanks than shown in Table 24, which, for tanks WM-181, WM-185, WM-186 and others, was based on a heel of only 5,000 gallons in each tank.

In March 2002, a sample from near the bottom of Tank WM-189 was taken using an existing steam jet located approximately 2-inches off the tank bottom. The 165 ml sample was allowed to settle for 24 hours, at which time a sludge layer of approximately 22 ml was seen (Batcheller 2003). In contrast, undissolved solids from a sample taken by steam jet, ~3-inches off the bottom, from Tank WM-180 were measured to be only 0.23 g/liter. While a direct comparison of data from these two tank samples is difficult, it appears that the WM-189 sample had considerably more solids than the WM-180 sample.

In light of the above indications that there could be more solids than originally estimated, the following estimates are proposed for the quantity of solids that will be present in the tanks at the commencement of SBW treatment, and have been used in composition estimates earlier in this report.

Table 25. Updated solids estimate.

	Expected	**Maximum**
WM-187	105,000 kg	135,000 kg
WM-188	5,000 kg	10,000 kg
WM-189	10,000 kg	20,000 kg
Total	**120,000 kg**	**165,000 kg**

The basis for the above estimates is as follows:

- **WM-187**: Summing the volume of heels flushed to WM-187 and assuming an average 16 vol % solids[g] in the sludge and a solids density of 2 kg/liter results in as estimate of 100,000 kg, exclusive of solids from WM-180. Tank WM-180 has not yet been emptied and so the heel level is not known. For WM-180, assuming 3-inches of sludge with an average solids content of 16-vol %[g] and a solids density of 2 g/cm^3 is equivalent to about 5,000 kg of solids. Thus the total solids estimated to be in Tank WM-187 is 105,000 kg. This expected amount estimate is consistent with the actual tank level on April 3, 2004 (58,000 gallons) and a solids content of about 18 vol %. The maximum amount was estimated by adding 30% (30,000) to the 100,000 kg estimate. The maximum estimate is consistent with the maximum solids content seen in any heel (25 vol %, WM-183), taking into account that not all solids from WM-181 and none from WM-180 had been flushed to WM-187 as of April 3, 2004.

- **WM-188 and WM-189**: When Tank WM-188 was at heel level, LDUA videos showed very few (~1/4 inch) solids (Patterson 1999). WM-188 has since been filled with ETS concentrate. A sample taken from WM-189, which was filled with much the same evaporator concentrate, showed

[f] Personal communication with Dan Griffith, October 23, 2002.

[g] A solids content of 16 vol % is based on the solids content of WM-183 heel in early 1997 and also the average of WM-183 LDUA sludge sample solids content (25 %) and WM-189 sludge solids content (~7%).

significantly more solids than similar samples from WM-180 and WM-188. Consistent with this observation is the fact that high solids waste streams (NWCF flushes and off-gas scrub) have been added to WM-189 and not to WM-188. Thus, Tank WM-189 should have more solids than WM-180 or WM-188. For lack of additional data, the amount of solids WM-188 was assumed to be equal to that estimated for WM-180 (5,000 kg) and the amount in WM-189 twice the amount in WM-180. The estimated expected amount of settled solids in WM-189 is consistent with the measured solids content of a sample from that tank and a heel volume of about 20,000 gallons.

3.2 Tank Solids Composition

After 2004, SBW will be contained in three INTEC Tank Farm tanks. The majority of the solids (~90%) will be contained in one tank, WM-187. It has not been possible to obtain a well-mixed, representative sample of solids from this tank. However, eleven samples from eight tanks have been taken since 1999 that have contained solids. This section presents a compilation, comparison and review of the solids analytical data. It also contains the basis for determining the average composition of solids in Tank WM-187.

Mike Swenson compiled older data for tank solids, mostly from the mid-1980's (Swenson 1992). In general, this older data is similar to more recent analyses, and indicate that the primary chemical species present in the solids are zirconium and phosphate, with smaller amounts of aluminum, iron, silicon, sodium, potassium, boron, nickel and tin. Other information in Swenson's report suggests the solids could contain significant levels of fluorides and noble metals.

Direct sampling of tank heels using the LDUA was performed in three tanks in 1999. Table 26 shows the results of analyses of these samples.

Table 26. Analyses of solids samples from Tanks WM-182, WM-183, and WM-188.

	WM-182 mg/kg	**WM-183** mg/kg	**WM-188** mg/kg		**WM-182** mg/kg	**WM-183** mg/kg	**WM-188** mg/kg
Al^{+3}	21,880	24,911	35,406	Sr^{+2}	<9	11	
Sb^{+5}	<14	32	<34	SO_4^{-2}	33,240	13,647	
As^{+5}	281	56	351	S^{+6}	8,743	2,849	
Ba^{+2}	127	24	12,542	Tc^{+7}		0	
Be^{+2}	<1	<0.9	0.2	Tl^{+3}	<17	<14	<783
B^{+3}	150	182	<482	Sn^{+4}	4,072	1,466	
Cd^{+2}	325	142	1,189	Ti^{+4}	650	711	
Ca^{+2}	1,765	1,868	5,630	U^{+4}	<46	0.193	
Ce^{+4}	<21	20		V^{+5}	13	11	6
Cs^{+}	42	9	<128	Zn^{+2}	179	148	126
Cl^{-}	2,015	1,308		Zr^{+4}	101,470	34,867	70,600
Cr^{+3}	552	949	1,341	Total	437,827	486,039	165,675
Co^{+2}	<9	9	9	TOC			<1215
Cu^{+2}	298	166					
F^{-}	14,800	4,373			WM-182	WM-183	WM-188
Gd^{+3}	53	170			mCi/g	mCi/g	mCi/g
Fe^{+3}	4,476	17,967	5,769		(Jan, 2000)	(Jan, 2000)	(March, 1999)
Pb^{+2}	369	274	647	Am-241	8.46E-04	2.45E-04	2.11E-04
Li^{+}	6	4		Sb-125	5.77E-02	2.90E-03	1.12E-02
Mg^{+2}	410	434		Cs-134	6.64E-03	5.89E-04	7.97E-03
Mn^{+4}	565	740	758	Cs-137	4.24E-01[a]	8.68E-01	2.44E+00
Hg^{+2}	310	324	1,566	Co-60	2.14E-04		6.30E-04
Mo^{+6}	2,495	694	2,770	Cm-244	2.84E-06		
Ni^{+2}	309	417	427	Eu-154	1.48E-03	7.56E-04	5.43E-04
Nb^{+5}	1,279	623	5,370	I-129	<2.22E-07	<9.03E-08	<1.53E-03
NO_3^{-}	70,720	174,955		Np-237	1.68E-06	1.76E-06	2.85E-06
Pd^{+4}	5,766	1,444		Pu-238	1.93E-02	4.00E-03	7.56E-03
PO_4^{-3}	68,410	125,612		Pu-239	1.47E-03	1.25E-03	4.30E-04
P^{+5}	9,586	4,607	17,700	Sr-90	2.29E-01	1.82E-01	5.46E+00
K^{+}	7,050	10,900		Tc-99	2.63E-03	3.29E-05	4.49E-03
Ru^{+3}	829	2,126	<313	H-3	1.15E-05		
Se^{+4}	91	<13	<1,720	U-234	<2.40E-06	3.30E-06	<2.10E-05
Si^{+4}	43,920	35,344		U-235	2.61E-07	9.29E-08	1.97E-07
Ag^{+}	65	220	9	U-236	3.05E-07	<3.40E-08	<2.20E-07
Na^{+}	30,400	21,400		U-238	3.83E-08	6.91E-08	1.18E-07

[a] Concentration corrected based on reissued lab report

Table 27 shows results of analyses of samples taken of Tank Farm waste transferred to the NWCF blend and hold cell for sampling. Tank WM-180 was sampled in June 2000; the tank was full of waste at the time of sampling. The solids were obtained from the waste sample by allowing two weeks for settling, drawing off liquid, and centrifuging the remaining sample. The solids were not washed but Jerry Christian states that approximately 4% of the weight of the dried solids was due to dissolved solids in interstitial liquid that crystallized during drying (Christian 2000). The WM-180 analytical results shown in Table 27 are as reported by Garn (2001).

Tanks WM-181, WM-186 and WM-188 were sampled in 2003. Tanks WM-181 and WM-186 were at heel level when sampled, while WM-188 was about three-quarters full of liquid. Solids from each of these tanks were washed with water prior to analysis. Results of analyses of WM-180, WM-181, and WM-188 samples are shown in Table 27. Solids from WM-186 were analyzed by different methods, (see Section 3.4 of Rev. 3 of this report) and results are shown in Table 28.

Table 27. Analysis data for tank solids samples obtained through NWCF.

	WM-180	**WM-181**	**WM-188**		**WM-180**	**WM-181**	**WM-188**
	mg/kg	mg/kg	mg/kg		mg/kg	mg/kg	mg/kg
Al^{+3}	59,619	5,870	14,568	Na^{+}	81,200	2,926	35,291
Sb^{+5}	41	19	<9	Sr^{+2}	23		14
As^{+5}	<10	36	<40	SO_4^{-2}	9,220	3,974	10,787
Ba^{+2}	34	10	29	S^{+6}	5,199		3,711
Be^{+2}	<2	0.23	<2	Tc^{+7}	0		
B^{+3}	<520	49	413	Tl^{+3}	<1,360	<4	50
Cd^{+2}	183	61	216	Sn^{+4}	2,120	4,117	2,178
Ca^{+2}	4,427	449	2,396	Ti^{+4}	959		477
Ce^{+4}	44		<30	U^{+4}	353		330
Cs^{+}	524		<25	V^{+5}	<13	<5	12
Cl^{-}	909	1,110		Zn^{+2}	200	27	73
Cr^{+3}	692	241	621	Zr^{+4}	27,971	37,930	32,209
Co^{+2}	<15	<1	7	Total	815,414	272,464	258,274
Cu^{+2}	139	41	55		Radionuclides		
F^{-}	93	2,165			mCi/g	mCi/g	mCi/g
Gd^{+3}	84		25		(Oct 2000)	(2003)	(2003)
Fe^{+3}	20,200	3,985	4,385	Am-241	3.20E-04	1.49E-04	5.31E-04
Pb^{+2}	541	47	175	Sb-125	3.37E-03	2.45E-03	1.17E-02
Li^{+}	<160		<17	Cs-134	2.62E-04	3.37E-04	1.70E-03
Mg^{+2}	1,402	235	460	Cs-137	2.63E-01	2.43E-01	2.62E+00
Mn^{+4}	1,618	116	579	Co-60	3.59E-05	7.18E-05	7.75E-04
Hg^{+2}	<8,930	25		Cm-244			1.70E-05
Mo^{+6}	357	283	207	Eu-154	4.32E-04	2.07E-04	2.12E-03
Ni^{+2}	282	57	355	I-129			
Nb^{+5}	<1,040		1,888	Np-237	3.41E-06	6.23E-07	6.41E-06
NO_3^{-}	455,000	645		Pu-238	8.76E-02	1.43E-02	2.45E-02
Pd^{+4}	<760		345	Pu-239	1.31E-02	1.42E-03	3.36E-03
PO_4^{-3}	37,000	197,980	25,428	Sr-90	6.24E-02		5.51E-02
P^{+5}	54,360		54,901	Tc-99	2.42E-05		2.23E-03
K^{+}	15,200	8,761	12,309	H-3			
Ru^{+3}	360		<803	U-234	4.49E-06	3.07E-06	1.18E-05
Se^{+4}	<1,280		<43	U-235	9.24E-08	2.15E-07	8.89E-07
Si^{+4}	20,920		52,601	U-236	1.74E-07	1.86E-07	
Ag^{+}	50	1,299	190	U-238	3.95E-08	2.26E-09	2.09E-07

Table 28. Analysis data for tank solids sample from WM-186.

SEM elemental analysis			
	Min Wt %	Ave Wt %	Max Wt %
Al	5.84	6.26	6.76
Fe	0.94	1.47	2.01
K	1.07	1.14	1.22
Na	0.36	0.64	1.01
O	49.62	50.2	50.63
P	10.74	11.01	11.19
Si	11.63	11.85	12.01
Zr	16.07	17.4	18.3
Total	**96.27**	**99.97**	**103.13**

X-ray fluorescence analysis, water washed	
	Wt %
Zr	74.71
K	6.55
Fe	5.80
Ca	3.70
Sn	2.08
Mn	1.93
Zn	1.26
Nb	1.20
Ti	0.92
Cr	0.84
Ni	0.40
Hg	0.32
Br	0.22
Au	0.09
Total	**100.02**

Tank WM-187 has been sampled several times between July 2003 and February 2004. The tank heel at the time of the first sample contained only solids from Tanks WM-182 and WM-183, while heels from WM-184, WM-185, and WM-186 had been added before the second sample was taken. Prior to the final sample, taken in February 2004, a portion of the heel from WM-181 had been transferred to WM-187 in an attempt to include these solids in the tank sample. Then, five separate transfers of about 6,000 gallons each were made back and forth between WM-187 and the sampling tanks, NCC-102 and NCC-103. This was done in an attempt to better mix the solids in Tank WM-187. Following these transfers, a transfer of about 1100 gallons was made from WM-187 and sampled. However, the particle size distribution of solids from the final sample shows a smaller average particle size that any of the other tanks or samples. Hence, the final sample may contain a disproportionately high fraction of smaller, more mobile particles than contained in the total solids in the tank. Results of analyses of the second sample will be reported by Janikowski later this year, while results for the first and third sample are shown in Table 29.

Table 29. Analysis data for tank solids samples from WM-187.

	WM-187 Sample 1	WM-187 Sample 3		WM-187 Sample 1	WM-187 Sample 3
	mg/kg	mg/kg		mg/kg	mg/kg
Al^{+3}	10,616	11,059	Th^{+4}	60	16
Sb^{+5}	<64	40	Sn^{+4}	4,208	4,363
As^{+5}	98	68	Ti^{+4}	1,429	
Ba^{+2}	12	98	W^{+4}	230	402
Be^{+2}	<2	<1	U^{+4}	<236	<222
B^{+3}	130	161	V^{+5}	<28	<14
Cd^{+2}	11	6	Y^{+3}	<33	<31
Ca^{+2}	570	536	Zn^{+2}	196	148
Ce^{+4}	<30	73	Zr^{+4}	66,464	38,644
Cs^{+}	68	81			
Cr^{+3}	307	444	Cl^{-}	14,394	3,051
Co^{+2}	<10	<9	NO_3^{-}	56,514	1,034
Cu^{+2}	69	84	PO_4^{-3}	221,788	231,089
Gd^{+3}	8	5	SO_4^{-2}	18,429	4,386
Hf^{+4}	166	66	F^{-}	2,584	30
Fe^{+3}	20,119	6,100			
Pb^{+2}	<37	76		**Ci/g**	**Ci/g**
Li^{+}	<14	<13	Am-241	3.0E-07	2.3E-07
Mg^{+2}	247	388	Sb-125	6.7E-06	9.1E-07
Mn^{+4}	62	71	Cs-134	5.1E-07	1.3E-07
Hg^{+2}	329	60	Cs-137	1.2E-03	2.8E-04
Mo^{+6}	923	310	Co-60	6.9E-08	2.7E-08
Ni^{+2}	43	52	Cm-242	1.4E-10	
Nb^{+5}	1,641	1,235	Cm-244	6.0E-10	8.3E-10
P^{+5}	4,587	79,682	Eu-154	2.8E-07	1.6E-07
K^{+}	3,475	3,360	Np-237	1.7E-09	1.7E-09
Se^{+4}	<49	<42	Pu-238	9.9E-06	2.0E-05
Si^{+4}	104,669	149,374	Pu-239	2.3E-06	3.4E-06
Ag^{+}	91	3,686	Sr-90	1.7E-05	1.4E-05
Na^{+}	637	2,924	Tc-99	3.5E-06	2.2E-07
Sr^{+2}	7	5	H-3	5.8E-08	2.8E-10
S^{+6}	2,728	1,747	U-234	3.5E-09	1.7E-09
Te^{+4}	<61		U-235	5.3E-10	
Tl^{+3}	<49	<36	U-238	1.3E-10	

To compare the solids composition data from the different tanks, the following adjustments or corrections were made:

- Contributions due to interstitial liquid were subtracted from the raw analytical results for Tanks WM-182 and WM-183. From mass and volume measurements made during drying the WM-183 LDUA sample, it was determined interstitial liquid accounted for 27.6 wt % of the dried solids sample. Analytical data for WM-183 liquid samples taken at the same time as the sludge sample was used to make this adjustment. The same fraction of interstitial liquid was assumed for the WM-182 sample, since no drying measurements were available. For a few species such as nitrate and ^{155}Eu, this subtraction gave negative concentrations, which were then changed to zero. A correction for interstitial liquid was also made to the composition WM-180 solids.

- Weight fractions of oxide for each sample were calculated by charge balance.
- The amount of hydrated water was estimated for samples for which it was not measured. The amount of hydrated water was estimated by assuming a 3 to 1 molar ratio of hydrates to phosphates and sulfates and a ratio of 1.16 moles hydrate per mole of nitrate.
- Analyses were not performed for some species for every sample. For these cases, the average concentration from tank samples for which these analyses were made was assumed.
- All phosphorus was assumed present as phosphate and all sulfur as sulfate. The higher concentration of phosphorus or phosphate was assumed for the phosphate concentration and the higher concentration of sulfur or sulfate was assumed for sulfate.

Table 30 shows the adjusted solids compositions. Values shown in italics correspond to undetected species, and the value shown for these species is the detection limit. Solids from Tank WM-186 were analyzed by different methods that the other samples and concentrations shown are normalized, whereas concentrations for the other tanks are not.

Both similarities and difference can be seen in solids concentrations shown in Table 30. The predominant anions in all samples but one are phosphate and oxide, while the predominant cations in all samples are silicon, zirconium and aluminum. Sodium, potassium, sulfate, iron, chloride, fluoride and tin occur in lesser but significant concentrations in most samples. Solids in Tank WM-180 appear to be the least similar to those in other tanks, being very high in nitrate and high in sodium relative to the other samples. Also, the sum of the concentrations for Tank WM-180 is slightly greater than unity, in contrast to all other tanks (except the normalized WM-186). The two samples from WM-187 show high concentrations of silicon and low concentrations of sodium, potassium and calcium relative to the other tank samples, even though these solids came from the other tanks.

Table 31 compares concentrations of major radionuclides, and shows large variations in concentrations between samples from the different tanks. No radionuclide analyses were performed for the sample from Tank WM-186. Concentrations shown in Table 31 for samples taken prior to 2003 were adjusted by decaying activities to January 2003.

Table 30. Comparison of tank solids compositions.

	WM-180	**WM-181**	**WM-182**	**WM-183**	**WM-186**	**WM-187-1**	**WM-187-3**	**WM-188-1**	**WM-188-2**
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Al+3	58,460	5,870	12,425	10,489	52,507	10,616	11,059	35,406	14,568
Sb+5	40	19	*17*	41	41	*64*	40	*34*	*29*
As+5	*7*	36	335	73	148	98	68	351	*40*
Ba+2	34	10	145	18	1,661	12	98	12,542	29
Be+2	*2*	*2*	*1*	*1*	1	*2*	*1*	*2*	*2*
B+3	*511*	49	100	51	261	130	161	*482*	413
Cd+2	177	61	282	32	276	11	6	1,189	216
Ca+2	4,303	449	1,214	449	7,866	570	536	5,630	2,396
Ce+4	43	35	*19*	15	35	*30*	73	35	*30*
Cs+	524	126	45	0	133	68	81	*128*	25
Cl-	909	1,110	1,891	1,168	3,451	14,394	3,051	3,754	3,754
Cr+3	681	241	486	398	1,786	307	444	1,341	621
Co+2	*15*	*1*	*10*	2	8	*10*	*9*	9	7
Cu+2	136	41	331	77	119	69	84	113	55
F-	33	2,165	16,603	4,426	5,916	2,584	30	4,307	0
Gd+3	81	25	24	8	38	8	5	25	25
Fe+3	20,120	3,985	4,251	20,123	12,330	20,119	6,100	5,769	4,385
Pb+2	524	47	314	76	257	*37*	76	647	175
Li+	*160*	35	5	2	34	*14*	*13*	35	*17*
Mg+2	1,383	235	434	195	462	247	388	477	460
Mn+4	1,568	116	271	106	4,103	62	71	758	579
Hg+2	*8,904*	25	73	0	680	329	60	1,566	0
Mo+6	356	283	2,958	816	1,267	923	310	2,770	207
Ni+2	275	57	281	129	850	43	52	427	355
Nb+5	*1,004*	0	1,526	818	2,551	1,641	1,235	5,370	1,888
NO3-	434,300	645	0	0	0	56,514	1,034	0	0
Pd+4	*760*	2,476	6,888	1,913	2,045	2,476	2,476	2,476	345
PO4-3	166,590	197,980	81,686	166,567	283,160	221,788	231,089	60,814	168,335
K+	14,710	8,003	4,924	9,243	9,562	3,475	3,360	8,003	12,309
Ru+3	359	1,051	980	2,798	1,110	1,051	1,051	*313*	803
Se+4	*1,279*	*52*	109	*16*	530	*49*	*42*	*1,720*	*43*
Si+4	20,920	71,114	52,416	46,707	99,395	104,669	149,374	71,114	52,601
Ag+	49	1,299	77	291	865	91	3,686	9	190
Na+	78,160	2,926	18,885	3,945	5,368	637	2,924	20,521	35,291
Sr+2	22	9	*5*	0	10	7	5	9	14
SO4-2	15,140	3,974	36,996	13,903	17,530	18,429	4,386	14,802	10,787
Tl+3	*1,359*	*4*	*19*	*16*	267	*49*	*36*	*783*	*50*
Sn+4	2,120	4,117	4,863	1,942	4,422	4,208	4,363	0	2,178
Ti+4	959	916	774	939	1,956	1,429	916	916	477
U+4	348	*206*	*46*	206	189	*236*	*222*	206	*330*
V+5	*10*	5	0	11	38	*28*	*14*	6	*12*
Zn+2	196	27	177	57	2,679	196	148	126	73
Zr+4	27,970	37,930	121,001	46,051	145,947	66,464	38,644	70,600	32,209
O-2	32,694	55,747	96,591	48,073	157,146	96,258	143,008	140,932	60,942
Hydrates	250,001	115,119	67,300	102,611	171,001	155,669	134,324	42,935	101,864
Total	**1,148,196**	**518,623**	**537,778**	**484,801**	**1,000,000**	**786,112**	**745,154**	**519,452**	**509,130**

Table 31. Comparison of solids radiological composition.

	Cs-137	Sr-90	U-235	U-238	Pu-238	Pu-239
	Ci/kg	Ci/kg	Ci/kg	Ci/kg	Ci/kg	Ci/kg
WM-180	0.21	4.8E-02	8.9E-08	3.8E-08	8.1E-02	1.3E-02
WM-181	0.24	6.0E-03	2.2E-07	2.3E-09	1.4E-02	1.4E-03
WM-182	0.34	8.5E-03	2.3E-07	2.2E-08	1.4E-02	1.2E-03
WM-183	0.72	6.8E-03	1.5E-07	3.6E-08	2.9E-03	1.0E-03
WM-187-1	1.18	1.7E-02	5.3E-07	1.3E-07	9.9E-03	2.3E-03
WM-187-2	0.28	1.4E-02	5.3E-07	1.3E-07	2.0E-02	3.4E-03
WM-188-1	1.93	2.0E-01	1.7E-07	6.8E-08	5.6E-03	3.6E-04
WM-188-2	0.26	5.5E-02	8.9E-08	2.1E-08	2.4E-03	3.4E-04
Minimum	0.21	0.006	8.9E-08	2.3E-09	2.4E-03	3.4E-04
Maximum	1.93	0.20	5.3E-07	1.3E-07	8.1E-02	1.3E-02
Average	0.64	0.04	2.5E-07	5.5E-08	1.9E-02	2.9E-03
Median	0.31	0.02	1.9E-07	3.7E-08	1.2E-02	1.3E-03
Standard Deviation	0.62	0.07	1.8E-07	4.8E-08	2.6E-02	4.2E-03
(Max-Ave)/SD	2.1	2.4	1.6	1.5	2.4	2.4
(Ave-Min)/SD	0.7	0.6	0.9	1.1	0.6	0.6
SD/Average	1.0	1.5	0.7	0.9	1.4	1.5

Revision 3 of this report (Barnes 2003) included an estimated composition of solids that would be in Tank WM-187. Table 32 compares the results of the FY 2004 WM-187 solids sample analysis to the predicted composition for major chemical and radionuclide species. As seen in the table, the concentrations of numerous species fall outside the expected range. This comparison suggests that tank samples may not be representative of a tank's total solids. As discussed in Section 3.3, it may also suggest that transfers of solids between tanks can result in compositional changes.

Because of the differences between the recent WM-187 sample analyses results and the composition expected, the present assumed composition of Tank WM-187 solids (Table 4) is not identical to the recent sample analyses. If the concentration of a chemical species in the recent analysis was outside the range of the concentrations of tanks that were flushed to WM-187, then it was replaced by the average concentration of those tanks plus both WM-187 sample analyses. Concentrations shown in Table 4 for Al, Cd, F, Gd, Pb, Mn, Hg, Ni, and Ag are averages. Concentrations for Ca, Fe, PO_4, K, SO_4, Zr, and H_2O were normalized to bring the sum of all species to 100%. Radionculide concentrations less than 80% or greater than 150% of the average were also replaced by the average.

Table 32. Comparison of recent WM-187 analyses to that predicted from previous data.

	FY-2004	**Rev. 3 SBW Feed Report**			
	Analysis	Low	Expected	High	Comparison of FY-2004
	Wt %	Wt %	Wt %	Wt %	Analysis to Rev. 3 Range
Al^{+3}	1.11	1.2	1.38	2.2	92% of low
Ca^{+2}	0.05	0.093	0.12	0.23	58% of low
Cl^{-}	0.31	0.092	0.21	0.31	100% of high
Fe^{+3}	0.61	0.92	1.1	1.8	66% of low
PO_4^{-3}	23.1	20	25.4	36	close to expected
K^{+}	0.34	1.1	1.27	1.7	31% of low
Si^{+4}	14.9	5.4	6.86	8	187% of high
Na^{+}	0.29	0.96	1.4	2.7	30% of low
SO_4^{-2}	0.44	1.2	2.19	2.8	37% of low
Sn^{+4}	0.44	0.44	0.587	0.67	100% of low
Zr^{+4}	3.86	5.9	9.15	10	65% of low
O^{-2}	14.3	3.4	6.66	4.8	300% of high
Hydrates	13.4	34	41	48	40% of low
Co-60	2.68E-05	3.20E-05	3.77E-05	5.90E-05	84% of low
Sr-90	1.42E-02	8.90E-03	1.00E-02	2.40E-02	within expected range
Tc-99	2.19E-04	7.30E-05	8.99E-05	1.40E-04	157% of high
Cs-137	2.77E-01	2.90E-01	3.55E-01	4.70E-01	96% of low
U-235	5.31E-07	8.80E-08	1.99E-07	3.00E-07	177% of high
U-238	1.28E-07	3.20E-09	1.56E-08	3.30E-08	387% of high
Np-237	1.73E-06	8.50E-07	1.15E-06	1.60E-06	108% of high
Pu-238	1.98E-02	7.10E-03	1.15E-02	2.80E-02	within expected range
Pu-239	3.37E-03	1.22E-03	8.20E-04	4.00E-03	within expected range
Am-241	2.33E-04	1.40E-04	2.98E-04	3.70E-04	within expected range

3.3 Feed Composition Uncertainties

The SBW treatment facility feed could vary from compositions presented in this report for several reasons, including: (1) analytical uncertainties in tank sample analyses, (2) species present in waste for which no analysis was done or which were not detected (2) actual NGLW that differs in rate or composition from that projected, (3) actual amounts of tank solids that differ from estimates, (4) nonrepresentativeness of tank solids samples, (5) processes occurring over time that could change the amount or composition of solids, and (6) potential changes in the tank farm management that could affect volumes and compositions of tank waste.

For recent analyses of Tank WM-189 and WM-188 samples, Batcheller (2003) and Johnson (2003a; 2003b) estimated analytical uncertainties to be 10% for most cations and 20 to 25% for Hg, Sb, Ce, Si, Ag, U, and Te. Anion concentrations were determined by ion chromatography, a different method than that used for cation concentrations, and the uncertainty for anion species is estimated to be larger than for other species, but has not been quantified.

Batcheller (2003) and Johnson (2003a; 2003b) have also reported uncertainties in measured radionuclide concentrations. While the analytical uncertainties for many radionuclides are less than 20%, the uncertainty in uranium and plutonium isotopes ranges from 13 to 100%. Typically, analyses of a tank waste sample are performed for only 15 to 25 isotopes. Concentrations of others are estimates, based on the assumption that the radionuclide concentrations in present waste are proportional to all the nuclear fuel processed at the ICPP over the lifetime of the plant. The uncertainty for these estimates is expected to be ±100%, but could be larger.

SBW contains a very large number of species due to its source. Typically, samples are analyzed for about 50 chemical species. Concentrations reported for others are estimates and could contain large errors. When analyses do not detect an element in a sample, the element is assumed present at a concentration corresponding to the detection limit, and these concentrations could have large errors. However, both for species not detected and species estimated, because their concentrations in the SBW are very small, these uncertainties are expected to have a negligible effect on most treatment processes.

Approximately 6 to 8% of the total liquid feed will be NGLW. Although the uncertainty in generated waste composition is high, the effect of this uncertainty on the SBW treatment facility feeds will be low for several reasons. The NGLW compositional data that are available generally show that the composition of NGLW, when concentrated, is similar to SBW composition. Thus, deviations from historical analyses will likely still fall within the range of SBW compositions for most species. And since NGLW itself is a blend of several dozen different waste streams, compositional variations in a few of the streams will have only a small effect on the composition of the final concentrated waste. Finally, the NGLW could be blended with SBW to further reduce the effect uncertainties and fluctuations in NGLW composition would have on the treatment process.

The uncertainty in the total quantity of tank solids is discussed in Section 3.1. The total volume of waste (liquid plus solids) is known to a high degree of accuracy based on tank volume measurements. For treatment processes that co-process solids and liquids, if the volume of solids is greater than expected, the volume of liquid will be less, and the effect on the process will be small. For the CsIX treatment process, or any other process that treats the solids separately, some of the equipment may be sized based on solids throughput, and thus will be affected by the total tank solids quantity. However, for any treatment process, the effect of more solids on individual equipment should be evaluated during design.

The goal of all SBW treatment processes is to produce a solid waste product from the mostly liquid SBW. For most unit operations of most processes, solids in the feed are like 'inerts" – that is, their composition will have little or no effect on the design. If the solids are chemically changed in the process, such as in a glass melter, their composition becomes more important to the design. Thus, even though there are significant uncertainties in the solids composition, these uncertainties are expected to have a negligible effect on most unit operations of a treatment process. The primary exemption to this statement would be a glass melter.

The variation in tank solids composition is detailed in Section 3.2. The analysis of the July 2003 Tank WM-187 samples provides one estimate of the uncertainties in these compositions. Table 33 shows a comparison between the results of analysis of this sample and the expected composition, based on analysis of samples from samples of Tanks WM-182 and WM-183, the source of the solids in WM-187 at the time it was sampled.

Table 33. Comparison of WM-187 solids composition to source tank solids composition.

	2:1 blend WM-183:WM-182	**WM-187-1**	**Ratio** WM-187/blend	**Ratio** WM-187/182	**Ratio** WM-187/WM-183
	Wt %	Wt %			
Al^{+3}	1.11	1.06	0.95	0.85	1.01
Ca^{+2}	0.07	0.06	0.81	0.47	1.27
Cl^{-}	0.14	1.44	10.22	7.61	12.33
Cr^{+3}	0.04	0.03	0.72	0.63	0.77
F^{-}	0.85	0.26	0.30	0.16	0.58
Fe^{+3}	1.48	2.01	1.36	4.73	1.00
Mo^{+6}	0.15	0.09	0.60	0.31	1.13
NO_3^{-}	0.00	5.65			
PO_4^{-3}	13.83	22.18	1.60	2.72	1.33
K^{+}	0.78	0.35	0.45	0.71	0.38
Si^{+4}	4.86	10.47	2.15	2.00	2.24
Na^{+}	0.89	0.06	0.07	0.03	0.16
SO_4^{-2}	2.16	1.84	0.85	0.50	1.33
Sn^{+4}	0.29	0.42	1.44	0.87	2.17
Ti^{+4}	0.09	0.14	1.62	1.84	1.52
Zr^{+4}	7.10	6.65	0.94	0.55	1.44
O^{-2}	6.42	9.63	1.50	1.00	2.00
H2O	9.08	15.57	1.71	2.31	1.52
Total	49.37	77.91			
	Ci/kg	**Ci/kg**			
Sr-90	7.3E-03	1.7E-02	2.37	2.05	2.58
Sb-125	1.2E-02	6.7E-03	0.57	0.21	4.03
Cs-134	9.2E-04	5.1E-04	0.56	0.22	2.35
Cs-137	5.9E-01	1.2E+00	1.99	3.42	1.64
Eu-154	4.9E-04	2.8E-04	0.58	0.39	0.76
U-234	3.8E-06	3.5E-06	0.93	0.64	1.20
U-235	1.8E-07	5.3E-07	3.01	2.34	3.51
U-238	3.2E-08	1.3E-07	4.05	5.76	3.52
Np-237	1.7E-06	1.7E-06	0.97	1.00	0.95
Pu-238	6.7E-03	9.9E-03	1.47	0.69	3.37
Pu-239	1.1E-03	2.3E-03	2.14	1.92	2.26
Am-241	3.4E-04	3.0E-04	0.88	0.46	1.60

If all samples were perfectly representative of well-mixed solids in the respective tanks, and no composition change occurred washing solids from WM-182 and WM-183 to WM-187, all ratios in the "WM-187/Blend" column would equal 1. The table shows ratios for a few species close to 1, but most are not. This implies nonrepresentative samples and/or composition changes due to precipitation or dissolution during or after solids transfer. Table 33 also shows ratios of the WM-187 sample concentration to those of solids from the two source tanks, WM-182 and WM-183. Comparing the three columns of ratios, it appears that tank WM-187 solids are closer in composition to WM-183 or the blend than they are to WM-182. This implies that some blending of the solids in WM-187 may have taken place.

Comparing results from analysis of the most recent Tank WM-187 sample to a predicted composition leads to similar conclusions. Some species, such as Hg and PO_4 are close to the predicted concentrations, while others are either significantly higher (Si, Cl, NO_3, O) or lower (Ca, K, Na, Fe, Zr, F, SO_4).

While changes in Tank Farm management could affect waste composition, any change from this time forward will have a minimal effect because one tank is now full, another is nearly full, and the third should be nearly full by the end of 2004. Thus, there is neither time nor tank space to make much of a change. Should the waste generated by Tank WM-180 evaporation unexpectedly exceed the capacity of Tank WM-187, another tank would need to be used to store the excess. Because present projections show WM-187 with about 15,000 gallons of spare capacity at the end of 2005, the risk of exceeding its capacity is low.

Tables 34 and 35 provide additional estimates of the uncertainty in SBW sample analyses. Table 34 compares results of liquid analyses for two samples from the same tank (WM-180), one sample taken in 1993 and the second in 2000. Approximately 278,900 gallons of waste were in WM-180 at the time of sampling in 1993. Later, about 400 gallons of waste and 2000 gallons of water were added, 3400 gallons were transferred out of WM-180 in 1997, and 2600 gallons were transferred to the NWCF for sampling in 2000. Thus, at most, 1% of the difference between the two analyses can be accounted for by additions to the tank; the remainder of the difference provides an estimate of the uncertainty in the composition. While the differences between the two sets of analyses are within ~10% for most species, larger differences are seen for a few species.

Table 35 provides an estimate of the how uncertainty in the solids composition affects the total waste composition in a tank. The table compares concentrations of the total waste in WM-189 based on two separate analyses of solids. As mentioned in Section 2.3, the sample of solids from Tank WM-189 was dried with interstitial liquid, the undissolved solids accounting for only about 22% of the total solids. Table 35 compares the total tank waste composition calculated assuming the solids have the composition of the WM-188 solids to the composition using the WM-189 undissolved solids/dissolved solids analyses. Differences are within about 10% for all major species except fluoride and phosphate.

Table 34. Comparison of analyses of WM-180 samples.

	1993 Mol/liter	**2000** Mol/liter	**Ratio** 2000/1993
H^+	1.14E+00	1.10E+00	0.96
Al^{+3}	5.90E-01	6.63E-01	1.12
Ba^{+2}	5.10E-05	5.58E-05	1.09
B^{+3}	1.02E-02	1.23E-02	1.20
Cd^{+2}	7.73E-04	7.54E-04	0.98
Ca^{+2}	3.39E-02	4.72E-02	1.39
Cl^-	3.11E-02	3.00E-02	0.96
Cr^{+3}	3.29E-03	3.35E-03	1.02
F^-	4.18E-02	4.74E-02	1.13
Fe^{+3}	1.75E-02	2.17E-02	1.24
Pb^{+2}	1.23E-03	1.31E-03	1.06
Hg^{+2}	9.89E-04	2.02E-03	2.04
Ni^{+2}	1.48E-03	1.47E-03	0.99
NO_3^-	4.56E+00	5.01E+00	1.10
K^+	1.83E-01	1.96E-01	1.07
Se^{+2}	1.04E-05	1.46E-04	14.0
Ag^+	4.43E-06	5.29E-06	1.19
Na^+	2.00E+00	2.06E+00	1.03
SO_4^{-2}	4.28E-02	6.98E-02	1.63

Table 35. Comparison of two methods of calculating the composition of WM-189 waste.

Concentration based on WM-189 solids analyses divided by concentration based on WM-188 solids analyses

	Ratio		**Ratio**
H^+	1.00	Sr-90	0.93
Al^{+3}	1.04	Cs-137	0.90
Ca^{+2}	1.04	U-238	1.08
Cl^-	0.92	Np-237	0.95
F^-	0.74	Pu-238	0.89
Fe^{+3}	1.04	Pu-239	0.88
Hg^{+2}	0.94	Am-241	1.09
NO_3^-	0.98		
PO_4^{-3}	0.31		
K^+	1.06		
Na^+	1.09		
SO_4^{-2}	1.01		
Zr^{+4}	1.09		

3.4 Solids Co-processing Scenarios

Consolidation of SBW into Tanks WM-187, WM-188, and WM-189 requires redefining a scenario to more evenly distribute tank solids within the entire SBW inventory from what has been presented in previous reports (such as Rev. 3 of this report or Wood 2002). For treatment alternatives that co-process undissolved solids with SBW liquid, solids distribution is needed to (1) reduce the concentration of undissolved solids from that in the initial waste in WM-187 in order to avoid settling of solids in lines during transfer of waste to treatment,[h] (2) to minimize effects of the solids on the performance of the treatment process, due both to physical and chemical differences in the solids and liquids, and (3) to potentially simplify waste qualification by having a more narrow feed composition band.

One option is to install mixing pumps only in Tank WM-187, and design a new receiving tank or tanks to blend waste received from different Tank Farm Tanks. Waste would be transferred from WM-187 and either WM-188 or WM-189 to the new receiving tank, mixed in the new tank and then fed to the treatment process. This scenario has the advantages of the using the minimum number of mix pumps and not using Tank WM-190. However, this scenario would require frequent, short-duration transfers of waste or a very large new tank. Another major disadvantage of this scheme is that it is likely that samples would need to be taken and analyzed each time the receiving tank was filled, for the purpose of waste qualification. In other scenarios, sampling is limited to samples from 300,000-gal tanks, greatly reducing the number of samples. A third disadvantage is that this scenario would require the transfer of Tank WM-187 waste with high solids to the treatment facility, and may result in solids settling if the existing jet transfer and transfer lines are used. While a cost /benefit analysis has not been performed for this scenario, the negative impact on waste qualification and potential for solids settling is likely to outweigh the benefits of this scheme.

A second option would be to use Tank WM-190 as the feed blend tank. A "batch" of feed would be made up in Tank WM-190 by transferring waste from WM-187, WM-188, WM-189, and the NGLW tanks. Feed to SBW treatment would then consist of three batches of nearly identical composition (the average of all SBW plus NGLW) plus a smaller final batch containing heel solids from WM-188 and WM-189. This scenario is shown in Table 36.

For this option, mixing pumps would be installed in Tanks WM-187 and WM-190. Installation of pumps in WM-190 could be done while the tank is empty and essentially free from contamination. The first two feed batches would be made up of equal amounts of waste from WM-187, WM-188, WM-189, and the NGLW tanks. For the second batch, the NGLW tanks would be emptied to allow for a later transfer of waste from WM-188. This waste would be held in the NGLW tanks for later blending with the heels flushed from WM-188 and WM-189. The third feed batch would be made up of waste from WM-187, WM-188, and WM-189, and would reduce the waste to heel level in each of these tanks. These heels would be flushed to WM-190, and then the flush water evaporated. The evaporator concentrate would be added back to WM-190 after emptying the tank to heel level, and the waste temporarily stored in the NGLW tanks would also be added to WM-190 to complete the make up of the fourth and final treatment feed batch. Additional tanks, such as WL-101 and/or WL-102 may be needed to store the evaporator concentrate if WM-100, WM-101, and WM-102 reach their capacities. After Batch 4 is processed, Tank WM-190 would be flushed to the NGLW tanks.

[h] Or alternatively, to avoid the expense of a new transfer system from the Tank Farm to the treatment facility

Table 36. Tank mix scenario using Tank WM-190 for blending.

	WM-187	WM-188	WM-189	NGLW Tanks	WM-190	Waste to Treatment
Initial waste volume, gallons	279,608	284,381	279,800	72,180	0	
Initial undissolved solids, g/liter	99.4	4.6	9.4	4.1		
Batch 1 transfers, gallons	-92,000	-64,000	-85,000	-36,090	285,402	299,673
undissolved solids, g/liter						31.1
Batch 2 transfers, gallons	-92,000	-64,000	-85,000	-36,090	285,402	299,673
undissolved solids, g/liter						31.1
Batch 3 transfers, gallons	-92,000	-95,000	-90,000		285,310	299,576
undissolved solids, g/liter						31.2
Transfer to NGLW tanks, gallons		-53,000		54,590		
Heel, gallons	3,608	8,381	19,800			
Flushing Heel to WM-190, gallons	-3,608	-8,381	-19,800		181,789	
Evaporation of WM-190, gallons					-180,000	
Addition of concentrated waste					31,789	
Batch 4 transfer, gallons				-54,590	88,017	92,418
undissolved solids, g/liter						41.1
Total waste to treatment, gallons						**991,338**

A second scenario would use WM-189 as the feed blend tank. Mixing pumps would be installed in Tanks WM-187 and WM-189. An initial transfer of about 141,000 gallons of waste would be made from WM-189 to WM-190, to provide capacity in Tank WM-189 to receive higher solids content waste from WM-187. Four sequential feed batches would be made up in Tank WM-189, the first two of waste from WM-189, WM-187, and NGLW, and the second two of waste from WM-188, WM-187, and NGLW. While Batch 4 is being processed in the treatment facility, Tank WM-188 could be flushed to Tank WM-187. Most of the solids initially in Tank WM-189 will have been processed with Batches 1-4, and thus less SBW would need to be saved for treating the final heel solids. This waste could initially be held in WM-190 and then transferred to one of the NGLW tanks, or transferred directly to one of the NGLW tanks after it has been emptied. Table 37 shows about 10,000 gallons from WM-189 and 16,000 gallons from WM-188 for this final batch, but the scenario could be adjusted to have all the waste come from just one of these tanks. When emptied of waste, the heel in WM-190 can be flushed to WM-187. Then upon completion of treatment of Batch 4, the heel in WM-189 can also be flushed to WM-187. The dilute liquid in Tank WM-187 would be evaporated, with the evaporator concentrate stored temporarily in the NGLW tanks. When the level in Tank WM-187 was brought down to the solids layer, evaporation of the tank would be stopped and the concentrate from the NGLW tanks added to make up the fifth and final treatment batch. Tank and feed volumes for this scenario are shown in Table 37.

Table 37. Tank mix scenario using Tank WM-189 for blending.

	WM-187	WM-188	WM-189	NGLW Tanks	WM-190	Waste to Treatment
Initial waste volume, gallons	279,608	284,381	279,800	72,180	0	
Initial undissolved solids, g/liter	99.4	4.6	9.4	4.1		
Tank transfer, gallons			-140,800		145,024	
Batch 1, gallons	-64,000		-220,506	-18,045		231,532
undissolved solids, g/liter						33.2
Batch 2, gallons	-64,000		-221,521	-18,045	-133,024	232,597
undissolved solids, g/liter						32.8
	Transfer, gallons	-16000			16,480	
Batch 3, gallons	-74,000	-130,000	-228,706	-18,045		240,142
undissolved solids, g/liter						31.0
Batch 4, gallons	-74,000	-130,000	-228,706	-18,045		240,142
undissolved solids, g/liter			31.0			31.0
Final heel	3,608	8,381	3,000		28,480	
Flushing Heel to WM-187	193,469					
Evaporation of WM-187	-173,500					
Batch 5 transfer				43,469		45,642
undissolved solids, g/liter						33.4
Total waste to treatment, gallons			**942,909**			**990,054**

Other schemes are certainly possible. For example, four feed batches rather than three could be prepared in Tank WM-190, which may improve the mix pump performance by reducing the height of waste in a tank. A summary of advantages and disadvantages of the two schemes is given below:

Advantages	WM-190 Blend Tank Scenario	WM-189 Blend Tank Scenario
Mix pumps installed in only two tanks	x	x
Mix pumps installed in an empty, nonrad tank	x	
Minimum treatment facility feed batches	x	
Most homogeneous blending of tank wastes	x	
Possible better mixing due to smaller feed batches		x
Uniform undissolved solids concentration in all feed batches		x
Greater flexibility to accommodate uncertainty in NGLW volume		x
Flushing of at least one tank can occur during SBW treatment		x
Minimal use of WM-190, allowing it to be availableas a spare for part of the time		x
Does not require use of tanks other than the four TF tanks and the 3 NGLW tanks		x

Blended waste compositions based on the WM-189 Blend Tank Scenario are shown in Table 38.

Table 38. Tank blend compositions for WM-189 Blend Scenario.

	Batch 1	**Batch 2**	**Batch 3**	**Batch 4**	**Batch 5**
Gallons	231,532	232,597	240,142	240,142	45,642
SG	1.25	1.21	1.22	1.22	1.24
	mol/liter	**mol/liter**	**mol/liter**	**mol/liter**	**mol/liter**
H+	2.25E+00	2.15E+00	2.03E+00	2.03E+00	2.43E+00
Al^{+3}	6.40E-01	6.16E-01	6.03E-01	6.03E-01	6.50E-01
Am^{+4}	9.46E-08	9.15E-08	9.10E-08	9.10E-08	8.34E-08
Sb^{+5}	1.56E-05	1.52E-05	1.40E-05	1.40E-05	8.82E-06
As^{+5}	1.62E-04	1.61E-04	1.79E-04	1.79E-04	5.26E-05
Ba^{+2}	7.02E-05	6.81E-05	8.21E-05	8.21E-05	7.07E-05
Be^{+2}	1.84E-05	1.77E-05	1.61E-05	1.61E-05	1.86E-05
B^{+3}	1.69E-02	1.62E-02	1.64E-02	1.64E-02	1.97E-02
Br^{-}	2.65E-07	2.55E-07	3.22E-07	3.22E-07	3.47E-07
Cd^{+2}	2.59E-03	2.46E-03	2.11E-03	2.11E-03	3.10E-03
Ca^{+2}	5.85E-02	5.60E-02	5.22E-02	5.22E-02	6.26E-02
Ce^{+4}	5.21E-05	5.08E-05	5.20E-05	5.20E-05	3.82E-05
Cs^{+}	4.27E-05	4.16E-05	4.78E-05	4.78E-05	3.56E-05
Cl^{-}	2.54E-02	2.47E-02	3.02E-02	3.02E-02	2.66E-02
Cr^{+3}	5.07E-03	4.88E-03	4.70E-03	4.70E-03	5.12E-03
Co^{+2}	4.04E-05	3.87E-05	3.94E-05	3.94E-05	4.43E-05
Cu^{+2}	8.08E-04	7.76E-04	6.82E-04	6.82E-04	7.87E-04
Eu^{+3}	4.40E-07	4.23E-07	5.34E-07	5.34E-07	5.75E-07
F^{-}	3.13E-02	3.08E-02	4.47E-02	4.47E-02	2.91E-02
Gd^{+3}	1.49E-04	1.44E-04	1.74E-04	1.74E-04	1.58E-04
Ge^{+4}	7.64E-09	7.34E-09	9.27E-09	9.27E-09	1.00E-08
In^{+3}	1.21E-06	1.17E-06	1.47E-06	1.47E-06	1.58E-06
I^{-}	3.00E-06	2.91E-06	3.56E-06	3.56E-06	3.11E-06
Fe^{+3}	2.70E-02	2.60E-02	2.54E-02	2.54E-02	2.55E-02
La^{+3}	7.99E-06	7.67E-06	9.69E-06	9.69E-06	1.04E-05
Pb^{+2}	1.08E-03	1.04E-03	9.96E-04	9.96E-04	1.03E-03
Li^{+}	4.51E-04	4.37E-04	4.29E-04	4.29E-04	3.74E-04
Mg^{+2}	1.89E-02	1.82E-02	2.02E-02	2.02E-02	2.20E-02
Mn^{+4}	1.80E-02	1.73E-02	1.59E-02	1.59E-02	1.64E-02
Hg^{+2}	4.97E-03	4.75E-03	5.07E-03	5.07E-03	6.04E-03
Mo^{+6}	3.47E-04	3.36E-04	3.33E-04	3.33E-04	2.92E-04
Nd^{+3}	2.58E-05	2.47E-05	3.12E-05	3.12E-05	3.37E-05

Table 38. (Continued.)

	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
	mol/liter	mol/liter	mol/liter	mol/liter	mol/liter
Np^{+4}	1.50E-05	1.44E-05	1.81E-05	1.81E-05	1.93E-05
Ni^{+2}	1.97E-03	1.89E-03	2.01E-03	2.01E-03	2.30E-03
Nb^{+5}	7.91E-04	7.71E-04	6.19E-04	6.19E-04	4.04E-04
NO_3^-	6.51E+00	6.26E+00	5.87E+00	5.87E+00	6.43E+00
Pd^{+4}	6.47E-04	6.43E-04	9.02E-04	9.02E-04	4.02E-04
PO_4^{-3}	1.05E-01	1.04E-01	1.07E-01	1.07E-01	4.13E-02
Pu^{+4}	9.03E-06	8.87E-06	1.04E-05	1.04E-05	5.93E-06
K^+	2.35E-01	2.27E-01	2.03E-01	2.03E-01	1.86E-01
Pr^{+4}	7.26E-06	6.98E-06	8.81E-06	8.81E-06	9.50E-06
Pm^{+3}	6.21E-08	6.18E-08	6.93E-08	6.93E-08	1.89E-08
Rh^{+4}	3.13E-06	3.01E-06	3.80E-06	3.80E-06	4.10E-06
Rb^+	4.82E-06	4.63E-06	5.85E-06	5.85E-06	6.31E-06
Ru^{+3}	4.89E-04	4.78E-04	4.77E-04	4.77E-04	3.02E-04
Sm^{+3}	4.80E-06	4.62E-06	5.82E-06	5.82E-06	6.25E-06
Se^{+4}	4.06E-05	4.01E-05	4.25E-05	4.25E-05	1.66E-05
Si^{+4}	1.80E-01	1.79E-01	1.91E-01	1.91E-01	6.36E-02
Ag^+	2.69E-04	2.67E-04	2.91E-04	2.91E-04	9.10E-05
Na^+	2.00E+00	1.93E+00	1.67E+00	1.67E+00	1.65E+00
Sr^{+2}	1.29E-04	1.25E-04	1.02E-04	1.02E-04	1.08E-04
SO_4^{-2}	8.57E-02	8.21E-02	4.46E-02	4.46E-02	6.06E-02
Tc^{+7}	1.54E-05	1.51E-05	2.04E-05	2.04E-05	1.33E-05
Te^{+4}	5.19E-06	4.95E-06	3.51E-06	3.51E-06	4.95E-06
Tb^{+4}	1.84E-09	1.77E-09	2.23E-09	2.23E-09	2.40E-09
Tl^{+3}	1.45E-05	1.43E-05	1.49E-05	1.49E-05	6.40E-06
Th^{+4}	2.27E-05	2.16E-05	2.00E-05	2.00E-05	2.87E-05
Sn^{+4}	1.15E-03	1.13E-03	1.17E-03	1.17E-03	4.72E-04
Ti^{+4}	6.64E-04	6.54E-04	6.70E-04	6.70E-04	2.96E-04
U^{+4}	5.60E-04	5.38E-04	4.06E-04	4.06E-04	4.78E-04
V^{+5}	2.85E-04	2.82E-04	3.21E-04	3.21E-04	1.06E-04
Y^{+3}	5.95E-06	5.72E-06	7.22E-06	7.22E-06	7.79E-06
Zn^{+2}	1.01E-03	9.75E-04	9.25E-04	9.25E-04	9.47E-04
Zr^{+4}	1.82E-02	1.80E-02	1.99E-02	1.99E-02	9.23E-03
O-2	2.82E-01	2.80E-01	2.98E-01	2.98E-01	9.89E-02
H2O	4.10E+01	3.95E+01	4.18E+01	4.18E+01	4.16E+01

Table 38. (Continued.)

	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
	g/liter	**g/liter**	**g/liter**	**g/liter**	**g/liter**
TOC	8.69E-01	8.48E-01	7.47E-01	7.47E-01	4.43E-01
UDS	3.15E+01	3.11E+01	3.14E+01	3.14E+01	1.29E+01
	Ci/kg	**Ci/kg**	**Ci/kg**	**Ci/kg**	**Ci/kg**
	Jan-03	**Jan-03**	**Jan-03**	**Jan-03**	**Jan-03**
Ra-226	6.94E-12	6.67E-12	8.41E-12	8.41E-12	9.01E-12
Ac-227	3.27E-11	3.14E-11	3.96E-11	3.96E-11	4.24E-11
Th-230	1.09E-09	1.06E-09	1.28E-09	1.28E-09	1.03E-09
Th-231	1.78E-08	1.71E-08	2.15E-08	2.15E-08	2.31E-08
Th-232	6.00E-16	5.77E-16	7.27E-16	7.27E-16	7.79E-16
Th-234	1.75E-08	1.69E-08	2.13E-08	2.13E-08	2.28E-08
Pa-231	7.57E-11	7.28E-11	9.18E-11	9.18E-11	9.83E-11
Pa-233	2.48E-06	2.39E-06	3.01E-06	3.01E-06	3.22E-06
Pa-234m	1.75E-08	1.69E-08	2.13E-08	2.13E-08	2.28E-08
U-232	2.51E-09	2.44E-09	3.03E-09	3.03E-09	2.54E-09
U-233	8.19E-11	7.92E-11	1.01E-10	1.01E-10	9.63E-11
U-234	1.58E-06	1.53E-06	1.30E-06	1.30E-06	1.37E-06
U-235	6.27E-08	6.06E-08	8.75E-08	8.75E-08	8.29E-08
U-236	8.50E-08	8.23E-08	6.93E-08	6.93E-08	6.14E-08
U-237	5.45E-09	5.24E-09	6.91E-09	6.91E-09	7.38E-09
U-238	3.80E-08	3.65E-08	2.17E-08	2.17E-08	2.48E-08
Np-237	1.99E-06	1.90E-06	2.47E-06	2.47E-06	3.08E-06
Np-238	4.27E-07	4.25E-07	4.76E-07	4.76E-07	1.23E-07
Np-239	8.45E-08	8.02E-08	1.30E-07	1.30E-07	1.64E-07
Pu-236	3.49E-09	3.39E-09	4.19E-09	4.19E-09	3.49E-09
Pu-238	8.80E-04	8.63E-04	1.05E-03	1.05E-03	6.45E-04
Pu-239	1.23E-04	1.21E-04	1.46E-04	1.46E-04	7.97E-05
Pu-240	1.31E-05	1.27E-05	1.57E-05	1.57E-05	1.29E-05
Pu-241	7.01E-04	6.86E-04	7.27E-04	7.27E-04	4.74E-04
Pu-242	1.01E-08	9.86E-09	1.23E-08	1.23E-08	1.02E-08
Pu-244	7.63E-16	7.39E-16	4.16E-16	4.16E-16	3.40E-16
Am-241	7.79E-05	7.53E-05	7.48E-05	7.48E-05	6.85E-05
Am-242m	1.24E-08	1.19E-08	1.67E-08	1.67E-08	1.82E-08
Am-242	1.24E-08	1.19E-08	1.66E-08	1.66E-08	1.81E-08
Am-243	2.07E-08	1.99E-08	2.69E-08	2.69E-08	2.67E-08
Cm-242	2.38E-08	2.28E-08	3.20E-08	3.20E-08	3.55E-08

Table 38. (Continued.)

	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
	Ci/kg	Ci/kg	Ci/kg	Ci/kg	Ci/kg
	Jan-03	Jan-03	Jan-03	Jan-03	Jan-03
Cm-243	3.68E-08	3.58E-08	4.32E-08	4.32E-08	3.50E-08
Cm-244	2.14E-06	2.09E-06	2.26E-06	2.26E-06	1.32E-06
Cm-245	4.43E-10	4.32E-10	5.17E-10	5.17E-10	3.84E-10
Cm-246	2.90E-11	2.83E-11	3.38E-11	3.38E-11	2.52E-11
H-3	1.27E-05	1.24E-05	1.67E-05	1.67E-05	1.37E-05
Be-10	2.54E-12	2.44E-12	3.08E-12	3.08E-12	3.30E-12
C-14	1.47E-10	1.43E-10	1.71E-10	1.71E-10	1.48E-10
Se-79	6.67E-07	6.45E-07	6.96E-07	6.96E-07	6.56E-07
Rb-87	2.48E-11	2.39E-11	3.01E-11	3.01E-11	3.22E-11
Sr-90	3.39E-02	3.26E-02	4.01E-02	4.01E-02	4.26E-02
Y-90	3.39E-02	3.26E-02	4.01E-02	4.01E-02	4.26E-02
Zr-93	1.88E-06	1.80E-06	2.28E-06	2.28E-06	2.44E-06
Tc-98	2.11E-12	2.02E-12	2.57E-12	2.57E-12	2.84E-12
Tc-99	2.59E-05	2.54E-05	3.43E-05	3.43E-05	2.22E-05
Ru-106	1.14E-06	1.11E-06	1.33E-06	1.33E-06	1.15E-06
Rh-102	7.30E-10	7.02E-10	8.85E-10	8.85E-10	9.48E-10
Rh-106	1.14E-06	1.11E-06	1.33E-06	1.33E-06	1.15E-06
Pd-107	1.40E-08	1.35E-08	1.70E-08	1.70E-08	1.82E-08
Cd-113m	2.81E-06	2.70E-06	3.41E-06	3.41E-06	3.65E-06
In-115	8.53E-17	8.20E-17	1.03E-16	1.03E-16	1.11E-16
Sn-121m	5.67E-08	5.44E-08	6.87E-08	6.87E-08	7.35E-08
Sn-126	5.02E-07	4.87E-07	5.84E-07	5.84E-07	5.06E-07
Sb-125	2.41E-04	2.40E-04	2.67E-04	2.67E-04	8.54E-05
Sb-126m	3.48E-07	3.34E-07	4.22E-07	4.22E-07	4.52E-07
Sb-126	4.87E-08	4.68E-08	5.91E-08	5.91E-08	6.33E-08
Te-123	3.25E-19	3.12E-19	3.94E-19	3.94E-19	4.21E-19
Te-125m	2.67E-06	2.56E-06	3.23E-06	3.23E-06	3.46E-06
I-129	6.40E-08	6.20E-08	7.45E-08	7.45E-08	6.53E-08
Cs-134	4.91E-05	4.76E-05	6.80E-05	6.80E-05	6.00E-05
Cs-135	1.02E-06	9.84E-07	1.19E-06	1.19E-06	1.05E-06
Cs-137	5.86E-02	5.68E-02	6.85E-02	6.85E-02	6.10E-02
Ba-137m	5.54E-02	5.37E-02	6.48E-02	6.48E-02	5.77E-02
La-138	1.62E-16	1.55E-16	1.96E-16	1.96E-16	2.10E-16

Table 38. (Continued.)

	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5
	Ci/kg	Ci/kg	Ci/kg	Ci/kg	Ci/kg
	Jan-03	Jan-03	Jan-03	Jan-03	Jan-03
Ce-142	2.53E-11	2.43E-11	3.07E-11	3.07E-11	3.29E-11
Ce-144	7.70E-07	7.47E-07	8.96E-07	8.96E-07	7.73E-07
Pr-144	5.56E-07	5.34E-07	6.58E-07	6.58E-07	7.12E-07
Nd-144	1.36E-15	1.31E-15	1.65E-15	1.65E-15	1.77E-15
Pm-146	4.31E-08	4.14E-08	5.23E-08	5.23E-08	5.60E-08
Pm-147	2.08E-04	2.01E-04	2.42E-04	2.42E-04	2.09E-04
Sm-146	2.34E-13	2.25E-13	2.83E-13	2.83E-13	3.03E-13
Sm-147	6.24E-12	6.00E-12	7.56E-12	7.56E-12	8.10E-12
Sm-148	3.21E-17	3.08E-17	3.89E-17	3.89E-17	4.16E-17
Sm-149	2.85E-18	2.74E-18	3.45E-18	3.45E-18	3.70E-18
Sm-151	4.11E-04	3.98E-04	4.78E-04	4.78E-04	4.13E-04
Eu-150	1.22E-11	1.17E-11	1.48E-11	1.48E-11	1.58E-11
Eu-152	2.45E-06	2.36E-06	2.91E-06	2.91E-06	2.89E-06
Eu-154	1.51E-04	1.45E-04	1.82E-04	1.82E-04	2.02E-04
Eu-155	1.58E-04	1.52E-04	1.87E-04	1.87E-04	1.87E-04
Gd-152	1.20E-18	1.16E-18	1.46E-18	1.46E-18	1.56E-18
Ho-166m	3.90E-11	3.75E-11	4.73E-11	4.73E-11	5.06E-11
Co-60	2.81E-05	2.69E-05	3.85E-05	3.85E-05	4.40E-05
Ni-63	4.01E-05	3.90E-05	4.86E-05	4.86E-05	3.99E-05

3.5 Solids & Slurry Properties

Poloski (2000b) reports that the particle density of air-dried solids from the WM-183 LDUA sample was measured to be 1.88 g/ml. Using measurements of the sludge sample mass, volume and percent water for the same tank sample, a solids particle density of 1.98 g/ml can be derived. These values are commonly rounded to a bulk density of 2.0 g/ml for dried tank solids.

The measured bulk density of solids from several tanks is shown below:

	g/ml
WM-181	0.786
WM-188	0.838
WM-187-1	0.459
WM-187-3	0.421

Particle size distributions (PSD) have been reported for WM-180 solids (Christian 2001), WM-182 and WM-183 solids (Poloski 2000a), WM-189 solids (Batcheller 2003), WM-188 solids (Johnson 2003a), WM-181 solids (Johnson 2003b), and were recently measured for WM-187 solids from the most recent Tank WM-187 sample. The WM-180 solid particles were normally distributed between 2 and 65 μm, with the center of the distribution at 10 μm (Christian 2001). PSDs for WM-182 and WM-183 sonicated solids show median particle sizes of 8 µm and 12 µm respectively. Without sonification, the WM-182 and WM-183 solids size distributions are shifted to larger particle sizes (Poloski 2000a). Particle sizes for the WM-189 sludge sample ranged from 0.5 to 100 µm with a peak at approximately 20 µm (Batcheller 2003). WM-188 particles, without sonification, were distributed between 0.5 and 60 µm, with the average size 4 µm (Johnson 2003a). WM-181 particles were distributed between 0.5 and 30 µm, with the average size about 9 µm (Johnson 2003b). A comparison of particle size distribution for solids from different tanks is shown in Figure 4.

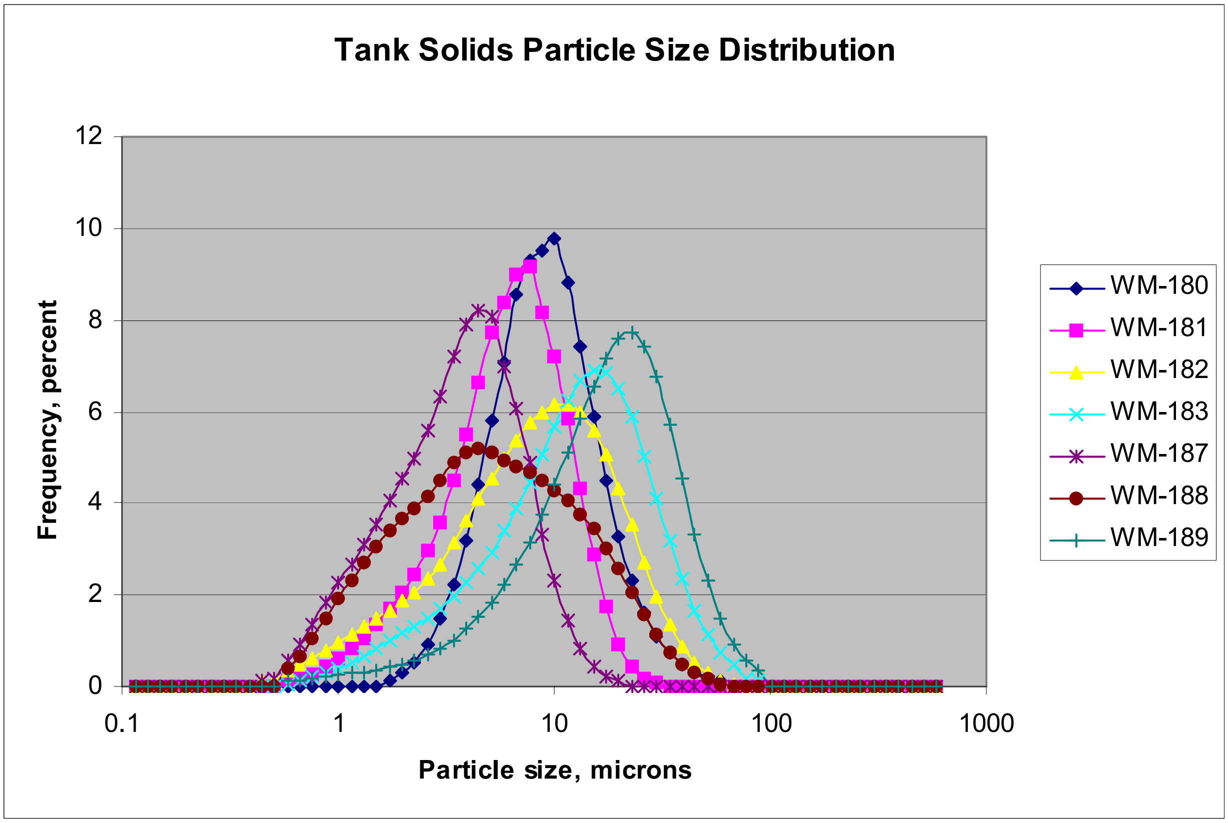


Figure 4. Comparison of solids particle size distribution analyses.

A comparison of settling rate data is shown on Figure 5. Data plotted on Figure 5 is based on measurements of the settled or sludge volume taken at various time intervals.

The solids from the tanks differed in settling. WM-188 and WM-189 both settled by the accumulated sediment method. The solution was cloudy until enough particles agglomerated and then they fell out of solution very rapidly. Once agglomerated, the WM-189 solids settled much faster than the other tanks. Solids in WM-182, WM-183, WM-186, and WM-187 samples all settled by the flocculated sedimentation method. The solution started to clear at the top and slowly cleared to the final volume. Tank WM-181 solids settled completely in about 35 minutes to a volume of 6.5 ml. Then over the next 4 days, this settled volume compressed to 2.1 ml.

The color of the solids differed as well. WM-189 solids were silica like. WM-188 were dark brown-black. Most of the other tanks were a dark gray to black color. A couple samples had a very fine dusting of white solids on top.

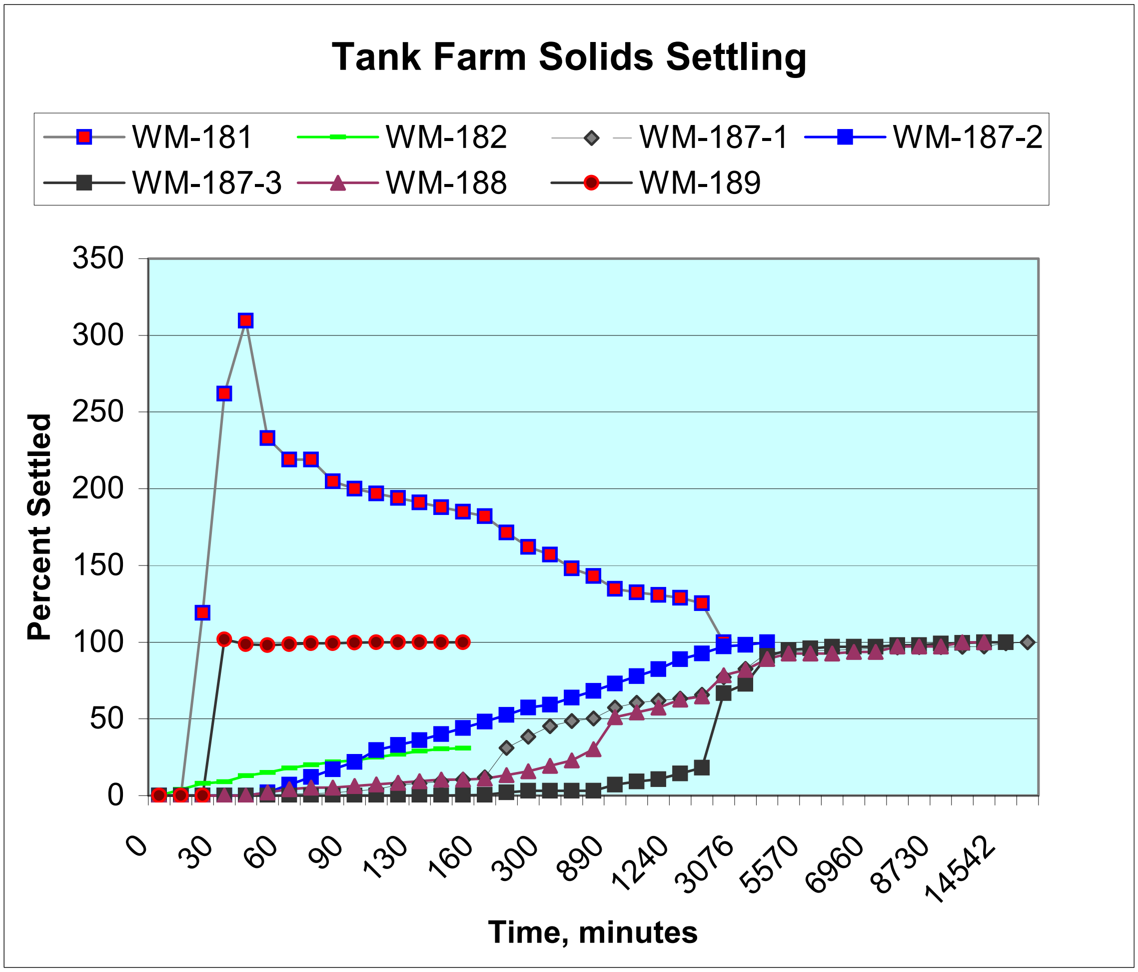


Figure 5. WM-189 and WM-182 relative volume % settled sludge vs. settling time.

Viscosity measurements were made on both the settled WM-182 sludge and the same sludge diluted with an equal volume of demineralized water. Poloski (2001) fit the data to the following flow curves:

Undiluted WM-182 sludge:
Shear stress, dyne/cm^2 = 7.25 x (shear rate, sec^{-1})$^{0.619}$ R^2 = 0.997

Diluted WM-182 sludge:
Shear stress, dyne/cm^2 = 10.25 x (shear rate, sec^{-1})$^{0.218}$ R^2 = 0.988

The viscosity of WM-182 undiluted sludge was approximately 200 cP (Poloski 2001), WM-182 sludge diluted with an equal volume of water about 50 cP (Poloski 2001), WM-189 sludge 3.5 cP (Batcheller 2003), WM-188 sludge 5.5 cP (Johnson 2003a), WM-181 sludge 2.76 cP (Johnson 2003b), and WM-187 sludge 2.71 cP. These viscosities are highly dependent upon the solids content of the sample. Wendt (2004) provides a more detailed analysis of sludge viscosity.

3.6 Liquid Waste Properties

The specific gravity for the liquid waste in Tanks WM-188 is 1.32 (Johnson 2003a) and in Tank WM-189, 1.34 (Batcheller 2003). The specific gravity of the liquid waste in Tank WM-187, when full, is expected to be 1.30.

The viscosity of a liquid sample from Tank WM-188 was measured to be 1.81 cP (Johnson 2003a) and the Tank WM-189 liquid viscosity was measured at 1.94 cP (30.2°C, 60 rpm) (Batcheller 2003). These viscosity values are consistent with measurements of samples from other tanks (Poloski 2001):

WM-180	2.2 cP
WM-181	1.8 cP
WM-182	1.3 cP
WM-186	1.8 cP.

Solids in samples from the above tanks were allowed to settle prior to withdrawing a portion of the liquid for the viscosity measurements. The lower viscosity of WM-182 liquid may be explained by water dilution of the waste prior to sampling.

Batcheller (2003) reports and discusses viscosity data for the WM-189 bottom sample as received. This sample contained about 9 g/liter UDS. At 60 rpm (73.4 sec^{-1} shear rate) the viscosity was 2.6 cP, while at 30 rpm (36.7 sec^{-1} shear rate) the viscosity was 2.1 cP.

Wendt (2004) presents additional data and discussion of the viscosity of tank slurries with different solids fractions.

The thermal conductivity of WM-180 and WM-189 SBW simulants was measured to be 0.547 W/(mK) and 0.525 W/(mK) respectively (Gembarovic 2003). The specific heat for the both simulants was approximately 3.2 W-s/g-K, increasing slightly with temperature (Gembarovic 2003). Gembarovic and Taylor present additional thermal property for SBW simulants as is and neutralized up to a pH of 9-11.

3.7 Organic Species in Liquid Waste

Estimated concentrations for total organics in various tank wastes are shown in Tables 2, 3, 6, 7, 9, 10, and 13-20. This section provides additional information regarding organic species in SBW.

Analysis of samples of Tank WM-189 waste showed 0.092-0.3 mg/liter volatile organic compounds and 0.24-2.0 mg/liter semi-volatile organic compounds (Batcheller 2003). The volatile and semi-volatile compounds amount to only a very small fraction of the TOC in these samples, which was measured to be 513-625 mg/liter. Analysis of a Tank WM-188 sample showed volatile organics present at a concentration of 0.45 mg/liter, semi-volatile organics at a concentration of 0.45 mg/liter, and TOCs at 435 mg/liter (Johnson 2003a).

Other samples of tank wastes have been analyzed for organic compounds.[i] While these samples were from tanks that typically contained reprocessing wastes rather than SBW, the results, in general,

---

[i] See Appendix B of the *Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for Idaho Nuclear Technology and Engineering Center Tanks WM-182 and WM-183*, DOE/ID-10802, November, 2001 and SBW analyses reported in *Analysis of the HLW Calcined During the NWCF Campaign H-4*, LMITCO Internal Report, INEEL/INT-98-00931, September 1998.

may be applicable to SBW. This data is summarized in Table 39. The same analyses reported the following compounds undetected: carbon disulfide, 2-butanone, 1,1,1-trichloroethane, carbon tetrachloride, benzene, 4-methyl-2-pentanone, toluene, and phenol.

Table 39. Summary of organic analyses of TFF samples.

Compound	**Concentration Range** µg/liter	**Validation** Flag[a]	**Tank**	**Reference**
2,4-Dinitrophenol	52-260	J	WM-182	DOE/ID-10802
2-Butanone	9-10	J	WM-182	DOE/ID-10802
Acetone	49-230	E, J	WM-182, WM-183	DOE/ID-10802
Acetone	7-86	J	WM-185, WM-188	INEEL/INT-98-00931
Arochlor-1260	2.5- 2.8	J	WM-183	DOE/ID-10802
Benzene	5-84	J	WM-182	DOE/ID-10802
Bromomethane	98	J	WM-182	DOE/ID-10802
Chloroethane	8	J	WM-182	DOE/ID-10802
Chloromethane	34-530	E, J	WM-182, WM-183	DOE/ID-10802
Ethylbenzene	3-4	J	WM-182	DOE/ID-10802
Xylene (total meta and para)[b]	14	J	WM-182	DOE/ID-10802
N-nitrosodimethylamine	16-31	J	WM-182	DOE/ID-10802
Tributyl phosphate	50	J	WM-182	DOE/ID-10802
Tributyl phosphate	12-58	J, N, B	WM-185, WM-188	INEEL/INT-98-00931
Triphenylester phosphoric acid	61	J, N	WM-188	INEEL/INT-98-00931
Unknown phthalates	1600	J	WM-188	INEEL/INT-98-00931
Unknown semi-volatiles	1100-6500	J, B	WM-185, WM-188	INEEL/INT-98-00931
Organomercury compound	62	J	WM-189	INEEL/INT-98-00931
Pyridine	26-160	E	WM-185, WM-189	INEEL/INT-98-00931
2-Nitropyridine	520	J, N	WM-188	INEEL/INT-98-00931
Dinitrobenzene	30-55	J	WM-185, WM-188	INEEL/INT-98-00931
Chlorinated dinitrobenzene	32	J	WM-188	INEEL/INT-98-00931
Bis (2-ethylhexyl) phthalate	41	J, N	WM-188	INEEL/INT-98-00931
Dibutyl phthalate	200	J, N	WM-189	INEEL/INT-98-00931
Diethyl phthalate	44	J, N	WM-185	INEEL/INT-98-00931
Butylated hydoxytoluene	18	J, N	WM-188	INEEL/INT-98-00931
Diisopropyl ether	36	J, N	WM-185	INEEL/INT-98-00931
Dimethyl sulfone	33	J	WM-185	INEEL/INT-98-00931
Benzylquinoline	500	J	WM-185	INEEL/INT-98-00931

[a] J = estimated; N = tentatively identified; B = compound associated with blank; E = concentration exceeds calibration range.

[b] ortho-xylene was not detected in samples from WM-185 and WM-188

Additional analysis data is available for organic compounds in waste from Tanks WM-189 and WM-185 sampled in 1999 in the NWCF blend and hold cell tanks (Young 2000). Analyses were performed for 68 semivolatile species. No compounds were present at a concentration greater than the detection limit.

Another study evaluated the destruction of 22 different volatile and 21 different semi-volatile organic compounds in simulated SBW (Soelberg 2002). The surrogate waste included nitric acid, aluminum sulfate, calcium chloride, iron sulfate, potassium fluoride, and sodium sulfate. The spiked organic compounds represented a wide range of organic classes and functional groups. Concentrations of the organic species in the simulant were measured at intervals during a 32-day period. Some of the results of this study were as follows:

- Except for chloromethane and bromomethane, levels of all volatile organic compounds (VOCs) decreased over time. The most volatile species rapidly decreased, sometimes to near 0% of the initial spike concentration, even prior to the Day 1 analysis. Lower volatility organic compounds and those with higher water solubility (like acetone, methylisobutylketone, methylene chloride, and carbon disulfide) either decreased more slowly, or showed erratic results. However they nevertheless almost always decreased to 30% or less of the initial spike concentration after 32 days. All VOCs, even those species with slower or erratic depletion rates, would be expected to be highly depleted from the actual SBW that has been held in storage for many years and also exposed to 100^{o}C temperatures during evaporation processes.
- Measured levels of semivolatile organic compounds (SVOCs) decreased more slowly, and in some cases were more erratic, than the VOCs. More reactive SVOCs, like those with double bonds (1,7-octadiene and hexachlorobutadiene) and phenyl groups (cresol, analine, and phenol) were rapidly depleted to a concentration near zero.
- More stable SVOCs like ethers (1,4-dioxane) and water-soluble species like pyridine were depleted more slowly to a relatively stable level, and may not be highly depleted even after long time durations. Levels of some other SVOCs (like nonanoic acid and the nitrophenols) were erratic, and suggest that either (a) in some samples, recovery of these more water-soluble compounds was poor, or (b) these compounds were being formed later in the longer-duration samples.
- The VOC gas chromatography/mass spectrometer scans were evaluated to find any tentatively identified compounds that were not included in the spike compounds and that could have been reaction products of the spiked VOCs. No tentatively identified compounds were detected in appreciable amounts. Even if some reactions of spiked VOCs resulted in reaction products, these products were either (a) volatilized, or (b) too water-soluble to efficiently extract from the aqueous media to be detected.
- Some SVOC tentatively identified compounds were detected in the SVOC scans and suggest that nitration, oxidation, and chlorination reactions occurred in the samples and could occur in the SBW during storage.

As shown in Table 16, oxalic acid, diethanolamine, triethanolamine, and kerosene are part of the decontamination solution used to remove scale from the PEWE evaporator. These compounds or products from the reaction of these compounds with species in SBW are thus likely present in the SBW waste tanks.

Trace amounts of organics may be contained in the tank solids. Analysis of a dried sample of WM-187 solids showed no detectable SVOCs and no detectable polychlorinated biphenyl compounds. Analysis of an undried sample of Tank WM-187 sludge showed a total of less than 1 mg/kg of VOCs. The concentration of 2-butanone in this sample was measured to be 44 µg/kg; concentrations of all other organics detected were flagged as estimated amounts or exceeding the instrument calibration range. These compounds included bromomethane (120 µg/kg), acetone (200 µg/kg), methylene chloride (4.5 µg/kg), 4-methyl-2-pentanone (8 µg/kg), chlorobenzene (3 µg/kg), and 15 unknown compounds.

3.8 NGLW Evaporation & Storage

Tanks WM-100, WM-101, and WM-102 currently contain about 12,000 gallons of waste. Starting in 2005, additional NGLW will be added to these tanks. Based on present projected NGLW generation rates, the three tanks will be filled to their combined maximum capacity of about 55,200 gallons near the end of 2010. If the start of treatment were delayed past 2010, additional storage for NGLW would likely be required. The PEWE bottoms tank, VES-WL-101, has a capacity of 18,400 gallons. The ETS uses the Fluoride Hot Sump Tank in the NWCF, VES-NCC-119, to collect evaporator bottoms. The capacity of this tank is about 5,000 gallons.

The maximum volume of dilute NGLW expected to be generated in any year is 1,084,000 gallons (see Table 12). Concentration of this waste by the PEWE is expected to require about 36 weeks, based on a processing rate of 30,000 gal/week. The ETS has capacity far in excess of what will be required to concentrate NGLW.

4. RECOMMENDATIONS

To reduce uncertainties in the feed compositions to a future SBW treatment facility, the following activities are recommended:

- Review solids analysis methods and procedures and evaluate ways to obtain a tighter material balance when analyzing solids. Based on this evaluation, modify or update procedures for analyzing solids from tank farm tanks.
- Review and evaluate possible ways to obtain more representative solids samples
- Review and evaluate possible ways to more accurately determine the quantity or level of undissolved solids in Tanks WM-187, WM-188 and WM-189.
- After Tank WM-187 is full, sample and analyze waste in this tank. Analyses of both liquid and solids are needed. Potentially, the solids present in the tank could change in composition with the planned addition of concentrated waste to the tank or over time after the tank has been filled. Thus, periodic resampling (every 1-2 years) and analysis of solids in the sample is recommended.
- After Tank WM-188 is full, sample and analyze waste in this tank. Sufficient sample should be obtained to be able to analyze both liquid and solids.
- Resample Tank WM-189 and analyze the solids only using the updated procedure.
- Sample and analyze the NGLW tanks (WM-100, WM-101 and WM-102) annually.

5. REFERENCES

Barnes, C. M., A. L. Olson, D. D. Taylor, 2004, *Sodium-Bearing Waste Treatment Technology Evaluation Report*, INEEL/EXT-04-01692.

Barnes, C. M., S. K. Janikowski, C. B. Millet, 2003, *Feed Composition for the Sodium-Bearing Waste Treatment Process*, INEEL/EXT-2000-01378, Rev. 3, September, 2003.

Barnes, C. M., R. A. Wood, B. H. O'Brien, 2002, "Process Design of SBW Treatment Alternatives," *Engineering Design File EDF-2373*, September 10, 2002.

Batcheller, T. A., D. D. Taylor, V. J. Johnson, 2003, *Characterization of Tank WM-189 Sodium-Bearing Waste at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-02-01171 Rev. 1, July 2003.

Christian, J. D., 2001, *Composition and Simulation of Tank WM-180 Sodium-Bearing Waste at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-2001-00600, May 2001.

Demmer, R., 2002, *INTEC Waste Minimization Plan*, PLN-225, October 15, 2002.

Garn, T. G., 2001, "Sampling and Characterization of WM-180," *INEEL Interoffice Memorandum TGG-01-01 to J. A. Rindfleisch*, January 11, 2001.

Gembarovic, J., R. E. Taylor, 2003, *Specific Heat and Thermal Conductivity of Two Sodium-Bearing Waste Simulants*, TPRL-3016, September 2003.

Griffith D. L., L. G. Olson, 2003, *Testing an Agitated Thin Film Evaporator For Solidifying a Mixture of Simulated Sodium Bearing Waste and Undissolved Solids (Test Series 2)*, INEEL/EXT-03-01189, November, 2003.

Harbour, J. R., R. F. Schumacher, A. Choi, A. K. Hansen, 2002, *Development of an Initial Simulant for the Idaho Tank Farm Solids*, WSRC-TR-2002-00436, November 11, 2002.

HLW Program Office, 1998, *Analysis of the HLW Calcined During the NWCF Campaign H-4*, LMITCO Internal Report, INEEL/INT-98-00931, September 1998.

Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act Closure Plan for Idaho Nuclear Technology and Engineering Center Tanks WM-182 and WM-183, 2001, DOE/ID-10802, Appendix B, "Data Summary for Tanks WM-182 and WM-183," November 2001.

Johnson, V. J., R. L. Demmer, T. A. Batcheller, 2003a, *Characterization of Tank WM-188 Sodium-Bearing Waste at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-03-00478, June 2003.

Johnson, V. J., R. L. Demmer, 2003b, *Characterization of Tank WM-181 Sodium-Bearing Waste Solids at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-03-00979, September, 2003.

Millet, C. B., 2003, "Composition of Tank Farm Waste as of October 2002", *INEEL Interoffice Memorandum Mil-07-02 to J. I. Pruitt*, originally issued December 12, 2002 and reissued with a correction September 25, 2003.

Nenni, J. A., 2004. "ETS Process Parameter and Outlet Stream Predictions for WM-180 Feed," *INEEL Interoffice Memeorandum to J. P. Law,* JAN-04-04, February 16, 2004.

Nenni, J. A., 2002, "Balance-of-Plant Sample Data Compilation," *Engineering Design File,* EDF-2506, September 2002.

Packer, E. Bart, 2003, "Preliminary Assessment of Evaporator Technologies for Direct Evaporation of Sodium Bearing Waste," *Engineering Design File EDF-3443*, April 8, 2003.

Palmer, W. B., C. B. Millet, M. D. Staiger, M. C. Swenson, W. B. McNaught, F. S. Ward, 2000, *INTEC Waste Management Through 2070,* INEEL/EXT-2000-01005, December 2000.

Patterson, M., 1999, *Light Duty Utility Arm Deployment in Tank WM-188*, INEEL/EXT-99-01302, December 1999.

Poloski, A., 2001, "Rheology of the INTEC Tank Farm Closure Surrogate and WM-182 LDUA Sample Dissolution of the WM-182 LDUA Sample in 6M Nitric Acid," *Engineering Design File EDF-1914,* February 19, 2001.

Poloski, A., 2000a, "Solids Characterization," *Engineering Design File EDF-TST-001*, September 20, 2000.

Poloski, A. P., 2000b, "INTEC Tank Farm Sludge Density Measurements/Calculations," *Engineering Design File 15722-040*, July 12, 2000.

Quigley, J. J., 2001, "Material Balance for Vitrification of SBW Liquids and Solids," *Engineering Design File EDF-1680 Rev. 3*, June 28, 2001.

Soelberg, N., et. al, 2002, "Delisting Data Quality Objectives Project Organic Compound Stability Study," Revision 1 (unpublished), April 10, 2002.

Staiger, M. D., C. B. Millet, R. A. Nickelson, R. A. Wood, A. Chambers, 2001, "Tank Farm Facility, Tank and Waste Data*," Engineering Design File EDF-1598*, February 27, 2001.

Swenson, M. C., 2003, "Validation of the Radionuclide Inventory and Mass Balance Used in the INTEC SBW and Tank Farm Residuals WIR Determination Reports," *Engineering Design File EDF-1920 INEEL/EXT-2001-534*, Revision 5, September 2003.

Swenson, M. C., 2002, "Radiological and Fissile Material Source Term for Tank Farm Undissolved Solids," *INEEL Interoffice Memorandum to R. P. Durante*, MCS-06-02, November 7, 2002.

Swenson, M. C., 2001, "HLLWE Plugging Problems Associated with WM-186 Waste," *INEEL Interoffice Correspondence to M. W. Patterson*, MCS-04-01, May 30, 2001.

Swenson, M. C., 1992, *Historical Tank Farm Sample Results*, *INEL Memorandum MCS-27-92 to M. R. Christensen*, December 17, 1992.

Tripp, J. L., 1998, *Supporting Information for the INEEL Liquid Waste Management Plan, Appendix B*, INEEL/EXT-98-00730, July 1998.

Tyson, D. R., 2002, "Validation of the Radionuclide Mass Balance Used in the INTEC SBW WIR Determination Report," *Engineering Design File EDF-1920*, Revision 4, August 29, 2002.

Young, L. J., N. R. Soelberg, B. H. O'Brien, R. D. Boardman, L. A. Matejka, M. L. Abbott, G. R. Hassel, 2000, *NWCF Calciner Emissions Inventory – Final Report for Test Series 1, 2, and 3*, INEEL/EXT-2000-00114, January, 2000, Part 2, Appendix F.

Wendt, D., 2004, *INTEC SBW Solid Sludge Surrogate Recipe and Validation*, ICP/EXT-04-00415 Rev. 0, June 2004.

Wenzel, D., 2002, "Relative Inventories of Reactor-Produced Species in INTEC Waste Types," *Engineering Design File EDF-CRPD-001*, November 4, 2002.

Wenzel, D. R., 2000, "Calculation of July 1999 Inventories for INTEC Wastes," *INEEL Interoffice Memorandum Wen-27-99 to M. D. Staiger*, originally issued November 7, 1999 and reissued with corrections August, 2000.

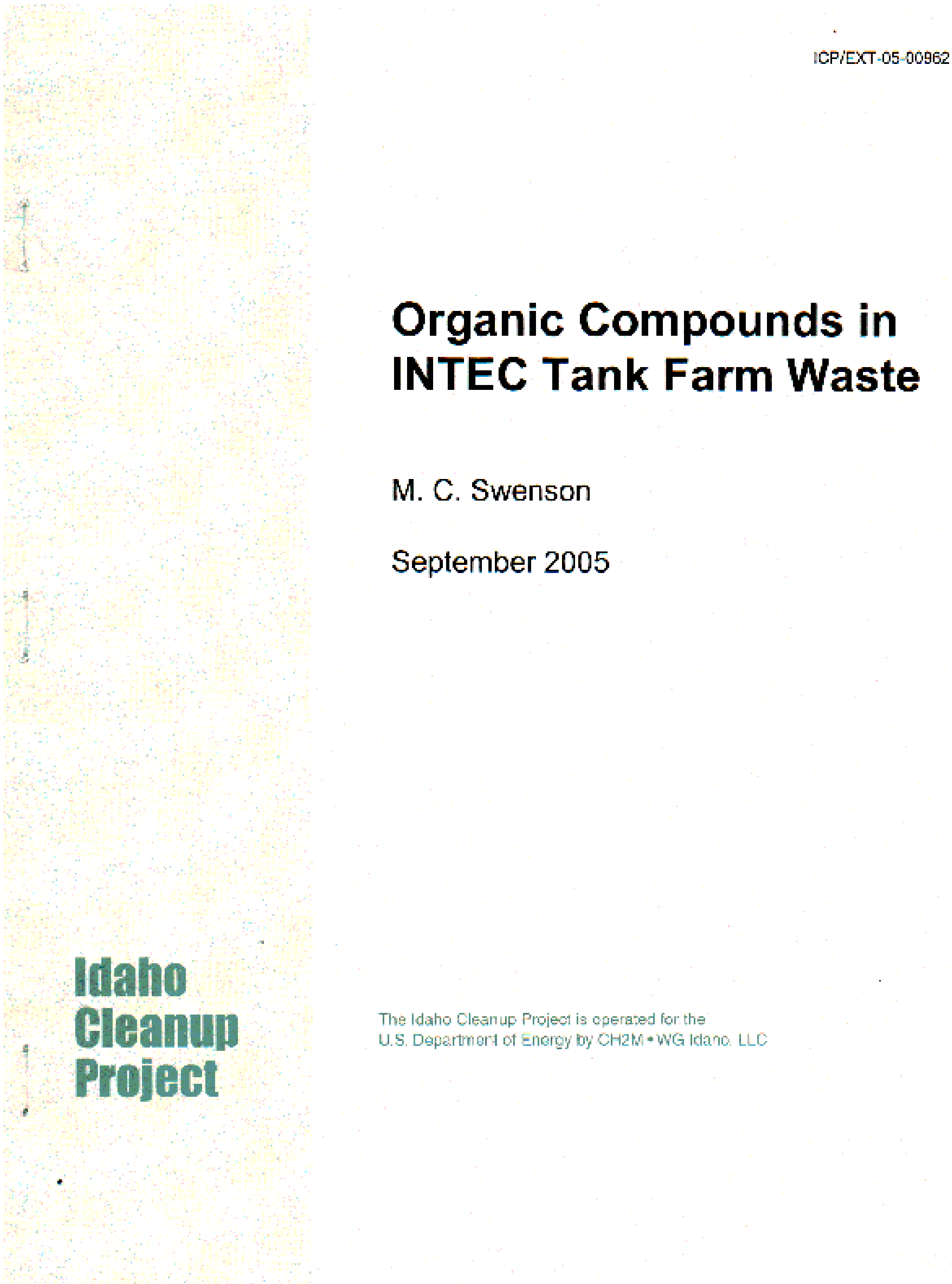
Wenzel, D. R., 1999, "Calculation of July 1999 Radionuclide Inventory for Sodium-Bearing Waste," *INEEL Interoffice Correspondence Wen-20-99 to A. L. Olson*, May 18, 1999.

Wenzel, D. R., 1997, "Evaluation of Radionuclide Inventory for Sodium-Bearing Waste," *Engineering Design File EDF-FDO-006/CPP-97080*, November 26, 1997.

Wood, R. A., 2002, "Heel Solids Process Evaluation for the Idaho Tank Farm Project NWCF MACT Upgrade Option," *Engineering Design File EDF-3049*, December 2002.

APPENDIX C-2

Organic Compounds in INTEC Tank Farm Waste



ICP/EXT-05-00962

Organic Compounds in INTEC Tank Farm Waste

M. C. Swenson

September 2005

Idaho Cleanup Project

The Idaho Cleanup Project is operated for the
U.S. Department of Energy by CH2M • WG Idaho, LLC

Double click on the icon to display the document

ICP/EXT-05-00962

Organic Compounds in INTEC Tank Farm Waste

M. C. Swenson

September 2005

Idaho Cleanup Project

The Idaho Cleanup Project is operated for the
U.S. Department of Energy by CH2M • WG Idaho, LLC

ICP/EXT-05-00962

Organic Compounds in INTEC Tank Farm Waste

M. C. Swenson

September 2005

Idaho Cleanup Project

Idaho Falls, Idaho 83415

**Prepared for the
U.S. Department of Energy
Assistant Secretary for Environmental Management
Under DOE-NE Idaho Operations Office
Contract DE-AC07-05ID14516**

ABSTRACT

Approximately 830,000 gallons of liquid, radioactive, sodium-bearing waste (SBW) are currently stored in three 300,000-gallon tanks at the Idaho Nuclear Technology and Engineering Center Tank Farm. Designing and permitting a SBW treatment facility requires characterization of the waste. This report documents the organic content of the current Tank Farm waste. The wastes remaining in the three tanks are the same waste type (SBW), have similar chemical composition, have undergone similar treatment (evaporation), and were derived from the same or similar sources. Wastes from two of the three tanks have been characterized for organics. The measured organic content of the waste is low, less than 1 g/l of total organic carbon and generally no detectable, specific volatile or semi-volatile compounds.

Although the contents of one tank have not been characterized for organics, the organic content of the wastes in all three tanks is similar due to the similarity in the sources and treatment of the wastes. The organic content of the wastes that have been analyzed, along with that of historical wastes, is characteristic of the waste in the tank that has not been analyzed.

SUMMARY

Approximately 830,000 gallons of liquid, radioactive, sodium-bearing waste (SBW) are stored in three 300,000-gallon tanks at the Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm. Designing and permitting a SBW treatment facility requires characterization of the waste. This report documents the organic content of the current Tank Farm waste. The waste in tanks VES-WM-188 and VES-WM-189 have been analyzed. The VES-WM-189 waste contains very low concentrations (less than laboratory detectable concentrations of about ten parts per billion) of specific volatile and semi-volatile organic compounds, and less than one gram per liter of total organic carbon. The waste in VES-WM-188 also has very low concentrations of specific volatile organic compounds (generally less than detectable amounts), no detectable polychlorinated biphenyls, and less than one gram per liter of total organic carbon. The semi-volatile organic analysis of the VES-WM-188 waste was not successful. The composition of the waste in VES-WM-187 has changed recently, due to transfers of waste in and out of the tank associated with tank cleaning activities elsewhere in the Tank Farm. Consequently, the waste currently in VES-WM-187 has not been analyzed for organic compounds. The waste in all three tanks is the same type (SBW), came from similar sources, has undergone the same treatment (concentration by evaporation), and has similar chemical content and radioactivity. Waste sample data show the concentrations of organic compounds in the current wastes are similar to those of historical wastes from which the waste is derived. Therefore, the organic content of the waste in VES-WM-187 should be similar to that of the waste in VES-WM-188 and VES-WM-189.

There have been four main potential sources of organic compounds in the Tank Farm waste. They include the uranium extraction and purification processes, the calcination facilities, the analytical laboratories, and equipment decontamination activities. Although some INTEC aqueous wastes had the potential to contain small amounts of organic compounds, the INTEC liquid waste storage and treatment conditions (high nitric acid concentration, concentration of the waste by evaporation, waste agitation, and the use of steam jets and air lifts to transfer waste eliminated most of the volatile and semi-volatile organic compounds from the wastes. Historical analytical data show there have generally been no reproducible detections of specific volatile or semi-volatile organic compounds in the Tank Farm wastes. The few volatile and semi-volatile organic compounds that have been detected were present in very low concentrations, often noted as laboratory contaminants, found in trip blanks, and generally not found in repeated analyses of the same waste. Therefore, their presence in detectable concentrations is suspect. Current and historical analytical data confirm the total organic content of Tank Farm wastes is low (less than 1 gram per liter).

CONTENTS

Figures

Organic Compounds in INTEC Tank Farm Waste

1. INTRODUCTION

Spent nuclear fuel was reprocessed between 1953 and 1992 at the Idaho Nuclear Technology and Engineering Center (INTEC), formerly called the Idaho Chemical Processing Plant (ICPP). Fuel reprocessing recovered enriched uranium and valuable nuclear reaction byproducts for the Department of Energy (DOE). Fuel reprocessing also generated radioactive liquid wastes that were stored in the INTEC Tank Farm. Between 1963 and 2000, most of the liquid waste was removed from the Tank Farm and converted into a solid, granular form called calcine. In April 1992, the DOE announced that spent nuclear fuel would no longer be reprocessed and initiated a shutdown of the reprocessing facilities at INTEC. Although fuel reprocessing ceased in 1992, calcination of the Tank Farm waste continued through 2000, when it ended pending a determination on how to treat the remaining waste. During the 40 years of calciner operation, approximately eight million gallons of liquid waste were removed from the Tank Farm and converted into 156,000 cubic feet of calcine (Staiger and Swenson 2005). The calcine is currently stored in six calcined solids storage facilities pending a decision on its final treatment and disposition.

Although the bulk of the liquid waste that was sent to the Tank Farm was removed and calcined, approximately 830,000 gallons of waste remain in three 300,000-gallon tanks. Designing and permitting a treatment facility for the remaining waste requires characterization of the waste. The chemical content and radioactivity of the waste have been documented elsewhere. This report documents the organic content of the waste, based upon historical and recent waste sample analyses, as well as process knowledge.

There have been four primary potential sources of organics to the Tank Farm. They include the raffinates from the uranium extraction and purification processes, waste (primarily off-gas scrubbing solution) from the calcination facilities, analytical laboratory wastes, and spent decontamination solution. This report describes the potential sources of organic compounds in the Tank Farm waste. It provides historical sample data that show the organic compound concentrations in the Tank Farm wastes were small, regardless of the type of waste or potential source of organics. Although some wastes may have contained low concentrations of organics when they were generated, historical sample data show there have generally been no detectable, specific, volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) in the Tank Farm wastes. The liquid waste storage conditions and treatment systems destroyed the bulk of the VOCs and SVOCs that may have originally been in the wastes. The historical analytical data are presented because the current wastes are derived from historical wastes, and current waste compositions can be inferred from historical data when current data are not available. The historical data, current data, and process knowledge provide assurance that the organic content of the current waste is known, even for waste that has not been analyzed for organics.

This report provides recent analytical data to document the organic content of the current Tank Farm wastes. The waste currently in VES-WM-189 (one of the three tanks that store waste) has been characterized for VOCs, SVOCs, and total organic carbon. The waste in VES-WM-188 has been analyzed for VOCs, polychlorinated biphenyls (PCBs), and total organic carbon. The waste currently in VES-WM-187 has not been analyzed for organic compounds. The waste in all three tanks is the same type of waste, has similar chemical composition, and came from the same or similar sources. All three tanks contain concentrate from the evaporation of wastes previously stored in the Tank Farm. Much of that waste was analyzed for organics prior to its evaporation. Both the evaporated concentrate and its predecessor solutions contained similar concentrations of organic compounds. Therefore, although not all of the current wastes have been fully characterized for organics, their organic content is similar to wastes that have been analyzed (each other and historical wastes).

2. SOURCES OF ORGANICS IN TANK FARM WASTE

The INTEC Tank Farm has received and stored radioactive, aqueous wastes since 1953. The Tank Farm received wastes from a variety of sources. Some of the wastes had the potential to contain small amounts of organic compounds. There have been four primary potential sources of organics to the Tank Farm; the uranium extraction and purification processes, the calcination facilities, analytical laboratories, and equipment decontamination activities.

2.1 Organics in Fuel Reprocessing Waste

Reprocessing spent nuclear fuel consisted of dissolving the fuel with acid, recovering enriched uranium from the acidic, dissolver-product solution, and purifying the recovered uranium. The uranium recovery and purification processes included three steps, often called "cycles." The first cycle separated the uranium in the dissolver-product solution from the bulk of the fission products, cladding material, and other components of the spent nuclear fuel. The second and third cycles purified the uranium by separating it from actinides such as plutonium. Each of the uranium recovery and purification cycles used an organic solution to selectively extract the uranium from the aqueous feed stream. Each uranium recovery and purification cycle produced an aqueous waste (raffinate) that was stored in the Tank Farm. First-cycle raffinate was the single largest source of waste to the Tank Farm waste and contained the bulk of the radioactive fission products originally in the fuel. The second and third-cycle raffinates were smaller in volume and contained much less radioactivity than first-cycle raffinate.

The organic extractants used in the uranium recovery and purification processes were potential sources of organic compounds in the Tank Farm waste. Originally, all three fuel-reprocessing cycles used hexone (methyl isobutyl ketone or 4-methyl-2-pentanone) as the organic extractant. INTEC changed the fuel reprocessing chemistry in the late 1950s and began using a solution of tributyl phosphate (TBP) dissolved in kerosene as the first-cycle organic extractant. The second and third-cycle uranium purification processes continued to use hexone as the organic extractant.

Organic contamination of the fuel reprocessing raffinates was possible from the mixing of aqueous and organic solutions during uranium recovery and purification. Hexone, the organic used in the original first-cycle uranium extraction system and in the second and third-cycle uranium purification processes, is slightly soluble in water (about 2 percent or 20 g/l). Therefore, first-cycle raffinate from the 1950s and all of the second and third-cycle raffinates likely contained some hexone when they were initially produced. The kerosene used in the first-cycle extraction process during most of the fuel reprocessing history is "insoluble" in aqueous solutions. However, trace amounts, less than the laboratory detection quantities of a few parts per billion (ppb), may have been in the first-cycle raffinate sent to the Tank Farm after the late 1950s.

Fuel reprocessing no longer occurs at INTEC. The last first-cycle raffinate was generated in the late 1980s. The last second and third-cycle raffinates were generated in the early 1990s. Virtually all of the first-cycle raffinate was removed from the Tank Farm by 1998 and converted into a solid, granular form (calcine). Fuel reprocessing has not been a potential source of organic compounds to the Tank Farm since the early 1990s.

2.2 Organics in Calcination Facility Waste

Some waste from the calcination facilities was a potential source of organics to the Tank Farm. From August 1970 through May 2000, the calcination facilities burned kerosene to generate heat for the calcination process. The kerosene was atomized with oxygen and sprayed into the fluidized calciner bed where it burned. The heat of combustion vaporized the water from the Tank Farm waste, leaving the dissolved constituents as a solid granular product called calcine. This method of burning kerosene within the fluidized bed of the calciners was called in-bed combustion (IBC).

The majority of the kerosene burned efficiently in the calciners. However, the relatively cool operating temperature range (500-600°C) of the calciners was not high enough for highly efficient combustion of the more stable and difficult to oxidize kerosene components such as aromatic compounds. Consequently, some products of incomplete combustion (PICs) formed. An extensive sampling program found small concentrations of PICs in the calciner off gas during emissions inventory testing (Boardman et. al. 1999, Young et. al. 2000, and Boardman et. al. 2001).

An off-gas quench and scrub system removed some of the PICs from the calciner off gas. Analyses of off-gas scrub solution samples obtained during the emissions testing program in 1999 and 2000 found low concentrations [<1 part per million (ppm)] of a few PICs (Young 2000). The bulk of the scrub solution was recycled into the calciner feed system, and the PICs in the scrub solution were destroyed or volatilized when they were fed to the calciner. However, during process upsets or following a calciner shutdown, some calciner scrub solution was sent to the Tank Farm. That scrub solution was a potential source of organics (PICs) to the Tank Farm.

Calcination of Tank Farm waste ceased in May 2000. The calciner scrub solution, with its low level of PICs, is no longer a potential source of organics to the Tank Farm.

2.3 Organics in Laboratory Waste

The INTEC analytical laboratories have been a potential source of organics to the Tank Farm. The INTEC laboratories use small quantities (gallon, pint, or smaller) of organic reagents in various analytical procedures. The laboratories do not send waste organic solutions to the Tank Farm. However, the laboratory disposes radioactive, aqueous wastes to the Process Equipment Waste (PEW) Evaporator feed collection system. Some of those wastes may be contaminated with organic reagents that are soluble in aqueous solutions. The PEW Evaporator feed system collects dilute, low-activity, aqueous wastes from a variety of sources, concentrates the wastes, and sends the concentrate to the Tank Farm. Thus, organic-contaminated wastes from the analytical laboratories are a potential source of organics to the Tank Farm via the PEW Evaporator.

Although the laboratories continue to operate today, the INTEC Liquid Waste Management System Permit (Volume 14) requires the analytical laboratories to maintain very low discharges of organics to the PEW Evaporator feed collection system. Historical and current Tank Farm waste analyses have included wastes generated by the analytical laboratories. Any contribution of organics by the analytical laboratories to the Tank Farm waste is included in both current and historical waste sample data.

2.4 Organics in Decontamination Waste

Some of the chemicals used to decontaminate process equipment were a potential source of organics to the Tank Farm. Much of the INTEC process equipment required “hands on” maintenance and repair work. Prior to performing such work, the processes were shut down and the equipment was decontaminated to lower the radiation fields and reduce radiation exposure to maintenance personnel. Various methods were used to decontaminate equipment, including flushing the equipment with cleaning solutions to remove radioactive contamination. The primary cleaning/decontamination reagents were water and nitric acid. However, some of the more aggressive decontamination procedures used organic compounds as cleaning/decontamination solutions (Johnson and Westra 1979). Organic compounds were typically used to complex radionuclides that were present as metal ions and prevent them from adsorbing onto the surface of the equipment.

Most of the acid-resistant metals (stainless steels) used in the INTEC processes had protective metal-oxide surface films that adsorbed radionuclides from waste solutions. In some cases, films or scale formed on the surface of equipment by deposition of species from the solution having low or marginal solubility. Such surface films also adsorbed radionuclides. Sometimes, equipment decontamination required the removal of the protective metal oxide film and scale in order to remove the adsorbed radionuclides. Removal of the surface films was done using corrosive decontamination reagents such as alkaline or acidic permanganate and oxalic acid. Radionuclides that were removed with the surface film were kept in solution (preventing their re-adsorption onto the equipment surfaces) by the addition of anionic organic compounds that formed stable complexes with the cationic radionuclides. The organic compounds most commonly used for such complexing were tartaric acid, citric acid, and ethylenediaminetetraacetic acid (EDTA). The radionuclide/organic complexes were rinsed from the equipment with the spent decontamination solution.

Most of the spent decontamination solution that contained organic chemicals was sent to the PEW Evaporator, where it was combined with other dilute wastes and concentrated. The Evaporator concentrate was sent to the Tank Farm for storage. Thus, decontamination reagents were a potential source of organic compounds in the Tank Farm waste.

3. ORGANIC CONTENT OF TANK FARM WASTES

The organic content of the Tank Farm waste was affected by the waste storage and treatment conditions. Originally segregation of Tank Farm wastes made some wastes more prone to have some organics than other wastes. However, all of the current wastes have been blended and concentrated, thus homogenizing the wastes and eliminating the historical segregation factor. The waste chemistry, especially the nitric acid content of the waste, has also affected the organic content of the waste. Waste treatment and storage conditions, including concentration of the wastes by evaporation, agitation (air sparging), and transferring wastes with steam powered jet pumps also affected the concentrations of organics in the waste.

3.1 Storage of Tank Farm Wastes

Originally, first-cycle raffinate was stored separately from other wastes because of its high fission product content and heat generation rate. First-cycle raffinate had design requirements (such as cooled tanks) that other wastes did not have. First-cycle raffinate had the potential for organic contamination from the hexone (1950s) and TBP/kerosene (1960s through 1980s) that were used in the first-cycle process.

Second and third-cycle raffinates were originally stored with the PEW Evaporator concentrate due to their low fission product activity and heat generation rates. With time, this waste became known by its current name of sodium-bearing waste (SBW). The name came from the relatively high sodium ion concentration (1-2 molar) in the waste. The high sodium concentration came from wastes generated by scrubbers, ion exchangers, and equipment decontamination that used sodium-containing chemicals such as sodium carbonate and sodium hydroxide. Most of the SBW began as dilute waste that was concentrated in the PEW Evaporator. The resulting concentrate was sent to the Tank Farm. The SBW had the potential to contain organics from second and third-cycle raffinates (hexone) and the PEW Evaporator concentrate (laboratory reagents and decontamination chemicals).

Over time, the waste storage philosophy (and plant piping configuration) changed. After the 1950s, most of the second-cycle raffinate was stored with the first-cycle raffinate (instead of the SBW) because it was chemically compatible with first-cycle raffinate and the calcination process. This provided a potential source of hexone to the first-cycle raffinate. The third-cycle raffinate was stored with the PEW Evaporator concentrate until the 1980s, when piping configuration changes allowed it to be stored with the first-cycle raffinate.

By 1998, only SBW remained in the INTEC Tank Farm. From 1990 through 2000 the SBW was calcined, and from 2000 through 2004 the remaining SBW was blended and concentrated by evaporation. This reduced the total waste volume and allowed several tanks to be emptied and removed from service. It also homogenized the inventory of the SBW currently stored in the INTEC Tank Farm.

3.2 Destruction of Organics in Tank Farm Wastes

Although there were potential sources of organics in the Tank Farm wastes, laboratory tests showed most of the VOCs and SVOCs that may have originally been in the wastes were destroyed by the chemistry, treatment, and storage conditions of the waste. Studies and tests by Radian (1995) and Science Applications International Corporation, or SAIC, (2002) evaluated the fate of organic compounds in Tank Farm wastes. The Radian test spiked simulated Tank Farm waste with 21 volatile and 23 semi-volatile target organic compounds. The spiked solutions were sampled and analyzed over a month-long period. The test found the concentrations of both the target VOCs and SVOCs in the simulated waste generally decreased over time. The concentrations of some organics decreased very rapidly, from concentrations of several thousand ppb to less than detectable quantities (typically about 10 ppb) in a few hours to days.

The rate of decrease depended on the reactivity of each individual organic component. A similar study by SAIC also found a decrease in the organic content of organic-spiked solutions over time. Both studies concluded the organics were destroyed, decomposed, or volatilized due to the high nitric acid concentration in the waste and the storage conditions of the waste.

Historically, Tank Farm wastes varied in chemical and radiochemical composition, depending on the process that generated the waste. However, one common factor among the Tank Farm wastes was a high (1-3 molar) nitric acid concentration. This was due to the extensive use of nitric acid in fuel reprocessing, as a decontamination chemical, in the calciner off-gas scrubbing systems, and elsewhere at INTEC. Based on the Radian and SAIC studies, the nitric acid in the waste likely destroyed most of the VOCs and SVOCs that may have originally been in the Tank Farm wastes.

Neither the Radian nor the SAIC study included the effect of evaporation on the amount of organics in the waste. The evaporation process accelerates the destruction and loss of organics. Computer simulations of the behavior of VOCs and SVOCs in the PEW Evaporator showed most of the organics in the dilute feed solution volatilized during the evaporation process and were not in the concentrate sent to the Tank Farm (Schindler 1999). The computer simulations used commercially available software [ASPEN PLUS™ and OLI System Incorporated's ESP (Environmental Simulation Program)] to estimate the concentrations of organics in the PEW Evaporator concentrate. The computer simulations evaluated 17 VOCs and SVOCs that may have entered the PEW Evaporator feed system, based on INTEC process knowledge, chemical usage, waste sample results, etc. The study concluded no more than one percent of any of the organic compounds evaluated were retained in the Evaporator concentrate. For most organic species, the amount retained in the Evaporator concentrate was several orders of magnitude less than one percent of the amount in the feed solution. The amount retained in the concentrate depended on the solubility and volatility of each compound. Therefore, although some of the dilute wastes sent to the PEW Evaporator may have contained VOCs or SVOCs, virtually none of them were retained in the concentrate that was sent to the Tank Farm.

Historically, evaporators concentrated most of the SBW before it was sent to the Tank Farm. Evaporators in the fuel reprocessing facility concentrated the second and third-cycle raffinates, and the PEW Evaporator concentrated most of the rest of the SBW. In addition, the Evaporator Tank System (ETS), also known as the high-level liquid waste (HLLW) evaporator, recently concentrated the SBW remaining in the Tank Farm.

As a result of the liquid waste treatment, chemistry, and storage conditions, the Tank Farm waste contains very low concentrations (typically less than laboratory detection values) of VOCs and SVOCs.

3.3 Organic Compound Data for Historical Tank Farm Wastes

Hundreds of samples of Tank Farm waste have been analyzed over the 50-year history of the Tank Farm. The bulk of the samples were analyzed for chemicals and radionuclides necessary for the operation of the Tank Farm, calciners, and other waste treatment processes. The analyses included the principal waste components (such as aluminum (Al), zirconium (Zr), and fluoride), constituents such as chloride that were significant to operational concerns such as corrosion, and radionuclides such as cesium (Cs-137) and strontium (Sr-90) that were important to radiation shielding and dose calculations. However, prior to 1990, there were few, if any, detailed analyses for organic compounds in the Tank Farm waste. The concentration of organics had been presumed to be low by process knowledge.

Beginning in 1990, Tank Farm waste samples were analyzed to characterize the waste in compliance with the Resource Conservation and Recovery Act (RCRA). The RCRA waste characterization included organic analyses. The Tank Farm wastes sampled since 1990 have included the various types of wastes that have been generated and stored throughout the history of the Tank Farm. The sampled wastes include first-cycle (Al and Zr) raffinates, second and third-cycle raffinates, SBW, and mixed wastes (blends of SBW, calciner scrub and decontamination solution, fuel reprocessing raffinates, etc.). The organic analyses have included VOCs, SVOCs, PCBs, and total organic carbon.

Historical Tank Farm waste samples have generally contained no (detectable) specific, target VOCs or SVOCs, regardless of the type or source of the waste. The total concentration of specific and tentatively identified VOCs and SVOCs has typically been less than one part per million. The total organic carbon has typically been less than one gram per liter.

Organic compound data for historical Tank Farm wastes are presented in this report because they help validate the data from the recent samples of the current SBW. The current wastes were derived from historical wastes (by blending and concentrating) and therefore should have similar organic content. The current SBW, like that of historical waste, has virtually no specific VOCs or SVOCs and a low (less than 1 g/L) concentration of total organic carbon. The similarity in the organic content of the current and historical wastes provides assurance that the organic data for the current wastes are reliable. The historical data also help provide assurance that the organic content of the waste in VES-WM-187, which is derived from historical wastes but has not been characterized for organics, is similar to that of both historical and current wastes.

The historical organic compound data in this report differ from that in some reports (Abbott et. al. 1999). Such reports used conservative, bounding values for the organic content of Tank Farm wastes, estimated from INTEC chemical receipts, for risk assessments or worst-case dose calculations. Such estimates did not take into consideration any destruction or removal of the organics by acids, evaporation, waste agitation, etc. Such documents acknowledge the organic concentration data from waste sample analyses are much lower for species for which both estimates and analytical data are available.

3.3.1 Volatile Organic Compounds in Historical Tank Farm Wastes

Table 1 includes data from some of the earliest (1990) analyses for VOCs. Table 2 includes later (1993) VOC data. In general, the number of specific analytes increased with time. Thus, the 1990 sample analyses have fewer analytes than subsequent analyses. The sample data in Tables 1 and 2 show historical Tank Farm wastes, with one exception, did not contain repeatable, detectable amounts of specific VOCs. Most of the analytes had concentrations below the laboratory detection limits (about 10 ppb). Small concentrations of VOCs were detected in a few of the waste samples. However, the detected analytes were present in very small concentrations, found in trip blanks and thus noted by the laboratory as likely lab contaminants (such as acetone), and not found in repeated analyses of the same waste.

Hexone (4-methyl 2-butanone) was the exception to the generalization that VOCs were not regularly detected in the Tank Farm wastes. Table 2 shows three waste samples from VES-WM-100 taken in 1993 consistently had detectable levels of hexone. The concentration of hexone was small, from 0.15 to 0.41 ppm, but above the detection level of 0.010 ppm. At the time, VES-WM-100 contained one-year-old second and third-cycle raffinates. The second and third-cycle uranium purification system used hexone as an organic extractant. Hexone is slightly soluble in water, so its presence in the waste was not unexpected.

Table 1. Volatile organic compound data from representative 1990 Tank Farm waste samples.

Waste Tank		WM-182	WM-185	WM-188	WM-188
Sample Log Number		90-10218	90-09042	90-09149	90-09157
Waste Description		First-Cycle Al Raffinate with Large Fraction (30%) Second/Third-Cycle Raffinates	SBW (PEW Evaporator Concentrate and Small Amounts of First, Second, and Third-Cycle Raffinates)	First-Cycle Zr Raffinate	First-Cycle Zr Raffinate
Volatile Organic Compound	**CAS Number**	**microgram/kg (ppb)**	**microgram/kg (ppb)**	**microgram/kg (ppb)**	**microgram/kg (ppb)**
1,1,1-Trichloroethane	71-55-6	<1.64	<1.6	<1.76	<1.74
Acetone	67-64-1	43[1]	<20.4	<26.4	<26.1
Benzene	71-43-2	9.4[1]	<9.38	<10.3	<10.2
Carbon Tetrachloride	56-23-5	<1.64	<1.6	<1.76	<1.74
Chloroform	67-66-3	<2.46	<2.4	<2,64	<1.74
Hexone	108-10-1	<7.37	<7.2	<7.93	<7.82
Methylene Chloride	75-09-2	<6.23	<60.8	<66.9	<66.1
Tetrachloroethylene	127-18-4	<0.82	<0.8	<0.88	<0.87
Trichloroethylene	79-01-6	<1.64	<1.6	<1.76	<1.74
Toluene	108-88-3	<7.9	<7.4	<8.17	<8.06

Note 1. Acetone and benzene were noted as being possible laboratory contaminants for this sample.

The 1993 VES-WM-100 waste was included in Table 2 as a "worst-case" sample in terms of VOCs in Tank Farm wastes. Generally, second and third-cycle raffinates were concentrated in an evaporator, which would have driven off the hexone, prior to being sent to the Tank Farm. The second and third-cycle raffinates in the 1993 VES-WM-100 waste had not been concentrated in an evaporator, resulting in higher than normal hexone concentrations. Although hexone was detected (0.15 to 0.41 ppm) in the VES-WM-100 waste, it was much lower than the amount that likely existed (20,000 ppm or 2%) when the waste was initially generated. This shows the bulk of the hexone had been destroyed or removed, even without evaporation, by the waste storage conditions (nitric acid, air sparging, etc.). The waste in VES-WM-100 was calcined in 1993 and is not part of the SBW currently in the Tank Farm.

The 1993 VES-WM-100 data in Table 2 is for "pure" second and third cycle wastes that had not been evaporated or blended with any other waste. Second and third-cycle wastes were generated in relatively small quantities and were usually blended with other wastes (SBW or first-cycle raffinate) for storage. Typically, Tank Farm wastes contained small fractions of second and third-cycle wastes (less than 10% each) that had been concentrated in an evaporator prior to storage in the Tank Farm. The existing SBW contains a total of about 6% second and third-cycle (combined) raffinate (Loos 2004). Historically, SBW has typically had no detectable hexone, as shown by the sample data on Tables 1 and 2.

Tables 1 and 2 include sample data for waste from tank VES-WM-182. At the time (1990 and 1993), VES-WM-182 contained first-cycle Al raffinate with a higher-than-normal fraction (30% combined) of second and third-cycle raffinates (Loos 2004). Despite its high fraction of second and third-cycle raffinates, the VES-WM-182 waste contained no detectable hexone (<0.010 ppm) in either the 1990 or 1993 sample analyses. The VES-WM-182 waste was typical of historical Tank Farm waste and the current SBW in which the second and third-cycle wastes had been evaporated and blended with other wastes.

Table 2. Volatile organic compound data from representative 1993 Tank Farm waste samples.

Waste Tank		WM-100	WM-180	WM-181	WM-182	WM-185	WM-188	WM-189
Sample Log Number(s)		93-082013, -08216, and - 08223	93-020710, -02089, and -021310	93-021411, -02205, and -022314	93-03234 and -050726	93-102912	93-09136	93-092315 and -092413
Waste Description		Second and Third-Cycle Raffinate	SBW (PEW Evaporator Concentrate and Second/Third - Cycle Raffinates)	SBW (PEW Evaporator Concentrate and Second/Third-Cycle Raffinates)	First-Cycle Al Raffinate with Large Fraction (30%) of Second/Third -Cycle Raffinate	SBW with Small Fraction of First-Cycle Raffinate	First-Cycle Zr (Fluorinel) Raffinate	Mixture: Primarily NWCF Scrub and Decon Solution
Volatile Organic Compound	**CAS Number**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**
1,1,1-Trichloroethane	71-55-6	<50	<10	<10	<10	<10	<50	<25
1,1,2,2-Tetrachloroethane	79-34-5	<50	<10	<10	<10	<10	<50	<25
1,1,2-Trichloroethane	79-00-5	<50	<10	<10	<10	<10	<50	<25
1,1-Dichloroethane	75-34-3	<50	<10	<10	<10	<10	<50	<25
1,1-Dichloroethene	75-35-4	<50	NA	NA	NA	<10	<50	<25
1,2-Dichloroethane	107-06-2	<50	<10	<10	<10	<10	<50	<25
1,2-Dichloropropane	78-87-5	<50	<10	<10	<10	<10	<50	<25
2-Butanone (methy ethyl ketone)	78-93-3	<50 to 54	NA	NA	NA	<10	<50	<25
2-Hexanone	591-78-6	<50	1-2[1]	5 to 35[1]	<10	<10	<50	<25
4-Methyl-2-pentanone (methyl isobutyl ketone or hexone)	108-10-1	150 to 410	1[2] and <10	2 to 4[2] and <10	<10	<10	<50	<25
Acetone	67-64-1	1000 to 1700[3]	NA	NA	Note 4	<10	68[6]	150 to 720[3]
Benzene	71-43-2	<50	<10	<10	<10	<10	<50	<25
Bromodichloromethane	75-27-4	<50	<10	<10	<10	<10	<50	<25
Bromoform	75-25-2	<50	<10	<10	<10	<10	<50	<25
Bromomethane	74-83-9	<50	NA	NA	NA	<10	170[6]	41 to 170[5]
Carbon disulfide	75-15-0	<50	NA	NA	NA	<10	<50	<25
Carbon tetrachloride	56-23-5	<50	<10	<10	<10	<10	<50	<25
Chlorobenzene	108-90-7	NA	NA	NA	NA	<10	<50	<25
Chloroform	67-66-3	<50	<10	<10	<10	<10	<50	<25
See notes at end of table on next page.								

Table 2. Volatile organic compound data from representative 1993 Tank Farm waste samples. (Continued)

Waste Tank		**WM-100**	**WM-180**	**WM-181**	**WM-182**	**WM-185**	**WM-188**	**WM-189**
Waste Storage Tank and Sample Log Number		Logs 93-082013, 08216, and 08223	Logs 93-020710, 02089, and 021310	Logs 93-021411, 02205, and 022314	Logs 93-03234 and 050726	Log 93-102912	Log 93-09136	Logs 93-092315 and 092413
Waste Description		Second and Third Cycle Raffinate	SBW (PEW Evaporator Concentrate and Second/Third-Cycle Raffinates)	SBW (PEW Evaporator Concentrate and Second/Third-Cycle Raffinates)	First-Cycle Al Raffinate with Large Fraction (30%) of Second/Third-Cycle Raffinate	SBW (PEW Evaporator Concentrate and Second/Third-Cycle Raffinates)	First-Cycle Zr Raffinate	Mixture: Primarily NWCF (Scrub and Decon Solution)
Volatile Organic Compound	**CAS Number**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**	**microgram/L**
Chloromethane	74-87-3	<50	NA	NA	NA	<10	300[6]	<25
cis-1,2-Dichloroethene	156-59-2	<50	<10	<10	<10	<10	<50	<25
cis-1,3-Dichloropropene	10061-01-5	<50	<10	<10	<10	<10	<50	<25
Dibromochloromethane	124-48-1	<50	<10	<10	<10	<10	<50	<25
Ethylbenzene	100-41-4	<50	<10	<10	<10	<10	<50	<25
Methylene Chloride	75-09-2	<50	<10	<10	<10	<10	62	<25
o-Xylene	95-47-6	<50	<10	<10	<10	<10	<50	<25
Styrene	100-42-5	<50	<10	<10	<10	<10	<50	<25
Tetrachloroethene	127-18-4	<50	<10	<10	<10	<10	<50	<25
Toluene	108-88-3	<50	<10	<10	<10	<10	<50	<25
trans-1,2-Dichloroethene	156-60-5	<50	<10	<10	<10	<10	<50	<25
trans-1,3-Dichloropropene	10061-02-6	<50	<10	<10	<10	<10	<50	<25
Trichloroethene	79-01-6	<50	<10	<10	<10	<10	<50	<25
Vinyl Chloride	75-01-4	<50	NA	NA	NA	<10	<50	<25
Xylene, Isomers m and p	1330-20-7	<50	<10	<10	<10	<10	<50	<25

Note 1. 2-Hexanone was estimated at less than the minimum qualification level (MQL). Found in VES-WM-181 trip blank and was likely a lab contaminant.

Note 2. Hexone was estimated at less than the minimum qualification level (MQL). Hexone was noted by the lab as a possible lab contaminant.

Note 3. Acetone was a possible lab contaminant as it was also in trip or system blank.

Note 4. Acetone was a tentatively identified compound but not estimated. It was identified as a possible lab contaminant.

Note 5. Bromomethane was detected in both the trip and system blanks. It was a possible laboratory contaminant.

Note 6. Though not specified for the VES-WM-188 sample, acetone, bromomethane, and chloromethane were common lab contaminants found in trip or system blanks of other samples (i.e. VES-WM-189 sample)

NA = Not Analyzed

Table 2 and other tables in this report often include data from multiple samples from a given tank of waste. This is evident by the information in the "Sample Log Number" line which often lists multiple log numbers (corresponding to multiple samples) for a given tank of waste. For the purpose of brevity, data from multiple samples from a given waste are typically included in a single column under the tank number. Usually, specific analytes were not detected in the waste samples, and the laboratory detection value is given in the data tables. In the few cases where multiple samples contained varying detected concentrations of a given analyte, the data tables show the lowest and highest detected value from among the multiple samples of the waste.

3.3.2 Semi-volatile Organic Compounds in Historical Tank Farm Waste

Table 3 shows the results of eight SVOC sample analyses of four wastes in the mid to late 1990s. Table 3 includes two samples of first-cycle Zr raffinate, four samples of SBW, and two samples of mixed wastes (blends of SBW, calciner scrub and decontamination solution, fuel reprocessing raffinates, etc.). Three waste samples came from VES-WM-185; two in 1993 and one in 1999 (the first numbers, 93 and 99, in the sample log number correspond to the year in which the sample was taken). The three VES-WM-185 samples came from the same waste. There were no waste transfers into VES-WM-185 between the two sample dates, thus its waste composition did not change. Three samples came from waste from VES-WM-189; one in 1993, one in 1996, and one in 1999. The 1993 and 1996 VES-WM-189 samples came from virtually the same waste. A small amount of waste was added to VES-WM-189 after the 1993 sample was taken, increasing the waste volume by about 10%. However, the source of the new waste was the same as the original waste, so there should have been no significant change in the waste composition. VES-WM-189 was emptied and refilled between 1996 and 1999. Therefore, the 1999 waste in VES-WM-189 was different than the 1993/1996 waste.

The sample data in Table 3 generally show no (detectable) specific SVOCs in the Tank Farm waste. The laboratory detection values generally varied from 5 to 25 parts per billion (ppb). The number of specific analytes increased with time, so the 1999 and 1996 analyte list is more extensive than that of 1993. Some nitrated aromatics (2-nitophenyl and 2-4-dintirophenyl) were found at low concentrations (<0.10 ppm) in some of the 1993 samples. Nitrated aromatics are possible PICs from the combustion of kerosene in the calciner. Small concentrations (less than 1 ppm) of PICs were detected in the calciner off-gas scrub solution during calciner emissions testing (Boardman et. al. 2001). The 1993 VES-WM-189 waste included a large amount of calciner decontamination and scrub solution that could have contained PICs from the calcination process. However, the nitrated aromatics were found only in the 1993 analysis, not in the subsequent (1996) analysis of the same waste. The reason for this anomaly is not certain. The 1993 analyses may have been inaccurate or the organics may have been destroyed in storage. In any event, the detected concentrations of the nitrated organics in 1993 were low.

The concentrations of specific SVOCs in historical Tank Farm wastes were generally below the laboratory detection limits (5 to 25 ppb). In the few instances when specific SVOCs were detected, the amounts were small (<0.1 ppm) and were not found in repeated analyses of the same or similar wastes.

Table 3. Semi-volatile organic compound data of representative historical Tank Farm wastes.

Waste Tank		WM-189		WM-188	WM-185		WM-189
Waste Description		Mixed Wastes--Primarily NWCF Scrub and Decon Solution derived from first-cycle raffinate		First Cycle Zr (Fluorinel) Raffinate	SBW –With Small Amount of First-Cycle Raffinate		SBW--With NWCF Scrub/Decon Solution and ETS Concentrate
Sample Log Number		93-092411	96-06111	93-07174, 93-07175	93-072115 93-07222	99-05241	99- 03111
Semi-Volatile Organic Compound	**CAS Number**	**Concentration (ppb)**		**Concentration (ppb)**	**Concentration (ppb)**		**Concentration (ppb)**
1,2,4-Trichlorobenzene	120-82-1	<10	<6.9	<10	10[1]	<25	<25
1,2-Dichlorobenzene	95-50-1	<10	<7.3	<10	<10	<25	<25
1,3-Dichlorobenzene	541-73-1	<10	<6.1	<10	<10	<25	<25
1,4-Dichlorobenzene	106-46-7	<10	<1.8	<10	10[1]	<25	<25
2,2'-Oxybis(1-chloropropane)	108-60-1	<10	<6.1	<10	<10	<25	<25
2,4,5-Trichlorophenol	95-95-4	<10	<17.4	<10	<10	<25	<25
2,4,6-Trichlorophenol	88-06-2	<10	<10.1	<10	<10	<25	<25
2,4-Dichlorophenol	120-83-2	<10	<7.6	<10	<10	<25	<25
2,4-Dimethylphenol	105-67-9	<10	<16.6	<10	<10	<25	<25
2,4-Dinitrophenol	51-28-5	81.14	<26.6	10[1]	10[1]	<25	<25
2,6-Dinitrotoluene	606-20-2	<10	<7.9	10[1]	<10	<25	<25
2-Chloronapthalene	91-58-7	<10	<10.4	<10	<10	<25	<25
2-Chlorophenol	95-57-8	<10	<5.6	<10	<10	<25	<25
2-Methylnaphthalene	91-57-6	<10	<7.0	<10	<10	<25	<25
2-Methylphenol	95-48-7	<10	<5.0	<10	<10	<25	<25
2-Nitroaniline	88-74-4	10[1]	<6.3	<10	<10	<25	<25
2-Nitrophenol	88-75-5	89.47	<7.3	35.32	19.55	<25	<25
3-Nitroaniline	99-09-2	<10	<6.3	<10	10[1]	<25	<25
4-Chloro-3-methylphenol	59-50-7	<10	<7.6	<10	<10	<25	<25
4-Chloroaniline	106-47-8	<10	<26.9	10[1]	<10	<25	<25
4-Methylphenol	106-44-5	10[1]	<5.4	10[1]	<10	<25	<25
Acenaphthene	83-82-9	<10	<5.6	<10	38.64	<25	<25
Acenaphthylene	208-96-8	<10	<6.9	<10	<10	<25	<25
Bis(2-chloroethoxy)methane	111-91-1	<10	<7.7	<10	<10	<25	<25
Bis(2-Chloroethyl)ether	111-44-4	<10	<6.9	<10	<10	<25	<25
Dimethylphthalate	131-11-3	<10	<6.9	<10	<10	<25	<25
Hexachlorobutadiene	87-68-3	<10	<9.8	<10	<10	<25	<25
Hexachlorocyclopentadiene	77-47-4	<10	<13.0	<10	<10	<25	<25
Hexachloroethane	67-72-1	<10	<8.5	<10	<10	<25	<25
Isophorone	78-59-1	<10	<7.2	<10	<10	<25	<25
Naphthalene	91-20-3	<10	<7.7	<10	10[1]	<25	<25
Nitrobenzene	98-95-3	<10	<8.7	<10	<10	<25	<25
N-Nitroso-dimethylamine	62-75-9	<10	<10.7	<10	<10	<25	<25
N-Nitroso-di-n-propylamine	621-64-7	<10	<13.1	<10	<10	<25	<25
Phenol	108-95-2	<10	<5.7	<10	<10	<25	<25

Note 1. Estimated value (below minimum quantification level).

NA = Not Analyzed

Table 3. Semi-volatile organic compound data of representative historical Tank Farm wastes. (continued)

Waste Tank		WM-189		WM-188	WM-185		WM-189
Waste Description		Mixed Wastes--Primarily NWCF Scrub and Decon Solution		First-Cycle Zr (Fluorinel) Raffinate	SBW –With Small Amount of First-Cycle Raffinate		SBW--With NWCF Scrub/Decon Solution and ETS Concentrate
Sample Log Number		93-092411	96-06111	93-07174, 93-07175	93-72115 93-07222	99-05241	99-03111
Semi-Volatile Organic Compound	**CAS Number**	**Concentration (ppb)**		**Concentration (ppb)**	**Concentration (ppb)**		**Concentration (ppb)**
2,4-Dinitrotoluene	121-14-2	NA	<9.8	NA	NA	<25	<25
3,3'-Dichlorobenzidine	91-94-1	NA	<66.3	NA	NA	<25	<25
4,6-Dinitro-2-methylphenol	534-52-1	NA	<5	NA	NA	<25	<25
4-Bromophenyl-phenylether	101-55-3	NA	<6.7	NA	NA	<25	<25
4-Chlorophenyl-phenylether	7005-72-3	NA	<7.3	NA	NA	<25	<25
4-Nitroaniline	100-01-6	NA	<4.2	NA	NA	<25	<25
4-Nitrophenol	100-02-7	NA	<18.6	NA	NA	<25	<25
Anthracene	120-12-7	NA	<5.2	NA	NA	<25	<25
Azobenzene	103-33-3	NA	<10	NA	NA	<25	<25
Benzo(a)anthracene	56-55-3	NA	<7.8	NA	NA	<25	<25
Benzo(a)pyrene	50-32-8	NA	<1.3	NA	NA	<25	<500
Benzo(b)fluoranthene	205-99-2	NA	<7.3	NA	NA	<25	<500
Benzo(g,h,i)perylene	191-24-2	NA	<3.2	NA	NA	<25	<500
Benzo(k)fluoranthene	207-08-9	NA	<5.7	NA	NA	<25	<500
bis(2-Ethylhexyl)phthalate	117-81-7	NA	<7.9	NA	NA	<25	<25
Butylbenzylphthalate	85-68-7	NA	<8.2	NA	NA	<25	<25
Carbazole	86-74-8	NA	<10	NA	NA	<25	<25
Chrysene	218-01-9	NA	<8.3	NA	NA	<25	<25
Dibenzo(a,h)anthracene	53-70-3	NA	<4.8	NA	NA	<25	<500
Dibenzofuran	132-64-9	NA	<4.1	NA	NA	<25	<25
Diethylphthalate	84-66-2	NA	<8.5	NA	NA	<25	<25
Di-n-butylphthalate	84-74-2	NA	<2.6	NA	NA	<25	<25
Di-n-octylphthalate	117-84-0	NA	<2.9	NA	NA	<25	<500
Fluoranthene	206-44-0	NA	<8.2	NA	NA	<25	<25
Fluorene	86-73-7	NA	<4.6	NA	NA	<25	<25
Hexachlorobenzene	118-74-1	NA	<7	NA	NA	<25	<25
Indeno(1,2,3-cd)pyrene	193-39-5	NA	<35.5	NA	NA	<25	<500
N-Nitrosodiphenylamine	86-30-6	NA	<10	NA	NA	<25	<25
Pentachlorophenol	87-86-5	NA	<13.3	NA	NA	<25	<25
Phenanthrene	85-01-8	NA	<6.5	NA	NA	<25	<25
Pyrene	129-00-0	NA	<11.7	NA	NA	<25	<25
Pyridine	110-86-1	NA	<10	NA	NA	<25	<25
Tri-n-butyl phosphate	126-73-8	NA	<10	NA	NA	<25	<25

Note 1. Estimated value (below minimum quantification level).
NA = Not Analyzed

3.3.3 Total Organic Carbon in Historical Tank Farm Waste

Several historical Tank Farm wastes were analyzed for total organic carbon (TOC). This analysis determines the total concentration of organic carbon from VOCs, SVOCs, and other organic molecules whose volatility is too low to be classified as either a VOC or SVOC. The TOC analysis would include residues from decontamination chemicals that would not be found with a VOC or SVOC analysis. Table 4 shows typical TOC data for wastes that were primarily SBW and typical of the waste from which the current SBW is derived. Table 4 shows the TOC concentration of multiple analyses of the same waste (VES-WM-189) varied significantly (factor of 4). However, despite the variability, the SBW in the various tanks all had similar TOC concentrations of less than 1 g/l (ranging from 0.1 to 0.6 g/l).

Table 4. Total organic carbon in typical historical Tank Farm wastes.

Waste Tank	WM-189				WM-183	WM-185	WM-189	
Waste Description	Mixed Wastes--Primarily First-Cycle Raffinate and NWCF Scrub/Decon Solution				SBW –With Small Amount of First-Cycle Raffinate	SBW –With Small Amount of First-Cycle Raffinate	SBW--With NWCF Scrub/Decon Solution and ETS Concentrate	
Sample Log Number	96-060311	96-06111	96-080510	96-08283	96-080715	99-05241	99-03111	00-3231
Total Organic Carbon (g/l)	0.466	0.642	0.146	0.128	0.175	0.232	0.204	0.123

3.4 Organic Compounds in Existing Tank Farm Waste

Concentrated SBW is currently stored in three tanks, VES-WM-187, VES-WM-188 and VES-WM-189. The waste in VES-WM-189 has been analyzed for VOCs, SVOCs, and TOC. The waste in VES-WM-188 has been analyzed for VOCs, SVOCs, PCBs, and TOC. It was also analyzed for SVOCs, but the analysis was not successful. The waste in VES-WM-187 has not been analyzed for organics.

3.4.1 Organic Compound Data for Current VES-WM-189 Waste

The waste in VES-WM-189 was sampled in March 2002 and analyzed for organic compounds (sample log numbers 02-03111, 02-03121, and 02-03141). The tank contained 282,000 gallons of waste when it was sampled. After VES-WM-189 was sampled, it received 2,700 gallons of waste in 2004, and "lost" 2,700 gallons due to instrument calibrations, for a net change of zero gallons. The current (August 2005) waste volume in VES-WM-189 is 282,000 gallons. The 2,700 gallons of waste that were added to the tank after it had been sampled were concentrated SBW from the ETS and PEW Evaporator. The new waste came from sources similar to the SBW already in VES-WM-189 when it was sampled. Because the new waste came from sources similar to the sampled waste and is only 1% of the total waste volume, the March 2002 liquid waste sample is representative of the waste currently in VES-WM-189.

Tables 5 and 6 summarize the results of the VOC and SVOC analyses respectively of the VES-WM-189 waste. The tables include both specific analytes and tentatively identified compounds (TICs). The concentrations of most of the analytes are below the laboratory detection value. The few detected analytes have shaded backgrounds to facilitate finding them in the tables. The concentrations of most detected analytes also include one or more letters that are laboratory qualifier flags (LQFs). The LQFs provide information about the detected analyte, such as whether the analyte was detected in a sample blank, was an estimated value, etc. The LQF definitions are provided at the ends of the tables.

Table 5. Volatile organic compounds in the SBW currently stored in VES-WM-189.

Volatile Organic Compound	CAS Number	Sample Log Numbers and Analyte Concentrations (microgram/L)					
		02-03111	02-03111 (repeat)	02-03121	02-03121 (repeat)	02-03141*	02-03141* (repeat)
1,1,1-Trichloroethane	71-55-6	<10	<10	<10	<10	<10	<10
1,1,2,2-Tetrachloroethane	79-34-5	<10	<10	<10	<10	<10	<10
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	<10	<10	<10	<10	<10	<10
1,1,2-Trichloroethane	79-00-5	<10	<10	<10	<10	<10	<10
1,1-Dichloroethane	75-34-3	<10	<10	<10	<10	<10	<10
1,1-Dichloroethene	75-35-4	<10	<10	<10	<10	<10	<10
1,2-Dichloroethane	107-06-2	<10	<10	<10	<10	<10	<10
1,2-Dichloropropane	78-87-5	<10	<10	<10	<10	<10	<10
2-Butanone	78-93-3	<10	<10	<10	<10	<10	<10
2-Hexanone	591-78-6	<10	<10	<10	<10	<10	<10
4-Methyl-2-pentanone	108-10-1	<10	<10	<10	<10	<10	<10
Acetone	67-64-1	33 BY	<10	11 BY	6 JBY	<10	<10
Benzene	71-43-2	<10	<10	<10	<10	<10	<10
Bromodichloromethane	75-27-4	<10	<10	<10	<10	<10	<10
Bromoform	75-25-2	<10	<10	<10	<10	<10	<10
Bromomethane	74-83-9	13 B	<10	32 B	<10	59	<10
Carbon disulfide	75-15-0	<10	<10	<10	<10	<10	<10
Carbon tetrachloride	56-23-5	<10	<10	<10	<10	<10	<10
Chlorobenzene	108-90-7	<10	<10	<10	<10	<10	<10
Chloroethane	75-00-3	<10	<10	<10	<10	<10	<10
Chloroform	67-66-3	<10	<10	<10	<10	<10	<10
Chloromethane	74-87-3	23 M	<10	35 M	<10	75 M	<10
cis-1,2-Dichloroethene	156-59-2	<10	<10	<10	<10	<10	<10
cis-1,3-Dichloropropene	10061-01-5	<10	<10	<10	<10	<10	<10
Dibromochloromethane	124-48-1	<10	<10	<10	<10	<10	<10
Ethylbenzene	100-41-4	<10	<10	<10	<10	<10	<10
Methylene Chloride	75-09-2	<10	<10	<10	<10	<10	<10
o-Xylene	95-47-6	<10	<10	<10	<10	<10	<10
Styrene	100-42-5	<10	<10	<10	<10	<10	<10
Tetrachloroethene	127-18-4	<10	<10	<10	<10	<10	<10

Table 5. Volatile organic compounds in the SBW currently stored in VES-WM-189. (Continued)

Volatile Organic Compound	CAS Number	Sample Log Numbers and Analyte Concentrations (microgram/L)					
		02-03111	02-03111 (repeat)	02-03121	02-03121 (repeat)	02-03141	02-03141 (repeat)
trans-1,2-Dichloroethene	156-60-5	<10	<10	<10	<10	<10	<10
trans-1,3-Dichloropropene	10061-02-6	<10	<10	<10	<10	<10	<10
Trichloroethene	79-01-6	<10	<10	<10	<10	<10	<10
Trichlorofluoromethane	75-69-4	<10	<10	<10	<10	<10	<10
Vinyl Chloride	75-01-4	<10	<10	<10	<10	<10	<10
Xylene, Isomers m and p	1330-20-7	<20	<20	<20	<20	<20	<20
Number of Tentatively Identified VOCs (TICs)		3 TICs		1 TIC		5 TICs	
Total mass of TICs (mg/L)		0.031 mg/L		0.016 mg/L		0.161 mg/L	
*All analytes for sample log 020314-1 have LQF = H							

Laboratory Qualifier Flags (LQFs) definitions:

B = analyte also detected in blank
J = estimated (extrapolated) value
M = quantified from first or higher order regression fit calibration curve with correlation coefficient <0.999
Y = analyte is a solvent used in hot cell for other procedures
H = hold time exceeded

Table 6. Semi-volatile organic compounds in the SBW currently stored in VES-WM-189.

Semi-volatile Organic Compound	CAS Number	Sample Log Number and Analyte Concentrations			
		02-03111 (microgm/L)	02-03111 (repeat) (microgm/L)	02-03121 (microgm/L)	02-03141* (microgm/L)
1,2,4-Trichlorobenzene	120-82-1	<6	<6	<6	<6
1,2-Dichlorobenzene	95-50-1	<5	<5	<5	<8
1,3-Dichlorobenzene	541-73-1	<7	<7	<7	<9
1,4-Dichlorobenzene	106-46-7	<8	<8	<8	<9
2,4,5-Trichlorophenol	95-95-4	<4	<4	<4	<8
2,4,6-Trichlorophenol	88-06-2	<12	<12	<12	<9
2,4-Dichlorophenol	120-83-2	<6	<6	<6	<6
2,4-Dimethylphenol	105-67-9	<3	<3	<3	<10
2,4-Dinitrophenol	51-28-5	<13	<13	<13	<8
2,4-Dinitrotoluene	121-14-2	<8	<8	<8	<8
2,6-Dinitrotoluene	606-20-2	<11	<11	<11	<8
2-Chloronaphthalene	91-58-7	<7	<7	<7	<7
2-Chlorophenol	95-57-8	<8	<8	<8	<8
2-Methylnaphthalene	91-57-6	<9	<9	<9	<7
2-Methylphenol (o-Cresol)	95-48-7	<9	<9	<9	<7
2-Nitroaniline	88-74-4	<9	<9	<9	<8
2-Nitrophenol	88-75-5	<8	<8	<8	<8
3 and 4-methylphenol	106-44-5	<11	<11	<11	<5
3,3'-Dichlorobenzidine	91-94-1	<12	<12	<12	<8
3-Nitroaniline	99-09-2	<16	<16	<16	<4
4,6-Dinitro-2-methylphenol	534-52-1	<13	<13	<13	<7
4-Bromophenyl phenyl ether	101-55-3	<12	<12	<12	<8
4-Chloro-3-methylphenol	59-50-7	<6	<6	<6	<5
4-Chloroaniline	106-47-8	<3	<3	<3	<14
4-Chlorophenyl phenyl ether	7005-72-3	<14	<14	<14	<8
4-Nitroaniline	100-01-6	<10	<10	<10	<5
4-Nitrophenol	100-02-7	<30	<30	<30	<2
Acenaphthylene	208-96-8	<6	<6	<6	<6
Anthracene	120-12-7	<8	<8	<8	<6
Azobenzene	103-33-3	<15	<15	<15	<11
Benzo(a)anthracene	56-55-3	<9	<9	<9	<7
Benzo(a)pyrene	50-32-8	<8	<8	<8	<6
Benzo(b)fluoranthene	205-99-2	<8	<8	<8	<6
Benzo(g,h,i)perylene	191-24-2	<8	<8	<8	<6
Benzo(k)fluoranthene	207-08-9	<8	<8	<8	<7
Benzyl butyl phthalate	85-68-7	<9	<9	<9	<10
bis-(2-chloroethoxy)methane	111-91-1	<6	<6	<6	<5
bis-(2-Chloroethyl)ether	111-44-4	<7	<7	<7	<11
bis(2-Chloroisopropyl)ether	108-60-1	<5	<5	<5	<6
bis-(2-ethylhexyl)phthalate	117-81-7	46 M	31 M	<9	25
Carbazole	86-74-8	<6	<6	<6	<6

Table 6. Semi-volatile organic compounds in the SBW currently stored in VES-WM-189. (continued)

Semi-volatile Organic Compound	Semi-volatile Organic Compound	Sample Log Number and Analyte Concentrations			
		020311-1 (microgm/L)	020311-1 (repeat) (microgm/L)	020312-1 (microgm/L)	020314-1 (microgm/L)
Chrysene	218-01-9	<7	<7	<7	<11
Dibenzo(a,h)anthracene	53-70-3	<8	<8	<8	<6
Dibenzofuran	132-64-9	<11	<11	<11	12 J
Diethyl Phthalate	84-66-2	<12	<12	<12	<11
Dimethyl phthalate	131-11-3	<9	<9	<9	<8
Di-n-butyl phthalate	84-74-2	<12	<12	<12	<14
Di-n-octyl phthalate	117-84-0	20	16 J	<6	<7
Fluoranthene	206-44-0	<11	<11	<11	<5
Fluorene	86-73-7	<10	<10	<10	<5
Hexachlorobenzene	118-74-1	<39	<39	<39	<5
Hexachlorobutadiene	87-68-3	<40	<40	<40	<7
Hexachlorocyclopentadiene	77-47-4	<30	<30	<30	<7
Hexachloroethane	67-72-1	<5	<5	<5	<8
Indeno(1,2,3-cd)pyrene	193-39-5	<9	<9	<9	<6
Isophorone	78-59-1	<6	<6	<6	82
Naphthalene	91-20-3	<7	<7	<7	<5
Nitrobenzene	98-95-3	<7	<7	<7	<11
n-Nitrosodimethylamine	62-75-9	<24	<24	<24	<8
n-Nitrosodi-n-propylamine	621-64-7	<9	<9	<9	<8
n-Nitrosodiphenylamine	86-30-6	<7	<7	<7	<9
Pentachlorophenol	87-86-5	<19	<19	<19	<11
Phenanthrene	85-01-8	<6	<6	<6	<6
Phenol	108-95-2	<18	<18	<18	<3
Pyrene	129-00-0	<6	<6	<6	<6
Pyridine	110-86-1	<15	<15	<15	<9
tri-n-butyl phosphate	126-73-8	11 BJM	11 BJM	11 BJM	44
Number of Tentatively Identified SVOCs (TICs)		20 TICs	19 TICs	6 TICs	20 TICs
Total mass of TICs (mg/L)		1.1 mg/L	0.741 mg/L	0.226 mg/L	1.8 mg/L
*All analytes for sample log 020314-1 have LQF = H					

Laboratory Qualifier Flags (LQFs) definitions:

B = analyte also detected in blank

J = estimated (extrapolated) value

M = quantified from first or higher order regression fit calibration curve with a correlation coefficient of <0.999

H = hold time exceeded

Tables 5 and 6 show most of the VOC and SVOC constituents in VES-WM-189 have concentrations below the laboratory detection level (about 10 ppb). The few detected compounds are present in very low concentrations. The VOC and SVOC data in Tables 5 and 6 are consistent with the historical Tank Farm sample data summarized in sections 3.2.1 and 3.2.2 of this report. Some of the detected compounds may have been laboratory contaminants because they were commonly used laboratory reagents (such as acetone), were not consistently detected in all samples, or were detected in the sample blanks.

The TOC content of the three VES-WM-189 samples ranged from 0.513 to 0.624 g/L. These values are similar to the historical TOC data for SBW shown on Table 4.

3.4.2 Organic Compound Data for Current VES-WM-188 Waste

The waste in VES-WM-188 was sampled in November 2002 (sample log 021125-2) when the tank contained 214,000 gallons of waste. The VES-WM-188 sample was successfully analyzed for VOCs, PCBs, and total organic carbon. The sample was also analyzed for SVOCs. The SVOC analysis found no specific analytes above the laboratory detection values and no TICs. However, due to equipment problems, laboratory personnel reported the SVOC analysis had "no meaningful results".[1] Therefore, the SVOC data are not included in this report.

When it was sampled in November 2002, VES-WM-188 contained 211,000 gallons of SBW. That waste had originally been in VES-WM-181, -184, -185, and -186 and had been concentrated in the ETS. The waste in VES-WM-189 also came from the same tanks and was also concentrated in the ETS. During 2001, the ETS concentrate was added alternately to VES-WM-188 and VES-WM-189 in an effort to equilibrate the waste compositions in the two tanks. Because of this, the wastes in VES-WM-188 and VES-WM-189 are very similar, including their organic content.

After VES-WM-188 was sampled in November 2002, it was filled with additional SBW. Between 2002 and 2004, tanks VES-WM-181, -182, -183, -184, -185 and -186 were cleaned in preparation for RCRA tank closure. The tank heels (residual liquids and solids in the bottom of the tanks) were flushed with demineralized water into VES-WM-187. The liquid that accumulated in VES-WM-187 was concentrated in the ETS, and the concentrate was sent to VES-WM-188. This increased the VES-WM-188 volume to 264,000 gallons by July 2004. The 53,000 gallons of waste came primarily from the same tanks and was concentrated in the same fashion as the 211,000 gallons that were sampled in November 2002. Therefore, the composition of the new (53,000 gallons) of waste was very similar to the waste that had been sampled in November 2002.

In July 2004, the ETS began concentrating the SBW in VES-WM-180. Some of the VES-WM-180 concentrate went into VES-WM-188, bringing its waste volume to its current (August 2005) value of 283,000 gallons. Historical samples of the SBW in VES-WM-180 (Swenson 2004) show its composition was similar to the SBW that had been in VES-WM-181, -184, and -186, which was concentrated and sent to VES-WM-188 and VES-WM-189. The 1993 RCRA characterization of the VES-WM-180 waste (see Table 2) showed it had no (detectable) specific VOCs. Historical analyses of other SBW showed they generally had no (detectable) specific SVOCs (see Table 3). Due to the similarity in waste sources and compositions, the organic content of the 19,000 gallons of concentrate from the evaporation of the VES-WM-180 waste was likely similar to the waste already in VES-WM-188. As a result, the November 2002 sample data is representative of the waste currently in VES-WM-188.

[1] CWI Intranet Memo from J. D. Long to M. C. Swenson, "WM-188 Volatiles Data", dated June 16, 2005.

Table 7 contains the results of the PCB analysis of the VES-WM-188 waste. The concentrations of all the specific PCBs were less than the laboratory detection values. This is consistent with historical Tank Farm sample data. There are less historical Tank Farm data for PCBs than other organic compounds. This is because PCBs were never part of any INTEC process and were known by process knowledge to have not been in the Tank Farm wastes. Consequently, relatively few analyses of Tank Farm waste have been made for PCBs.

Table 7. Polychlorinated biphenyls in the SBW currently stored in VES-WM-188.

Polychlorinated Biphenyl	CAS Number	Log 021125-2 Concentration (milligram/kg or parts per million)
PCB-1016	12674-11-2	< 0.306
PCB-1221	11104-28-2	< 0.202
PCB-1232	11141-16-5	< 0.247
PCB-1242	53469-21-9	< 0.347
PCB-1248	12672-29-6	< 0.258
PCB-1254	11097-69-1	< 0.298
PCB-1260	11096-82-5	< 0.253

Table 8 summarizes the results of the VOC analysis of the VES-WM-188 waste. The data in Table 8 are consistent with the historical Tank Farm waste VOC analyses summarized in section 3.2.1 and with the current VES-WM-189 waste analysis. The concentrations of VOCs in the VES-WM-188 waste are very low. Most of the specific analytes have concentrations below the laboratory detection level (about 10 ppb). Bromomethane was the only specific analyte detected in the VOC analysis, and it had a very low concentration 33 ppb). Though the bromomethane concentration in Table 8 has no laboratory qualifier flags, it has been noted as a laboratory contaminant in the past (see Tables 2 and 4).

The TOC concentration in the VES-WM-188 waste sample was 0.416 g/L. This value is consistent with the historical SBW data shown on Table 4 and with the VES-WM-189 waste analysis.

3.4.3 Organic Compound Data for Current VES-WM-187 Waste

During the past few years, VES-WM-187 has been the collection tank for the wastes and rinse solutions generated by cleaning other tanks in the INTEC Tank Farm. As such, it has been periodically filled with dilute tank cleaning/flush solution, and then emptied when the dilute waste was concentrated in the ETS. The bulk of the ETS concentrate generated from tank cleaning/flush solutions is now stored in VES-WM-188 and VES-WM-189. Recent samples of the VES-WM-187 waste have been taken, but the analyses have been limited to those species needed for immediate waste treatment (evaporation) and have not included organic compounds.

Some of the waste currently in VES-WM-187 is derived from tank cleaning/flushing solution, similar to those of VES-WM-188 and VES-WM-189. The portion of the VES-WM-187 waste that came from cleaning/flushing solution should have an organic content similar to the wastes in VES-WM-188 and VES-WM-189, which have been analyzed for organics.

Table 8. Volatile organic compounds in the SBW currently stored in VES-WM-188.

Volatile Organic Compound	CAS Number	Log 021125-2 (microgram/kg)
1,1,1-Trichloroethane	71-55-6	<2
1,1,2,2-Tetrachloroethane	79-34-5	<2
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	<2
1,1,2-Trichloroethane	79-00-5	<2
1,1-Dichloroethane	75-34-3	<2
1,1-Dichloroethene	75-35-4	<2
1,2-Dichloroethane	107-06-2	<2
1,2-Dichloropropane	78-87-5	<2
2-Butanone (methy ethyl ketone)	78-93-3	<4
2-Hexanone	591-78-6	<2
4-Methyl-2-pentanone (methyl isobutyl ketone or hexone)	108-10-1	<2
Acetone	67-64-1	<2
Benzene	71-43-2	<2
Bromodichloromethane	75-27-4	<2
Bromoform	75-25-2	<2
Bromomethane	74-83-9	33
Carbon disulfide	75-15-0	<13
Carbon tetrachloride	56-23-5	<3
Chlorobenzene	108-90-7	<2
Chloroform	67-66-3	<2
Chloromethane	74-87-3	<1
cis-1,2-Dichloroethene	156-59-2	<2
cis-1,3-Dichloropropene	10061-01-5	<2
Dibromochloromethane	124-48-1	<2
Ethylbenzene	100-41-4	<2
Methylene Chloride	75-09-2	<3
o-Xylene	95-47-6	<2
Styrene	100-42-5	<2
Tetrachloroethene	127-18-4	<2
Toluene	108-88-3	<2
trans-1,2-Dichloroethene	156-60-5	<2
trans-1,3-Dichloropropene	10061-02-6	<2
Trichlorofluoromethane	75-69-4	<2
Trichloroethene	79-01-6	<2
Vinyl Chloride	75-01-4	<2
Xylene, Isomers m and p	1330-20-7	<3
Number of Tentatively Identified VOCs (TICs)	NA	1
Total mass of TICs (mg/kg)	NA	0.033

Most (about three fourths) of the waste in VES-WM-187 came from VES-WM-180. During 2004, waste from VES-WM-180 was concentrated in the ETS and most of the concentrate was sent to VES-WM-187. The waste in VES-WM-180 was SBW that came from the same or similar sources as other historical SBW. Historical samples of the SBW in VES-WM-180 (Swenson 2004) show its composition was similar to the SBW that had been in VES-WM-181, -184, and -186 and was concentrated and sent to VES-WM-188 and VES-WM-189. The 1993 RCRA characterization of the VES-WM-180 waste (see Table 2) showed it had no (detectable) specific VOCs. Historical analyses of similar SBW found no (detectable) specific SVOCs (see Table 3).

The consistency of the organic content of recent and historical Tank Farm wastes suggests the organic content of the VES-WM-180 waste was similar to that of other historical SBW that were concentrated in the ETS and whose concentrates are now stored in VES-WM-188 and VES-WM-189. Therefore, due to the similarity of waste sources and compositions, the organic content of the SBW currently stored in VES-WM-187 should be similar to the SBW currently stored in VES-WM-188 and VES-WM-189.

4. CONCLUSION

Some Tank Farm wastes had the potential to contain small amounts of organics when they were initially generated. However, the liquid waste storage and treatment conditions, including high acid content, evaporation, steam jetting, air lifting, and tank agitation destroyed or removed most of the VOCs and SVOCs from the waste.

SBW is currently stored in three 300,000-gallon tanks. The waste in VES-WM-189 has been analyzed for VOCs, SVOCs, and total organic carbon. The waste in VES-WM-188 has been analyzed for VOCs, PCBs, and total organic carbon. The organic compound data from the VES-WM-188 and VES-WM-189 sample analyses are consistent with historical SBW sample data. The wastes in VES-WM-188 and VES-WM-189 generally contain no (detectable) specific VOCs or SVOCs. The few detected VOCs and SVOCs had very low concentrations (less than 0.1 ppm), were rarely detected in repeated analyses of the same waste, and may have been laboratory contaminants. The waste analyses also found no (detectable) PCBs. The total organic carbon concentration in the wastes was also low (less than 1 gram per liter).

The waste currently in VES-WM-187 has not been characterized for organic compounds. However, it is the same general type of waste (SBW) as that stored in VES-WM-188 and VES-WM-189, and came from the same or similar sources. The wastes in all three tanks have had similar storage conditions and waste treatments. The chemistry of all three tanks is similar. Sample analyses have shown the organic content of VES-WM-188 and VES-WM-189 is similar to each other and to historical Tank Farm wastes. Historical data and process knowledge support the conclusion that the organic content of the waste in VES-WM-187 is similar to that of the waste in VES-WM-188 and VES-WM-189.

5. REFERENCES

Abbott, M. L., K. N. Keck, R. E. Schindler, R. L. Van Horn, N. L. Hampton, and M. B. Heiser, 1999, *Screening Level Risk Assessment for the New Waste Calcining Facility*, INEL/EXT-97-00686, Revision 5a, May 2000.

Boardman, R.D., L. J. Young, N. R. Soelberg, M. L. Abbott, and D.V. Croson, 1999, *Summary of NWCF Calciner Emissions Inventory Data*, INEEL/EXT-99-1190, November 1999.

Boardman, R. D., L. J. Young, N. R. Soelberg, and L. A. Matejka, 2001, *NWCF Calciner Emissions Inventory – Final Report for Phase IV Testing*, INEEL/EXT/01-00260, February 2001.

Johnson J. E. and A. G. Westra 1979, ICPP *Decontamination Manual*, ICP-1172 January 1979.

Loos, R. L., 2004, "INTEC Tank Farm Operating History Report and Completion of Sodium-Bearing Waste Treatment Process Project Milestone", CCN 47582, dated January 29, 2004.

Radian Corporation, 1995, *Results of a Laboratory Study to Assess the Fate of Organic Compounds in Synthetic ICPP Tank Farm Waste*, RCN 660-078, July 17, 1995.

Schindler, R. E., 1999, "Simulations of the Behavior of Organic Species in the PEW Evaporator", Interoffice Memorandum Schi-01-99, January 12, 1999.

Science Applications International Corporation, 2002, *Final Report for Organics Partitioning Resulting from Operation of an INTEC Double Needle Sampler*, Rev 1, September 24, 2002.

Staiger, M. D. and M. C. Swenson 2005, *Calcined Waste Storage at the Idaho Nuclear Technology and Engineering Center*, INEEL/EXT-98-00455, Revision 2, June 2005.

Swenson, M. C., 2004, "Improved Radionuclide Source Term for Sodium-Bearing Waste", Interoffice Memorandum MCS-06-04, October 26, 2004.

Young, L. J., N. R. Soelberg, B. H. O'Brien, R. D. Boardman, L. A. Matejka, M. L. Abbott, and G. R. Hassel, 2000, *NWCF Calciner Emissions Inventory – Final Report for Test Series 1, 2, and 3*, INEEL/EXT-2000-00114, January 2000.

APPENDIX C-3

Example of an INL Waste Determination and Disposition Form

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

WDDF Number: ______________________

Waste Stream: ______________________ Material Profile Number: ______________________

SECTION I: PROCESS KNOWLEDGE EVALUATION (Completed by the generator with assistance from the Facility Representative)

1. Waste Generation Location: Facility: Building/Room: Area: Generator: Facility Rep.:

2. Process and Waste Description:

3. Were any waste minimization activities a part of this process: ☐ Yes ☐ No (If Yes, provide description or reference.)

4. Generation Status (check all that apply): ☐ INL ☐ ICP ☐ non-CERCLA DD&D/RCRA Closure Activities ☐ CERCLA ☐ VCO ☐ Routine Operations

5. Physical Description (check all that apply): ☐ Solid ☐ Sludge ☐ Organic Liquid ☐ Aqueous Liquid ☐ Aerosol ☐ Multiphase ☐ Gas Cylinder ☐ Stabilized/Solidified

6. Sources used for process evaluation (e.g., MSDS, operational logs, procedures, analyses):

7. Waste composition (e.g., paper, plastic, metal, liquid) and percentages (if known):

8. Additional Items of Concern:

A. Are free liquids present? ☐ Yes ☐ No ☐ Unknown

A1. If free liquids are present, are there multiple layers/phases? ☐ Yes ☐ No ☐ Unknown ☐ NA

A2. If multiple layer/phases are present, identify the number of layers/phases and the percentage of each (e.g., 2 layers [50 vol% liquid and 50 vol% sludge]): ☐ Yes ☐ No ☐ Unknown ☐ NA

A3. If free liquids are present, are the Total Suspended Solids (TSS) <1 wt%?

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

WDDF Number: ______________________

Waste Stream: ____ Material Profile Number: ______________________

A4. If free liquids, are present, is the Total Organic Carbon (TOC) <1 wt%? ☐ Yes ☐ No ☐ Unknown ☐ NA

B. Is asbestos present? ☐ Yes ☐ No ☐ Unknown

B1. If asbestos is present, specify the form: ☐ Friable ☐ Non-friable ☐ Unknown ☐ NA

C. Is this a PCB waste? ☐ Yes ☐ No ☐ Unknown If Yes, complete Form 435.93, "PCB Waste Certification"

D. Is debris present (>60 mm, >50 vol% by visual inspection)? ☐ Yes ☐ No ☐ Unknown

E. Are classified items present? ☐ Yes ☐ No ☐ Unknown

F. Is elemental beryllium or insoluble beryllium compound or alloy containing ≥0.1% beryllium present? ☐ Yes ☐ No ☐ Unknown

G. Are animal carcasses present? ☐ Yes ☐ No ☐ Unknown

G1. If animal carcasses are present, was formaldehyde used as a preservative? ☐ Yes ☐ No ☐ Unknown ☐ NA

H. Are chelating or complexing agents present at a volume >1% of the total volume of waste? ☐ Yes ☐ No ☐ Unknown

I. Are pathogens, infectious wastes, or other etiologic agents present? ☐ Yes ☐ No ☐ Unknown

J. Does the waste have >15 wt% of particles with a diameter <200 micrometers? ☐ Yes ☐ No ☐ Unknown

K. Does the waste contain >1 wt% of particles with a diameter <10 micrometers? ☐ Yes ☐ No ☐ Unknown

9. Does the waste contain accountable nuclear material or source material, or is the waste originating from a nuclear accountable area (see DOE M 470.4-6, Table I-1)?

☐ Yes If Yes, list the isotopes:

☐ No ☐ Unknown

10. Radioisotopes: Are radioisotopes present? ☐ Yes ☐ No ☐ Unknown

A. If No, list references that justify the no-rad determination (e.g., Form 435.02, EDF, analytical data): If Yes, reference source term:

B. Are sealed sources present? ☐ Yes ☐ No ☐ Unknown

B1. If sealed sources are present, do any of them contain transuranic nuclides? ☐ Yes ☐ No ☐ Unknown ☐ NA

B2. If sealed sources are present, do any of them have an activity ≥100 uCi? ☐ Yes ☐ No ☐ Unknown ☐ NA

11. Waste Characteristics (check all that apply):

NOTE: *The waste characteristics may not be known at time of initial determination.*

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

WDDF Number: ____________________

Waste Stream: ____________________ Material Profile Number: ____________________

Ignitability	Corrosivity	Reactivity
Flash point less than 60°C (140°F)? ☐ Yes ☐ No ☐ Unknown	pH less than or equal to 2? ☐ Yes ☐ No ☐ Unknown	It is normally unstable and readily undergoes violent change without detonating. ☐ Yes ☐ No ☐ Unknown
Ignitable compressed gas? ☐ Yes ☐ No ☐ Unknown	pH greater than or equal to 12.5? ☐ Yes ☐ No ☐ Unknown	It reacts violently with water. ☐ Yes ☐ No ☐ Unknown
It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard. ☐ Yes ☐ No ☐ Unknown	It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F). ☐ Yes ☐ No ☐ Unknown	It forms potentially explosive mixtures with water. ☐ Yes ☐ No ☐ Unknown When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment. ☐ Yes ☐ No ☐ Unknown
It is an oxidizer as defined in 49 CFR 173.127 ☐ Yes ☐ No ☐ Unknown		It is a cyanide or sulfide-bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment. ☐ Yes ☐ No ☐ Unknown
		It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement. ☐ Yes ☐ No ☐ Unknown
		It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.54. ☐ Yes ☐ No ☐ Unknown

Metals and Organics (Select "Yes" if the following are present at any concentration and provide supporting documentation [e.g., EDF, sample analysis, process knowledge statements].)

Metals	Organics			
Arsenic ☐ Yes ☐ No ☐ Unknown	Benzene ☐ Yes ☐ No ☐ Unknown	Cresol ☐ Yes ☐ No ☐ Unknown	Hexachlorobenzene ☐ Yes ☐ No ☐ Unknown	Pyridine ☐ Yes ☐ No ☐ Unknown
Barium ☐ Yes ☐ No ☐ Unknown	Carbon Tetrachloride ☐ Yes ☐ No ☐ Unknown	2,4-D ☐ Yes ☐ No ☐ Unknown	Hexachlorobutadiene ☐ Yes ☐ No ☐ Unknown	Tetrachloroethylene ☐ Yes ☐ No ☐ Unknown

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

WDDF Number: ______________________

Waste Stream: ______________________ Material Profile Number: ______________________

Cadmium ☐ Yes ☐ No ☐ Unknown	Chlordane ☐ Yes ☐ No ☐ Unknown	1,4-Dichlorobenzene ☐ Yes ☐ No ☐ Unknown	Hexachloroethane ☐ Yes ☐ No ☐ Unknown	Toxaphene ☐ Yes ☐ No ☐ Unknown
Chromium ☐ Yes ☐ No ☐ Unknown	Chlorobenzene ☐ Yes ☐ No ☐ Unknown	1,2-Dichloroethane ☐ Yes ☐ No ☐ Unknown	Lindane ☐ Yes ☐ No ☐ Unknown	Trichloroethylene ☐ Yes ☐ No ☐ Unknown
Lead ☐ Yes ☐ No ☐ Unknown	Chloroform ☐ Yes ☐ No ☐ Unknown	1,1-Dichloroethylene ☐ Yes ☐ No ☐ Unknown	Methoxyclor ☐ Yes ☐ No ☐ Unknown	2,4,5-Trichlorophenol ☐ Yes ☐ No ☐ Unknown
Mercury ☐ Yes ☐ No ☐ Unknown	o-Cresol ☐ Yes ☐ No ☐ Unknown	2,4-Dinitrotoluene ☐ Yes ☐ No ☐ Unknown	Methyl ethyl ketone ☐ Yes ☐ No ☐ Unknown	2,4,6-Trichlorophenol ☐ Yes ☐ No ☐ Unknown
Selenium ☐ Yes ☐ No ☐ Unknown	m-Cresol ☐ Yes ☐ No ☐ Unknown	Endrin ☐ Yes ☐ No ☐ Unknown	Nitrobenzene ☐ Yes ☐ No ☐ Unknown	2,4,5-TP (Silvex) ☐ Yes ☐ No ☐ Unknown
Silver ☐ Yes ☐ No ☐ Unknown	p-Cresol ☐ Yes ☐ No ☐ Unknown	Heptachlor ☐ Yes ☐ No ☐ Unknown	Pentachlorophenol ☐ Yes ☐ No ☐ Unknown	Vinyl Chloride ☐ Yes ☐ No ☐ Unknown

12. Waste Usage Information

A. Was the waste used as a solvent or extractant? ☐ Yes ☐ No ☐ Unknown

A1. If Yes, did the solvent or extractant before use exceed 10% of product composition? ☐ Yes ☐ No ☐ Unknown ☐ NA

A2. If Yes, did the solvent or extractant retain the characteristic of ignitability upon generation as a waste? ☐ Yes ☐ No ☐ Unknown ☐ NA

B. Is the waste an unused chemical or an off-specification commercial chemical product? ☐ Yes ☐ No ☐ Unknown

B1. If Yes, is the waste a combination of unused commercial chemical products? ☐ Yes ☐ No ☐ Unknown ☐ NA

B1.1. If Yes, does the unused commercial chemical product(s) contain only one sole active ingredient? ☐ Yes ☐ No ☐ Unknown ☐ NA

B2. If Yes (Line B), is the waste soil, water, or other media resulting from a spill or release of an unused commercial chemical product? ☐ Yes ☐ No ☐ Unknown ☐ NA

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

WDDF Number: ____________________

Waste Stream: ______________________________ Material Profile Number: ____________________

13. Is the waste covered by a RCRA closure plan? (If Yes, list the RCRA closure plan number.)	☐ Yes ☐ No
14. Is the waste generated by or governed under a CERCLA activity? (If Yes, list the governing document for waste generation.)	☐ Yes ☐ No

CERTIFICATION

I certify that the information in Section I of this form and the applicable attachments are fully disclosed. A good faith effort has been put forward to acquire and verify the information. Willful or deliberate omissions have not been made, and all known and suspected hazards have, to the best of my knowledge, been identified.

Generator Print/Type Name	Generator Signature	Date

SECTION II: WASTE DETERMINATION AND DISPOSITION (Completed by the WGS Technical Specialist)

A. Waste Determination

1. Is the information provided, other than container specific information (e.g., the container source term, dose rates), adequate for the waste determination, management, transportation, treatment, and disposal of waste? ☐ Yes ☐ No (If No, provide additional information or analysis needed.)

2. Waste Stream Data or Analysis Required (TCLP, EDF, Source Term, etc):	Data Received (Yes / No):	Date:	Adequate (Yes / No):

3. Provide a documented evaluation of the process knowledge sources used for waste characterization that identifies the uncertainties, inconsistencies, limitations, and usefulness of the process knowledge sources (provide attachments as needed).

4. Is this a solid waste (per 40 CFR 261.2)? ☐ Yes ☐ No

5. Is this a hazardous waste (per 40 CFR 261.3)? ☐ Yes ☐ No

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

WDDF Number: ____________________

Waste Stream: ____ Material Profile Number: ____________________

5a. Is the waste excluded from regulation under 40 CFR 261.4 or 40 CFR 261.5(g)? ☐ Yes ☐ No ☐ NA

(If Yes, provide the regulatory citation) ____

5b. Is the waste listed in Subpart D of 40 CFR 261? ☐ Yes ☐ No ☐ NA
(If Yes, provide information in C.2.)

5c. Is the waste characteristic per Subpart C of 40 CFR 261? ☐ Yes ☐ No ☐ NA

(If Yes, provide information in C.2.)

5d. Is the waste exempt for recycling in accordance with 40 CFR 261.2(e)(1)? ☐ Yes ☐ No ☐ NA

(If Yes, provide the regulatory citation.)

B. Evaluation of Land Disposal Restrictions

1. Is waste subject to 40 CFR 268 regulations? ☐ Yes ☐ No

If Yes, specify the waste treatability group: ☐ Waste Water ☐ Nonwastewater

1a. Does the waste require evaluation in accordance with 40 CFR 268.48? ☐ Yes ☐ No ☐ NA

(If Yes, provide Information in C.3.)

1b. Is this waste debris per 40 CFR 268.45? ☐ Yes ☐ No ☐ NA

1c. Is this waste a lab pack? ☐ Yes ☐ No ☐ NA

C. Waste Type

1. Based on an evaluation of the process and available data, identify the waste type. (Check all that apply. If mixed low-level, then hazardous and low-level need not be checked.)

☐ Hazardous	☐ Low-level	☐ Mixed low-level	☐ Industrial
☐ High-level	☐ Transuranic	☐ Mixed transuranic	☐ Recyclable
☐ Used oil	☐ Waste regulated as asbestos-containing waste material	☐ Other—Describe:	☐ Waste incidental to reprocessing
☐ Universal waste	☐ Friable or ☐ Nonfriable		
	☐ TSCA regulated as PCBs		

WASTE DETERMINATION & DISPOSITION FORM (WDDF)

(This form is used with MCP-1390, MCP-454, MCP-3811, MCP-9424, & MCP-1396)

2. Applicable EPA Waste Codes (D, F, K, P, and/or U) ____________________
3. Applicable Underlying Hazardous Constituents: ____________________

D. Proposed Disposition Plan

1. Will this waste be treated on-site? ☐ Yes ☐ No

   If Yes, provide references: ____________________

2. Proposed disposition path (e.g., Energy Solutions, RWMC, NTS):

CERTIFICATIONS

I certify that the information in Section II of this form (and the applicable attachments) is fully disclosed and accurate. A good faith effort has been put forward to acquire and verify the information. Willful or deliberate omissions have not been made.

WGS Waste Technical Specialist Print/Type Name	WGS Waste Technical Specialist Signature	Date
WGS Independent Reviewer Print/Type Name	WGS Independent Reviewer Signature	Date

APPROVAL

I approve this WDDF:

WGS Facility Representative Print/Type Name	WGS Facility Representative Signature	Date

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 3, Section F-1
Security

Effective Date: November 20, 2014

CONTENTS

ACRONYMS

CFA	Central Facilities Area
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
DCS	Distributed Control System
DOE	Department of Energy
DOE-ID	Department of Energy, Idaho Operations Office
ETS	Evaporator Tank System
HEPA	high-efficiency particulate air
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTU	Integrated Waste Treatment Unit
LET&D	Liquid Effluent Treatment and Disposal
PEWE	Process Equipment Waste Evaporator
RCRA	Resource Conservation and Recovery Act
TFT	Tank Farm Tank
TSDF	treatment, storage, or disposal facility
WAC	waste acceptance criteria

F. PROCEDURES TO PREVENT HAZARDS

The Process Equipment Waste Evaporator (PEWE), Liquid Effluent Treatment and Disposal (LET&D)facility, the Evaporator Tank System (ETS), and the Integrated Waste Treatment Unit (IWTU), referred to as the Idaho Nuclear Technology and Engineering Center (INTEC) Liquid Waste Management System (ILWMS), are designed and operated to minimize exposure of the general public, operating personnel, and the environment to hazardous waste stored and treated at the Idaho Nuclear Technology and Engineering Center (INTEC). The Idaho National Laboratory (INL) Site provides procedures, equipment, and structures to prevent, mitigate, or respond to environmental or human hazards. Inspection plans and schedules are followed for the PEWE system, LET&D facility, ETS, and IWTU ensuring these facilities and their associated equipment are properly maintained and operated as mandated in the Idaho Administrative Procedures Act (IDAPA) and the Code of Federal Regulations (CFR).

F-1. Security

Specific security measures taken for INTEC include fencing, warning signs, keycard access or personnel sign-in, and building locks.

F-1a. Security Procedures and Equipment [IDAPA 58.01.05.008 and 58.01.05.012; 40 CFR §§ 264.14 and 270.14(b)(4)]

A security system, physical control procedures, and equipment control access to INTEC. A security force operates the security system.

The security force's operations are consistent with Department of Energy, Idaho Operations Office (DOE-ID) directives and orders on access control. The DOE operates a personnel security clearance program to ensure that employees who are required to have a clearance to perform their duties are evaluated and cleared consistently with DOE-ID security policies.

Fencing, guarded gates, and uniformed guards with communication devices are used at INTEC. There are communication devices in occupied buildings at INTEC. The same communication devices may be used for communication outside of the plant. The INTEC also has a plant-wide voice paging system that is used to announce critical information regarding security and safety. At the IWTU Facility (Building CPP-1696) there is a facility specific intercom system that is used to announce critical information regarding safety and security. Outside of the IWTU building, facility personnel will rely on the INTEC plant wide voice paging system to announce critical information regarding security and safety.

F-1a(1) 24-Hour Surveillance System [IDAPA 58.01.05.008; 40 CFR § 264.14(b)(1)]

Security at INTEC is provided by trained security guards, who monitor the entry and egress of people and material from the INTEC facility. The main INTEC guard gate at the west side of INTEC is staffed with guards 24 hours a day, seven days a week. There are other gates into INTEC, and they are either locked or staffed with guards. The guards also perform other security functions within the plant premises, including patrolling the perimeter fence and areas throughout INTEC on a 24-hour basis.

F-1a(2) Barrier and Means to Control Entry [IDAPA 58.01.05.008; 40 CFR § 264.14(b)(2)(i)]

The treatment, storage, or disposal facilities (TSDFs) at INTEC are enclosed within a fence. All gates into INTEC are either locked or manned with security guards.

F-1a(2)(a) Barrier

The INTEC facility is located approximately 42 air miles west of the largest nearby population area, Idaho Falls, Idaho. The entire INTEC facility area is enclosed within a fence. There are gates in the perimeter fences, but only two guarded gates. These gates are identified with the Guard Post (building) where they are located. The Guard Posts are numbered P-501 (CPP-1686), P-507 (CPP-661), and P-521 (CPP-697). The other gates are locked but can be opened by patrols when requested. There is a separate perimeter fence around the IWTU. Access is controlled by authorized key card using a locked turnstile. IWTU supervision controls the keys to the turnstile.

F-1a(2)(b) Means to Control Entry [IDAPA 58.01.05.008; 40 CFR § 264.14 (b)(ii)]

Employees, sub-contractors, or vendors that have completed required access training and have keycard access are not escorted in the general INTEC interior.

Individuals that have the required access training but do not have keycard access sign an "Employee Log" and are allowed into INTEC without being escorted.

Individuals that do not have the required access training and do not have keycard access are escorted and sign a "Visitors Log" to gain access to INTEC.

CPP-604 PEWE System and TFT

For purposes of Section F, Procedures to Prevent Hazards, the PEWE system and the CPP-604 Tank Farm Tanks (TFT) system will be addressed jointly, as both regulated systems are located within the same building, CPP-604.

The Resource Conservation and Recovery Act (RCRA) regulated units in CPP-604 are located in cells or vaults. Access to these cells and vaults are limited due to radiological controls. Personnel access to the condensate collection cell, the EVAP-WL-161 evaporator cell, the EVAP-WL-129 evaporator cell, and the feed pump cell is gained through the condensate collection cell door. The cell door is normally locked limiting access. The facility entrance access has a sign that limits access to authorized personnel.

Access to the VES-WL-132 vault, the VES-WL-133 vault, the VES-WM-100 vault, and the VES-WM-101/VES-WM-102 vaults is limited by high-density reinforced concrete hatch covers, which weigh greater than 1 ton each. The hatch covers can be removed only with the use of a crane.

CPP-1618 LET&D

The Liquid Effluent Treatment and Disposal (LET&D) facility tanks and fractionators are located in two cells within Building CPP-1618. Access is gained through doors on the main level of the building. The doors to the building have signs limiting access to authorized personnel only. The cell doors are kept locked when the facility is in operation.

Nitric Acid Recycle Tank Vault

VES-NCR-171 and VES-NCR-173 are located in the CPP-659 Annex. Access is gained through doors on the main level of the building. The door to the building has signs limiting access to authorized personnel only. The door is normally locked, and the area supervisor controls the keys.

CPP-659 ETS

The evaporator and associated equipment is located within cells at CPP-659. Access is gained through doors on different levels of the building and hatches in the ceiling of the cells. Doors within the building that provide personnel access to areas where process equipment and hazardous waste is located have signs limiting access to authorized personnel only. The cell doors are normally locked and the area supervisor controls the keys.

CPP-1696 IWTU

The steam reformers and associated equipment are located within cells at CPP-1696. Access is gained through doors on the main level of the building. Doors within the building that provide personnel access to areas where process equipment and hazardous waste are located have signs limiting access to authorized personnel only. The cell doors are normally locked and the area supervisor controls the keys.

F-1a(3) Warning Signs [IDAPA 58.01.05.008; 40 CFR § 264.14(c)]

Warning signs that are visible and legible from at least 25 ft are posted at facility entrances. Entrances into RCRA storage or treatment areas have, at a minimum, signs reading "**DANGER**--Unauthorized Personnel Keep Out."

ATTACHMENT 4 - SECTION F-2 - INSPECTION SCHEDULE

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 4, Section F-2
Inspection Schedule

Revision Date: September 5, 2019

CONTENTS

APPENDICES

ACRONYMS

ALARA	as low as reasonably achievable
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
DCS	Distributed Control System
DOE	Department of Energy
DOE-ID	Department of Energy, Idaho Operations Office
EP/RCRA CP	Emergency Plan Resource Conservation and Recovery Act Contingency Plan
HEPA	high-efficiency particulate air
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTU	Integrated Waste Treatment Unit
LET&D	Liquid Effluent Treatment and Disposal
PEWE	Process Equipment Waste Evaporator
RCRA	Resource Conservation and Recovery Act
TFT	Tank Farm Tank
TSDF	treatment, storage, or disposal facility
WAC	waste acceptance criteria

F-2. INSPECTION SCHEDULE

Surveillance and preventive maintenance programs are in place to ensure the proper and safe operation of the ILWMS. These programs will provide a mechanism for early detection, prevention, and expeditious correction of conditions that may cause or lead to the release of hazardous materials to the environment or that may pose a threat to human health.

All RCRA deficiencies noted during inspections are documented. Corrective action is initiated and tracked to completion.

The following subsections describe the key elements of the inspection program for the ILWMS. This program will address the inspection requirements necessary to prevent, detect, or respond to threats to human health or environmental hazards posed by this facility.

F-2a General Inspection [IDAPA 58.01.05.012 and 58.01.05.008; 40 CFR §§ 270.14(b)(5), 264.15(a) and (b), and 264.33]

The portions of the ILWMS addressed by this permit will be inspected for malfunctions, deterioration, operator error and discharges which may be causing or may lead to: (1) releases of hazardous waste constituents to the environment, or (2) a threat to human health. These inspections will be conducted often enough to identify problems in time to correct them before they harm human health or the environment.

This section discusses various operating practices and inspections employed to prevent hazards, and ensure safe operation of the ILWMS. Level sensors and indicators that are used for leak detection are calibrated annually to ensure reliability of the instrumentation.

The ILWMS is instrumented and alarmed to maintain proper operation and to detect system upsets. Records of data generated by the process instrumentation are maintained at INTEC or other INL storage facilities for the lifetime of the units. Operations personnel monitor the system instrumentation and alarms for process changes and to verify that no errors have been made. They are required to read and record values from the Distributed Control System (DCS). They are also required to read and record values on the inspection forms from the instrumentation. Examples of the inspection forms currently used are provided in Appendix F-1. Although the format of the forms is subject to change, inspections will remain the same.

CPP-1696 has additional hazardous and/or mixed waste storage areas. Containers are located in the product storage building and vault loading station container storage areas, these areas are inspected weekly to ensure the integrity of the containers, etc. The waste piles are located in the canister fill cells. These areas are inspected weekly to check for the presence of liquids, generation of leachate, and to ensure no liquids have contacted the waste piles.

The inspection records are maintained in the operating record. Records are retained for the life of the regulated unit and stored at INTEC or other INL storage locations. These records include the time and date of the inspection, the printed name and signature of the inspector, notation of observations made, and the date and nature of any repairs or other remedial actions.

F-2a(1) Types of Problems [IDAPA 58.01.05.008; 40 CFR § 264.15(b)(3)]

The inspection schedules for the units that comprise the ILWMS, including the scope of the inspections performed and the types of problems noted, are summarized in Appendices F-2 through F-7.

F-2a(2) Frequency of Inspection [IDAPA 58.01.05.008; 40 CFR § 264.15(b)(4)]

The frequency of inspections or observations, and the inspecting organization are listed in the schedules in Appendices F-2 through F-7.

If a problem is found during an inspection surveillance or performance of a preventive maintenance inspection or action in progress, it is reviewed and confirmed by the applicable supervision or systems engineer. If the deficiency warrants immediate attention, shift supervision will be informed, and if necessary, the affected process will be immediately shut down. All items observed during an inspection that require repair, replacement, corrective action, or other attention are documented on the associated record sheet and tracked until final resolution. If the responsible supervision determines the need, an engineering evaluation will be conducted to determine whether operations can proceed, repairs must be made, or materials must be replaced. Environmental and Operations personnel work together to decide whether or not a remedial action is required and to plan the required action. Remedial actions are investigated, documented, and tracked to completion.

In those cases where an off-normal operational event (such as a ventilation upset and potential radioactive contamination) prevents access to an area where inspections are performed, a RCRA remedial will be opened and the remedial will be noted in the spaces on the inspection forms where the inspections or readings would normally be recorded. The RCRA remedial will be closed, and inspections resumed, as soon as the upset conditions have been corrected and the area released for re-entry.

The ILWMS is equipped with instruments and alarms to detect system upsets or operator error. The frequency of the inspections is listed in the inspection schedules (Appendix F-2 through F-5). Manufacturer specifications, process knowledge, and equipment history determine the frequency of instrument and alarm calibration and maintenance.

Operations personnel review the previous inspection logs and take note of previous observations for which corrective actions are necessary, before conducting further inspections. They read and/or record values on inspection forms from the instrumentation. While taking the readings, the operator is able to confirm that the instruments are operating. Per operating procedures, any parameter found to be outside of its operating range requires that the operator check the operability of the instruments as well as the status of the process and inform the shift supervisor. The shift supervisor will take appropriate action to correct the situation. For the Condensate Collection Cell, the WL-161 Evaporator Cell, and the Pump Pit Sump, daily visual cell inspections will be performed on portions of these cells through the use of cameras.

Inspections of IWTU tank systems and miscellaneous units will be completed in accordance with the inspection schedule in Appendix F-5. Due to personnel hazards, certain units will be visually inspected via the use of cameras as identified in Appendix F-5.

The IWTU Vault Storage Area, a container storage area, and the Vault Loading Area, a container loading area, will be visually inspected weekly. Due to the high radiation fields associated with the treatment product and to ensure exposure to workers remains as low as reasonably achievable (ALARA), the portable storage vaults will not be opened to complete container inspections. Rather, the vaults will be examined for evidence of damage, deterioration, or signs of leakage.

F-2b Specific Process Inspection Requirements

F-2b(1) Container Inspection [IDAPA 58.01.05.008; 40 CFR § 264.174]

State and federal regulations require owners and operators to inspect the areas where containers (canisters) are stored at least weekly. Due to the unique mixture of radiological, hazardous, and industrial safety conditions associated with the vault storage areas, the canisters are neither visible nor readily accessible. However, the storage vault configuration detailed in diagram 632359 found in Appendix III of this permit will enable weekly visual inspections of the portable storage vaults to be performed.

Visual inspections of the Vault Loading Area will be completed weekly when a vault is located in the area. The inspections will be completed by viewing the vault and loading area through the cell entrance. This angle will allow the inspector to view three sides of the vault. In addition, since the portable storage vaults are equipped with approximately 8-in. shoes, inspection below the vault will also be allowed. Any indication of deterioration of the vault or cell, and any sign of leaks or spills will be noted on the inspection form and appropriate action taken.

The vaults in the Vault Storage Area are configured so as to maintain a minimum 3-ft aisle space in the east/west direction. However, since two aisles are partially obstructed by 18-in. support beams, personnel will be restricted from accessing these aisleways and will only use the aisles that align with the access doors on the west side of the Vault Storage Area for inspection. Within each aisle the vaults will be stored in close proximity to one another. A minimum of 6 inches will be maintained between consecutive vault walls. This will allow inspection between vaults in the north/south direction; however, these aisleways will not be used for personnel movement. In addition, since the portable storage vaults are equipped with approximately 8-in. shoes, inspection below the vaults will also be allowed. Any indication of deterioration of the vault or storage area, and any sign of leaks or spills will be noted on the inspection form and appropriate action taken.

F-2b(2) Tank System Inspection [IDAPA 58.01.05.008; 40 CFR § 264.195]

F-2b(2)(a) Certification for Tank Repairs

A qualified, professional engineer will certify permitted ILWMS tank systems when major repairs are made per 40 CFR § 264.196(f).

F-2b(2)(b) Tank System External Corrosion and Releases (IDAPA 58.01.05.008; 40 CFR § 264.195)

The ILWMS is secondarily contained in vaults and cells that are constructed of concrete, with a stainless steel lining, Hypalon® lining, or compatible coating or lining. The associated ancillary equipment is also equipped with adequate secondary containment.

State and federal regulations require owners and operators to inspect the externally accessible portions of tank systems for evidence of deterioration or signs of a release. EPA guidance suggests that daily inspections of tank systems or components are not necessary in cases where those systems are not readily accessible or visible. The EPA stresses that in these instances special efforts should be made to inspect for leaks from such systems.

The ILWMS is monitored using instrumentation to detect leaks from the system daily. However, due to the unique mixture of radiological, hazardous, and industrial safety conditions associated with the ILWMS, many of the tank systems are neither visible nor readily accessible. In those cases where the hazards to personnel are comparatively low, daily visual inspections will be performed.

Camera systems have only limited effectiveness due to the harsh radiological, corrosive, and thermal conditions of the system. Where camera use is feasible, daily inspections will be conducted for the limited coverage area.

Other tank systems associated with the ILWMS that cannot be visually inspected daily either through manned entries or remotely, via cameras, due to the unacceptable risk to personnel, are protected through a combination of other system controls including containment and leak detection systems; continuous DCS controls; and tank, process, and stack offgas monitoring.

Tank system inspection techniques and frequencies are outlined in the inspection schedules included as Appendices F-2 through F-7.

Steam jets are used for transferring liquids out of some ILWMS sumps. It is common for a small amount of liquid to remain in the sump following a transfer. This liquid results from liquid waste and steam and condensate in the jet piping draining back to the sump after the jet is shut off. A small amount of liquid may therefore be detected in the sump following a transfer. A continued accumulation of liquid may indicate a leak from the tank system. In this case, the condition would be investigated and appropriate action taken.

F-2b(2)(d) Tank System Overfilling Control Equipment [IDAPA 58.01.05.008; 40 CFR § 264.195(a)]

While conducting the daily inspection, the readings for tank levels are taken and compared to previous readings to determine if any spills or leaks have occurred. Additionally, alarms are provided to indicate conditions such as leaks or high liquid levels. Any monitor reading found to be outside its operating parameters prompts the operator to check the operability of the instruments as well as the status of the process and to inform the shift supervisor, as necessary. Required remedial action will be taken.

F-2b(2)(e) Tank System Monitoring and Leak Detection Equipment [IDAPA 58.01.05.008; 40 CFR § 264.195(b)(2)]

Information is recorded on the daily inspection form for all regulated tanks. The ILWMS operators review the previous daily inspection log and take note of any ongoing corrective actions before conducting further inspections. While taking the readings, the operator confirms that the instruments are operating properly. Any monitor reading found to be outside its operating parameters prompts the operator to check the operability of the instruments as well as the status of the process and to inform the shift supervisor, as necessary. Required remedial action will be taken.

F-2b(2)(f) Tank System Cathodic Protection [IDAPA 58.01.05.008; 40 CFR § 264.195(c)]

The ILWMS Cathodic Protection System will be inspected for proper operation at least annually; and all sources of impressed current will be inspected and/or tested bi-monthly, in accordance with IDAPA 58.01.05.008 [40 CFR § 264.195(g)(1) and (2)].

F-2b(2)(g) Tank Condition Assessment [IDAPA 58.01.05.008; 40 CFR § 264.195(b)(1)]

During maintenance turnarounds in the associated vaults/cells, an assessment of the regulated tanks will be performed. The assessment will consist of visual inspections of the exterior of the tanks for leaks, corrosion, and deterioration of tanks and secondary containment. The results of these inspections are documented in the facility's inspection records. The records are maintained at INTEC or other INL Site storage locations.

F-2b(3) Waste Pile Inspection [IDAPA 58.01.05.008; 40 CFR § 264.254]

Facility personnel inspect the waste pile storage areas addressed in this permit on a weekly basis, when waste is present. One or more of the following inspection methods will be used: a) direct visual, (b) looking through shielded windows, (c) remotely operated cameras, or (d) monitoring of leak detection systems. Use of methods (b), (c), or (d) is necessary in some areas to maintain radiation exposure levels as low as reasonably achievable (ALARA). Where methods (b), (c) or (d) are used, complete inspections of the cell and any waste pile will be conducted when the cell is first entered for maintenance or repairs and repeated at least weekly when such activities are prolonged. An evaluation of hazards is performed prior to cell entries. When the anticipated safety hazards preclude entry into parts of a cell, inspection of these cell areas or waste piles will be made by methods (b), (c) or (d).

During inspections, the waste pile storage locations are inspected for presence of liquids and generation of leachate. Any liquids discovered during the inspections are removed as soon as possible. Since the piles are stored in rooms within a completely enclosed, self-supporting building, there is no need for inspection of the waste piles after storms.

In addition, the sumps within the Product Load-Out Cells where the waste piles are located are monitored on the DCS. Any reading found to be outside its operating parameters prompts the operator to check the status of the process, and/or operability of the instruments, and to inform the shift supervisor, as necessary. Any liquids discovered within the sump will be removed as soon as possible. If waste is present in the waste pile storage area when liquids are detected in the cell, the source of the liquid will be determined and whether or not the liquids have contacted the waste will be evaluated. Required remedial action will be taken.

APPENDIX F-1

Example Inspection Forms

Form INTEC 4004 RCRA NWCF Tank Leak and Overfill Daily Facility Inspections, Rev. 38

Form INTEC 4005 RCRA PER Tank Overfill and Daily Leak Inspections, Rev. 30

Form INTEC 4006 RCRA PER Daily Facility Inspections, Rev. 23

INTEC 4025 RCRA PEW/Tank Farm Monthly Facility Inspections, Rev. 26

Form INTEC 4039 RCRA Waste Processing Vault and Valve Box Inspections, Rev. 12

Form INTEC 4053 RCRA LET&D Monthly Inspections, Rev. 22

Form INTEC 4055 RCRA LET&D Daily Facility Inspections, Rev. 22

Form INTEC 9123 RCRA LWCF Cell Inspections, Rev. 8

Form INTEC 9123A Abbreviated RCRA Cell Inspection, Rev. 4

Form INTEC 9124 RCRA LWCF Monthly Voice Paging/Evacuation System Inspections, Rev. 14

Form INTEC 8185 RCRA Tank Farm Daily Inspections and Process Monitoring Sheet, Rev 24

IWTU Inspection Forms:

FRM 1115 IWTU-Daily RCRA Inspections, Rev 21

FRM 1116 IWTU-Monthly RCRA Inspections, Rev 9

FRM 1117 IWTU-Monthly RCRA Voice Paging/Evacuation System Test, Rev 4

FRM 1118 IWTU-RCRA Cell Inspections, Rev 6

FRM 1119 IWTU-Weekly RCRA Vault Inspections, Rev 3

Form INTEC-4004
06/08/17
Rev. 38

Use with MCP-1283

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Previous Week's Inspection Checked (Initials): ____________________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table (Initials): ________________

Date: Through		**Time:**							
Area/Item	**Normal Condition**	**Off Spec. Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
INTEC Perimeter Fence									
"No Trespassing" signs posted at guard gates and on the fence around INTEC? Signs are visible and legible from at least 25 ft?[1]	Yes	No				Yes/No/N/A			
First Level									
Hazardous liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Phone/paging functional & accessible?[2]	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
"Danger–Unauthorized Personnel Keep Out" and "Notice–No Smoking Beyond This Point" signs - missing, damaged, obstructed?[3]	No	Yes			No/Yes				
Acid Recycle room doors locked?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Second Level Corridors									
Hazardous liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Hazardous liquids on utility corridor floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Phone/paging functional & accessible?[2]	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Third Level Corridors									
Hazardous liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Phone/paging functional & accessible?[2]	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Loading and Unloading Docks									
North Dock: Presence of hazardous solid or liquid waste spills?[4]	No	Yes	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA
East Dock: Presence of hazardous solid or liquid waste spills?[4]	No	Yes	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA	No/Yes/NA

(1) Perform inspection semi-annually on the second Sunday of April and October.
(2) Check designated phone.
(3) See list on page 2.
(4) This inspection is required daily only when loading/unloading is occurring.

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Doors which should be posted with "Danger–Unauthorized Personnel Keep Out" and “Notice–No Smoking Beyond This Point” signs:

South side of NWCF:

1. Personnel door between Acid Recycle Storage Tank Enclosure (Room 443) and outdoors. Sign posted on the outside.
2. Roll-up door between Decon Vehicle Entry (Room 417) and outside ramp. Sign posted on the outside.

West side of NWCF:

1. Personnel door between Decon Vehicle Entry (Room 417) and outdoors. Sign posted on the outside.
2. Personnel door between Decon Hot Shop (Room 442) and outdoors. Sign posted on the outside.

East side of NWCF:

1. Personnel door between Emergency Generator Room (432) and outdoors. Sign posted on the outside.
2. Personnel emergency exit door from Stair No. 1 to outdoors. Sign posted on the outside.
3. Outer door from elevator to east loading dock. Sign posted on the outside.
4. Double door between vestibule (Room 431) and east loading dock. Sign posted on the outside.

North side of NWCF:

1. Double door between Decon Solution Makeup Room (429) and north loading dock. Sign posted on the outside.
2. Roll-up door between Crane Maintenance Area (Room 428) and north loading dock. Sign posted on the outside.
3. Personnel door between Calcium Nitrate Addition Room (427) and north loading dock. Sign posted on the outside.
4. Roll-up door between Calcium Nitrate Addition Room (427) and north loading dock. Sign posted on the outside.
5. Double door between Decon Exhaust Air Plenum Room (431) and outside ramp. Sign posted on the outside.
6. Personnel emergency exit door from Corridor 424 to Tank Farm. Sign posted on the outside.
7. Personnel door between Equipment Decon Room (418) and Glycol Chiller Units. Sign posted on the outside.

Inside NWCF, first level:

1. Personnel door between lunchroom and Decon Shift Office (Room 415). Sign posted on lunchroom side.
2. Personnel door between Corridor 441 and Crane Maintenance Area (Room 428). Sign posted on the corridor side.
3. Personnel door between Corridor 411 and Stair No. 3. Sign posted on the corridor side.
4. Personnel door between Corridor 411 and Decon Area. Sign posted on the corridor side.
5. Personnel door between Corridor 409 and Elevator Entry (Room 430). Sign posted on the corridor side.
6. Personnel door between Corridor 409 and Stair No. 1. Sign posted on the corridor side.

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Fire Systems-Fire Alarm Control Panel FACP0659-01

Display on Panel FACP0659-01	Normal Condition	Off Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Normal Condition (5)	Display On	Display Off	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off	On/Off
L1M1 Waterflow 400 Level East	Display Off	Display On	On	On	On	On	On	On	On
L1M2 Waterflow 300 Level East	Display Off	Display On	On	On	On	On	On	On	On
L1M3 Waterflow 200 Level East	Display Off	Display On	On	On	On	On	On	On	On
L1M4 Waterflow Calciner Exhaust	Display Off	Display On	On	On	On	On	On	On	On
L1M5 Waterflow 300 Level West	Display Off	Display On	On	On	On	On	On	On	On
L1M6 Waterflow Calciner Supply	Display Off	Display On	On	On	On	On	On	On	On
L1M7 Waterflow Decon Exhaust	Display Off	Display On	On	On	On	On	On	On	On
L1M8 Waterflow Calciner Exhaust	Display Off	Display On	On	On	On	On	On	On	On
L1M9 Waterflow Decon Cell 308	Display Off	Display On	On	On	On	On	On	On	On
L1M10 Waterflow Filter Cell 309	Display Off	Display On	On	On	On	On	On	On	On
L1M11 Calciner Cell (Waterflow)	Display Off	Display On	On	On	On	On	On	On	On
L1M12 Heat Detector 400 Level Decon	Display Off	Display On	On	On	On	On	On	On	On
L1M13 Heat Detector 400 Level Decon	Display Off	Display On	On	On	On	On	On	On	On
L1M14 Heat Detector Decon/Calcine Cell	Display Off	Display On	On	On	On	On	On	On	On
L1M15 Manual Station 400 Level North	Display Off	Display On	On	On	On	On	On	On	On
L1M16 Manual Station 400 Level South	Display Off	Display On	On	On	On	On	On	On	On
L1M17 Manual Station 300 Level West	Display Off	Display On	On	On	On	On	On	On	On
L1M18 Manual Station 200 Level South	Display Off	Display On	On	On	On	On	On	On	On
L1M19 Smoke Detector 659 Control Room	Display Off	Display On	On	On	On	On	On	On	On
L1M30 Smoke Detector 659 400 Level Hall	Display Off	Display On	On	On	On	On	On	On	On
L1M33 Manual Station Acid Recycle Exit	Display Off	Display On	On	On	On	On	On	On	On
L1M45 Manual Station 659 400 Level East	Display Off	Display On	On	On	On	On	On	On	On
L1M46 Manual Station 659 300 Level East	Display Off	Display On	On	On	On	On	On	On	On
L1M51 Heat Detector 400 Level Calciner	Display Off	Display On	On	On	On	On	On	On	On
L1M52 Heat Detector 400 Level Calciner	Display Off	Display On	On	On	On	On	On	On	On

(5) If “Normal Condition” is displayed, circle “On” and skip all subsequent FACP0659-01 alarm display inspections. If “Normal Condition” is not displayed, circle “Off,” then circle “On” for all alarm conditions displayed that are listed. Alarms that are NOT listed do not require opening a remedial.

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Area/Item	Normal Condition	Off Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Calciner Cell									
New leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
NCC-105–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
NCC-107–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Piping–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Floor–New cracks, gaps, or deterioration visible?(6)	No	Yes	No/Yes						
Off-Gas Cell									
New leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Tanks or piping–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Floor–New cracks, gaps, or deterioration visible?(6)	No	Yes	No/Yes						
Filter Cell and Valve Cubicle									
New leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Piping–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Floor–New cracks, gaps, or deterioration visible?(6)	No	Yes	No/Yes						
Liquid Sample Cell									
New leaks observed in cell?(7)	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Piping–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Floor–New cracks, gaps, or deterioration visible?(6)	No	Yes	No/Yes						

Footnote 7 is an item that has been previously identified. The operation of the Calciner process has been terminated; do not re-report these items unless new leaks are observed.

(6) The areas of the floor that are visible from the shielding windows are inspected. The entire floor is inspected only when a cell entry is made.
(7) Liquid Sample Cell. Evidence of leakage. Component leaking is unknown. See Form INTEC-4004 dated April 3, 2002.

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Area/Item	Normal Condition	Off Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Flowmeter Cubicle									
New leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Piping–New cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Floor–New cracks, gaps, or deterioration visible?(6)	No	Yes	No/Yes						
Acid Recycle Room/Cell									
Leaks observed in room/cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Tanks or piping-Cracks, gaps, or deterioration visible?(8)	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Floor-Cracks, gaps, or deterioration visible?(8)	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes

(6) The areas of the floor that are visible from the shielding windows are inspected. The entire floor is inspected only when a cell entry is made.
(8) The areas of the tanks, piping, and floor that are visible with mirrors are inspected. The entire floor is inspected only when a room/cell entry is made.

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Vessel	Instrument	Normal Range	Off Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Tank Farm Encasement	LSH-102-2C	Off Alarm	On Alarm	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On
VES-NCC-101 Volume	VOL101C	0 to 4,910 gal	>4,910 gal							
VES-NCC-102 Volume	VOL102C	0 to 3,455 gal	>3,455 gal							
VES-NCC-103 Volume	VOL103C	0 to 3,455 gal	>3,455 gal							
VES-NCC-104 Volume	VOL104C	0 to 10 gal	>10 gal							
Air Lift Pit Sump (Local)	LI-552-1	0 to 8 in.	>8 in.							
Blend and Hold Cell Drain	L-215C	Off Alarm	On Alarm	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On
VES-NCC-108 Volume	VOL108C	0 to 1,500 gal	>1,500 gal							
Off-Gas Cell Drain	L-207C	Off Alarm	On Alarm	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On
Absorber Cell Drain Line	L-206C	Off Alarm	On Alarm	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On
Decon Holdup Collection Tank Cell Drain	L-219C	Off Alarm	On Alarm	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On	Off/On
VES-NCC-119 Volume	VOL119C	0 to 5,765 gal	>5,765 gal							
VES-NCC-122 Volume	VOL122C	0 to 4,180 gal	>4,180 gal							
Hot Sump Tank Cell Sump (Local) (9)	LI-551-1	0 to 10 in.	>10 in.							
VES-NCR-171	L171-1C	0 to 109 in.	>109 in.							
Acid Recycle Sump	L174-1C	0 to 4 in. WC	>4 in. WC							
LET&D to Acid Recycle Leak Detection (10)	MJAH-174-1C	Off Alarm	On Alarm	OOS T	OOS T	OOS T	OOS T	OOS T	OOS T	OOS T
VES-NCR-171 to Valve Box Leak Detection	Carboy	Dry	Liquid present	Dry/Liquid	Dry/Liquid	Dry/Liquid	Dry/Liquid	Dry/Liquid	Dry/Liquid	Dry/Liquid
VES-NCC-150 Volume	Q150-1C	0 to 2,362 gal	>2,362 gal							
VES-NCC-152 Volume	Q152-1C	0 to 170 gal	>170 gal							
VES-NCC-116 Level	L116-1C	0 to 12 in.	>12 in.							
VES-NCC-136 Level	L136-1C	0 to 12 in.	>12 in.							

(9) If the magnehelic for the Hot Sump Tank Cell Sump, LI-551-1, indicates any level increase in the sump, GO TO EAR-211,"Calciner Process Alarm Conditions," for response.
(10) The alarm function on MJAH-174-1C has been removed from service. See Comments section for clarification.

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Record the following information for leaks of hazardous materials from NWCF systems:

Date/time of leak discovery:	
Location of leak: System/Cell	
Component leaking (valve, fitting, etc.):	
Estimated leak volume or rate:	
Continuous or occasional leak? If occasional, when does leak occur?	
Comments:	

Form Review	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Supervision Initials:							

Day	Inspector's Name (Print)	Inspector's Signature	Inspection Completed Date	Nature of Any Repairs or Other Remedial Actions	Repairs/Remedial Actions Completed or Not Required Supervision Signature/Date
Thu					
Fri					
Sat					
Sun					
Mon					
Tue					
Wed					

RCRA NWCF TANK LEAK AND OVERFILL DAILY FACILITY INSPECTIONS

Comments: **Footnote 10 clarification**: MJAH-174-1C (encasement leak detection from LET&D to the Acid Recycle Room 443) went on alarm on 12-20-2016 and remedial action (T) was opened. Attempts to clear this alarm have failed. As a result, the primary transfer line from LET&D has been drained and administratively isolated and taken out of service. This remedial will remain open until closure actions of the VES-NCR-171 tank system have been completed.

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments
T	4004-16-219	12-20-2016	MJAH-174-1C on alarm, Shift Supervisor notified.

RCRA PEW TANK OVERFILL AND DAILY LEAK INSPECTIONS

This Is the current revision per EDMS.

____
Signature / Date

Previous Week's Inspection Checked (Initials): ____________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ____________

Date: ____________	Through____________		Time:							
Vessel	**Instrument**	**Normal Condition**	**Off Spec. Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
VES-WL-135	L-WL-135-1	≤12 in. WC	>12 in. WC							
SU-WL-135	L-WL-135-2	≤5 in. WC	>5 in. WC							
VES-WL-136	L-WL-136-1	≤12 in. WC	>12 in. WC							
SU-WL-136	L-WL-136-2	≤19 in. WC	>19 in. WC							
VES-WL-137	L-WL-137-1	≤18 in. WC	>18 in. WC							
SU-WL-137	L-WL-137-2	≤23 in. WC	>23 in. WC							
VES-WL-138	L-WL-138-1	≤18 in. WC	>18 in. WC							
SU-WL-138	L-WL-138-2	≤23 in. WC	>23 in. WC							
VES-WL-139	L-WL-139-1	≤12 in. WC	>12 in. WC							
SU-WL-139	L-WL-139-2	≤19 in. WC	>19 in. WC							
SU-WL-140	L-WL-140-1	≤9 in. WC	>9 in. WC							
VES-WL-142	L-WL-142-1	≤12 in. WC	>12 in. WC							
SU-WL-142	L-WL-142-2	≤19 in. WC	>19 in. WC							
SU-WL-143	L-WL-143-1	≤11 in. WC	>11 in. WC							
VES-WL-144	L-WL-144-1	≤18 in. WC	>18 in. WC							
SU-WL-144	L-WL-144-2	≤23 in. WC	>23 in. WC							
SU-WL-145	L-WL-145-1	≤11 in. WC	>11 in. WC							
SU-WL-146	L-WL-146-1	≤10 in. WC	>10 in. WC							
SU-WL-147	L-WL-147-1	≤11 in. WC	>11 in. WC							
SU-WL-148	L-WL-148-1	≤11 in. WC	>11 in. WC							
VES-WL-106	Q-WL-106	≤4,250 gal	>4,250 gal							
VES-WL-107	Q-WL-107	≤4,250 gal	>4,250 gal							
VES-WL-163	Q-WL-163	≤4,250 gal	>4,250 gal							
VES-WL-134	L-WL-134	≤90 in. WC	>90 in. WC							
VES-WL-101	L-WL-101-1	≤ 104 in. WC	> 104 in. WC							
VES-WL-102	L-WL-102	≤ 104 in. WC	> 104 in. WC							
WL-101/102 Sump	L-WL-101/102S	≤24 in. WC	>24 in. WC							
VES-WL-133	L-WL-133-2	≤ 109 in. WC	> 109 in. WC							
VES-WL-132	L-WL-132-1	≤9 in. WC	>9 in. WC							
WL-132/133 Sump	L-WL-132/133S	≤20 in. WC	>20 in. WC							
VES-WM-100	L-WM-100-1	≤100 in. WC	> 100 in. WC							
WM-100 Sump	L-WM-100S-1	≤36 in. WC	>36 in. WC							
VES-WM-101	L-WM-101-1	≤ 100 in. WC	>100 in. WC							
VES-WM-102	L-WM-102-1	≤ 94 in. WC	> 94 in. WC							

RCRA PEW TANK OVERFILL AND DAILY LEAK INSPECTIONS

Vessel	Instrument	Normal Condition	Off Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
WM-101/102 Sump	L-WM-101/102S-1	≤15 in. WC	>15 in. WC							
VES-WL-109	L-WL-109	≤95 in. WC	>95 in. WC							
VES-WL-111	L-WL-111	≤ 34 in. WC	> 34 in. WC							
VES-WL-161	L-WL-161	≤75 in. WC	> 75 in. WC							
VES-WL-131	L-WL-131	≤18 in. WC	>18 in. WC							
VES-WL-129	L-WL-129	≤ 75 in. WC	> 75 in. WC							
Pump pit sump	L-WL-528	≤10 in. WC	>10 in. WC							
VES-WL-150	L-WL-150-1	≤31 in. WC	>31 in. WC							
SU-WL-153	L-WL-153	≤4 in. WC	>4 in. WC							

Form Review	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Supervision Initials:							

Day	Inspector's Name (Print)	Inspector's Signature	Inspection Completed Date	Nature of Any Repairs or Other Remedial Actions	Repairs/Remedial Actions Completed or Not Required Supervision Signature/Date
Thu					
Fri					
Sat					
Sun					
Mon					
Tue					
Wed					

Comments: ____________________

RCRA PEW TANK OVERFILL AND DAILY LEAK INSPECTIONS

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments:

Record the following information for leaks of hazardous materials from process systems:	
Date/time of leak discovery	
Location of leak: System/Cell	
Component leaking (valve, fitting, etc.)	
Estimated leak volume or rate	
Continuous or occasional leak? If occasional, when does leak occur?	
Comments:	

Date/time of leak discovery	
Location of leak: System/Cell	
Component leaking (valve, fitting, etc.)	
Estimated leak volume or rate	
Continuous or occasional leak? If occasional, when does leak occur?	
Comments:	

RCRA PEW DAILY FACILITY INSPECTIONS

This form is the current revision per EDMS.

____
Signature/Date

Previous Week's Inspection Checked (Initials): ____________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ____________________

Date: __________ Through ____________ **Time:**

Area/Item Yes/No	**Normal Condition**	**Off Spec. Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
Operating Corridor									
Process liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Telephone functional & accessible at the shift desk?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Pipe Corridor									
Process liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Telephone functional & accessible?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Access Corridor									
Process liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Telephone functional & accessible?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Condensate Collection cell door locked?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
EVAP-WL-161 Cell (1)									
Leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Piping-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Tanks-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Condensate Collection Cell (1)									
Leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Pumps & Piping-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Tanks-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Pump Pit Sump Cell (1)									
Leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Pumps & Piping-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
North Cell (1)									
VES-WL-144 leaking?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
VES-WL-144-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Middle Cell (1)									
VES-WL-142 leaking?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
VES-WL-142-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Entrance to INTEC-605									
"Danger–Unauthorized Personnel Keep Out" sign - missing, damaged or obstructed?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes

RCRA PEW DAILY FACILITY INSPECTIONS

INTEC-605

Process liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Liquid in drain bottle for secondary containment of double containment piping – located on north wall	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Liquid in drain bottles for secondary containment of double containment piping – located on south wall	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes

(1) Inspect areas visible with remote camera.

Form Review	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Supervision Initials:							

Record the following information for leaks of hazardous materials from process systems:

Date/time of leak discovery	
Location of leak: System/Cell	
Component leaking (valve, fitting, etc.)	
Estimated leak volume or rate	
Continuous or occasional leak? If occasional, when does leak occur?	
Comments:	

Day	Inspector's Name (Print)	Inspector's Signature	Inspection Completed Date	Nature of Any Repairs or Other Remedial Actions	Repairs/Remedial Actions Completed or Not Required Supervision Signature/Date
Thu					
Fri					
Sat					
Sun					
Mon					
Tue					
Wed					

Comments: ____

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments

RCRA PEW/TANK FARM MONTHLY FACILITY INSPECTIONS

Previous Month's Inspection Checked: ______________ Date: ________________ Time: ______________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous month's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ____________

PEW

Safety Showers and Eyewashes: Check for leaks, accessibility, and ensure supply valve is open and the PM tag is current for the month being inspected.

Bldg.	Location	Equipment No.	Passed Test		Problem(s) Found
604	Pipe Corridor, Center	SSW/EFN-WL-52	Yes	No	
	Access Corridor, Northeast	SSW/EFN-WL-50	Yes	No	

Fire Extinguishers: Check for physical damage, sealed, accessibility, and gauge indication in green (if equipped).

Bldg.	Location	Passed Test		Problem(s) Found
604	Switch Gear Room	Yes	No	
	Pipe Corridor North Wall	Yes	No	
	Sample Corridor Entry	Yes	No	
	Access Corridor North Wall	Yes	No	
	Access Corridor South Wall	Yes	No	
	Control Room East Wall	Yes	No	
	Operating Corridor North Wall	Yes	No	

Fire Alarm Pull Boxes: Check for accessibility.

Bldg.	Location	Equipment No.	Passed Test		Problem(s) Found
604	Operating Corridor, North Exit	MFA-WL-1	Yes	No	
	Operating Corridor, South Exit	MFA-WL-2	Yes	No	
	Pipe Corridor, North Exit	MFA-WL-3	Yes	No	
	Pipe Corridor, South Exit	MFA-WL-4	Yes	No	
	Access Corridor, Vestibule	MFA-WL-5	Yes	No	
	Access Corridor, South Exit	MFA-WL-6	Yes	No	

NOTE: *To ensure the leak detection cables are working properly, the following needs to be accomplished: Press and hold TEST button and confirm the following:*

Display indicates cable length
Red alarm indicator light is ON
Buzzer is ON
Yellow continuity indicator light is ON
Green power indicator light is ON
Red external alarm light is ON

Leak Detection Cables: Check to see if operational per TPR-7077, "LET&D—Preparation for Startup."

Bldg.	Location	Equipment No.	Passed Test		Problem(s) Found
605	Northeast Side of Walkway	MA-WLK-399-15A	Yes	No	
	Northeast Side of Walkway	MA-WLL-296-11	Yes	No	

RCRA PEW/TANK FARM MONTHLY FACILITY INSPECTIONS

Tank Farm

Fire Extinguishers: Check for physical damage, sealed, accessibility, and gauge indication in green (if equipped).

Bldg.	Location	Equipment No.	Passed Test		Problem(s) Found
635	Northwest Wall	FE-WM-3	Yes	No	
636	Northwest Wall	FE-WM-4	Yes	No	

Spill Control Equipment Inventory

Instructions: The cabinet is located in the CPP-604 WO area.
Place ✓ if minimum quantity (or greater) is present. Notify supervision of any usage so that cabinet can be restocked.
If seal no. is the same and the seal has not been broken, an inventory needs only to be taken every other year, in the even years, during the July monthly inspection.

Item	Quantity Required	Inventory
Non-rad acid suits (green) (1) (These are reusable)	6 pair	
Acid boots (1)	6 pair (2 > Size 12)	
Rad acid suits (yellow) (1)	6	
Acid gloves (neoprene) (1)	12 pair	
Face shields	4	
Splash goggles	4	
Plastic buckets	2	
Spill control pillows	24	
Acid neutralizer	5-gallon bucket	
Caustic neutralizer	5-gallon bucket	
Waste bags (1)	12	
Hazardous material pigs	12	
Mop handles	1	
Mop heads	3	
Safety rope	At least 25 feet	
Signs (5 total)	4 "Danger-Acid Spill" 1 "Chemical Spill"	
pH paper	2 boxes	
Duct tape (white) (1)	2 rolls	
Shovel (flat head)	1	
Pocket knife	1	
Smear paper and envelopes	1 box	
Pencils, grease pencils	2 each	
Radiological tags/signs	5 each	
Radiation rope or ribbon	At least 25 feet	
	Previous Inspections Seal Number for Cabinet	
	Seal Number for Cabinet	

(1) Replace these items with new, out-of-the-box equipment, in July, in the even years.

RCRA PEW/TANK FARM MONTHLY FACILITY INSPECTIONS

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments	Nature of Any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions

Inspector's Name (Print): ______________________

Inspector's Signature: ______________________

Inspection Completed; Shift Supervisor's Signature: ______________________

Remedial Actions Completed or Not Required;
Shift Supervisor's Signature: ______________________

Comments: ______________________

Form INTEC-4039
04/15/14
Rev. 12

Used with MCP-1283

RCRA WASTE PROCESSING VAULT AND VALVE BOX INSPECTIONS

Previous Inspection Checked (Initials): ____________ Vault Inspected: __________________ Date: _______________ Time: __________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ________________________

Equipment/Area Inspected	Types of Problems/Inspection Items	Observations	Nature of Any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions
Sump	Erosion, cracks, debris, settling, spills			
Sump jet	Steam leaks, debris			
Concrete floor (stainless lined)	Cracks, deterioration, uneven settling, spills			
Concrete walls (stainless lined)	Cracks, deterioration, settlement			
Concrete floor (epoxy painted)	Cracks, deterioration, uneven settling, spills			
Concrete walls (epoxy painted)	Cracks, deterioration, settlement			
Concrete walls	Cracks, deterioration, settlement, paint			
Tank exteriors	Corrosion, erosion, leaks, discoloration, buckles, bulges			
Piping	Corrosion, erosion, leaks, loose or corroding connections			
Valves	Leaks (external), corrosion			
Ladder	Corroded, poor structural stability, damaged			
Pumps	Leaking, corrosion, loose connections, deterioration			

Comments: ____

RCRA WASTE PROCESSING VAULT AND VALVE BOX INSPECTIONS

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments

Inspector's Name (print): ____________________

Inspector's Signature: ____________________

Inspection Completed; Shift Supervisor's Signature: ____________________

Remedial Actions Completed or Not Required; Shift Supervisor's Signature: ____________________

RCRA LET&D MONTHLY INSPECTIONS

Previous Month's Inspection Checked (Initials): ____________ Date: ____________ Time: ____________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous month's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ____________

Fire Extinguishers: Check for accessibility, physical damage, sealed, and gauge indication in green (if equipped).

Level	Location	Passed Test		Problem(s) Found
1	East Door	Yes	No	
	West Door	Yes	No	
2	East Door	Yes	No	
	West Door	Yes	No	
3	East Door	Yes	No	
	West Door	Yes	No	

Safety Showers and Eyewashes: Check for leaks, accessibility, and ensure supply valve is open and the PM tag is current for the month being inspected.

Level	Location	Equipment No.	Passed Test		Problem(s) Found
1	Sample Room	SSW/EFN-WLJ-97	Yes	No	
2	Center	SSW/EFN-WLQ-98	Yes	No	
3	Center	SSW/EFN-WLR-99	Yes	No	

Fire Alarm Pull Boxes: Check for accessibility.

Level	Location	Location No.	Passed		Problem(s) Found
1	East Door	MFA-WLH-1	Yes	No	
	West Door	MFA-WLH-2	Yes	No	
2	East Door	MFA-WLQ-3	Yes	No	
	West Door	MFA-WLQ-4	Yes	No	
3	East Door	MFA-WLR-5	Yes	No	
	West Door	MFA-WLR-6	Yes	No	

RCRA LET&D MONTHLY INSPECTIONS

SPILL CONTROL EQUIPMENT INVENTORY

Instructions:

Cabinets are located in the vestibule on level 1, and on the south central wall on level 2.

Place √ if minimum quantity (or greater) is present. Notify supervision of any usage so that cabinet can be restocked.

If seal no. is the same and the seal has not been broken, an inventory needs only to be taken every other year, in the even years, during the July monthly inspection.

Item	Quantity Required	Level 1	Level 2
Non-rad acid suits (green) **(1)** (These are reusable)	6 pair		
Acid boots **(1)**	6 pair (2 > Size 12)		
Rad acid suits (yellow) **(1)**	6		
Acid gloves (neoprene) **(1)**	12 pair		
Face shields	4		
Splash goggles	4		
Plastic buckets	2		
Spill control pillows	24		
Acid neutralizer	5-gallon bucket		
Caustic neutralizer	5-gallon bucket		
Waste bags **(1)**	12		
Hazardous material pigs	12		
Mop Handles	1		
Mop Heads	3		
Safety rope	At least 25 feet		
Signs (5 total)	4 “Danger-Acid Spill” 1 “Chemical Spill”		
pH paper	2 boxes		
Duct tape (white) **(1)**	2 rolls		
Shovel (flat head)	1		
Pocket knife	1		
Smear paper and envelopes	1 box		
Pencils, grease pencils	2 each		
Radiological tags/signs	5 each		
Radiation rope or ribbon	At least 25 feet		
	Previous Inspections Seal Number for Cabinet		
	Seal Number for Cabinet		

(1) Replace these items with new, out-of-the-box equipment, in July, in the even years.

RCRA LET&D MONTHLY INSPECTIONS

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial Was Identified	Deficiency Description/Comments	Nature of Any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions

Inspector's Name (Print): ______________________

Inspector's Signature: ______________________

Inspection Completed; Shift Supervisor's Signature: ______________________

Remedial Actions Completed or Not Required;
Shift Supervisor's Signature: ______________________

Comments: ______________________

RCRA LET&D DAILY FACILITY INSPECTIONS

This form is the current revision per EDMS.

____
Signature/Date

Previous Week's Inspection Checked (Initials): ______________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): __________

Date: ____________ Through ______________

			Time:							
Area	**Item**	**Normal Condition**	**Off Spec. Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
First Level	"Danger– Unauthorized Personnel Keep Out" signs - missing, damaged or obstructed?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
	Hazardous liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
	Liquid in Sample Room leak detection bottle? (1)	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
	Telephone functional & accessible?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
	Cell 1 door locked? (2)	Yes	No	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA
	Cell 2 door locked? (2)	Yes	No	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA
Second Level	Hazardous liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
	Liquid in leak detection bottle on north middle wall? (1)	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
	Telephone functional & accessible?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Third Level	Hazardous liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
	Telephone functional & accessible?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
	Cell 1 door locked? (2)	Yes	No	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA
	Cell 2 door locked? (2)	Yes	No	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA	Yes/No/ NA

(1) If liquid is found in any leak detection bottle, treat the liquid as a leak of process solution until proven otherwise.
(2) Cell doors may remain open when facility is not operating to facilitate daily cell inspections. The definition of "operating" is in footnote (3). Circle "Yes" if the facility is operating and the cell door is locked, circle "No" if the facility is operating and the cell door is NOT locked, circle "N/A" if the facility is not operating.

RCRA LET&D DAILY FACILITY INSPECTIONS

Item	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Is the LET&D Facility operating (3)? Circle Yes or No. (4)	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

(3) The LET&D Facility is considered operating when steam is being fed to the reboiler or either Fractionator contains liquid.
(4) If circled "Yes", then the daily cell inspections **ARE NOT** required, leave the cell inspection sections blank. If circled "No" then the daily cell inspections **ARE** required.

Item	Normal Condition	Off Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Cell #1 (4)									
Leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Piping-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Tanks-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Cell #2 (4)									
Leaks observed in cell?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Pumps & Piping-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Tanks-cracks, gaps, or deterioration visible?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes

	DCS Tag Number	Normal Condition	DCS Alarm/Off-Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Tank Levels	L-WLK-197-2	≤ 28 in. WC	> 28 in. WC							
	L-WLK-171-1	≤ 40 in. WC	> 40 in. WC							
	L-WLL-170-1	≤ 40 in. WC	> 40 in. WC							
	L-WLL-195-2	≤ 28 in. WC	> 28 in. WC							
Sump Levels	L-WLK-171-39	< 17 in. WC	≥ 17 in. WC							
	L-WLL-170-38	< 17 in. WC	≥ 17 in. WC							
	L-WLL-169-1	< 7 in. WC	≥ 7 in. WC							

Form Review	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Supervision Initials:							

RCRA LET&D DAILY FACILITY INSPECTIONS

Day	Inspector's Name (Print)	Inspector's Signature	Inspection Completed Date	Nature of Any Repairs or Other Remedial Actions	Repairs/Remedial Actions Completed or Not Required Supervision Signature/Date
Thu					
Fri					
Sat					
Sun					
Mon					
Tue					
Wed					

Comments: ____

____

____

____

____

____

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments:

Record the following information for leaks of hazardous materials from process systems:

Date/time of leak discovery	
Location of leak: System/Cell	
Component leaking (valve, fitting, etc.)	
Estimated leak volume or rate	
Continuous or occasional leak? If occasional, when does leak occur?	
Comments:	

RCRA LWFC CELL INSPECTIONS

This form is the current revision per EDMS.

____
Signature/Date

Previous Inspection Checked (Initial): ____________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ____________

Facility: ________________ Cell Inspected: ________________ Date: __________ Time: __________

A full inspection of the cell will be conducted when the cell is initially entered. If the cell remains open for more than one day (24 hours), and cell conditions have not changed, a cell inspection will be performed using either Form INTEC-9123 or 9123A each day the cell is re-entered. If the cell remains open for 7 days or longer, then perform a full cell inspection every 7 days when entering the cell.

Equipment/Area Inspected	Types of Problems/Inspection Items	Observations	Nature of Any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions
Sump	Erosion, cracks, debris, settling, spills			
Sump jet	Steam leaks, debris			
Concrete floor (stainless lined)	Cracks, gaps, deterioration, uneven settling, spills			
Concrete walls (stainless lined)	Cracks, gaps, deterioration, settlement			
Concrete floor (epoxy painted)	Cracks, gaps, deterioration, uneven settling, spills, paint			
Concrete walls(1)	Cracks, deterioration, settlement, paint			
Tank exteriors	Corrosion, erosion, leaks, cracks, gaps, discoloration, buckles, bulges			
Piping	Corrosion, erosion, leaks, cracks, gaps, loose or corroded connections			
Valves	Leaks (internal and external), corrosion			
Cell door	Deterioration, corrosion, will not close			
Pumps (if any)	Corrosion, erosion, leaks, deterioration, loose connections			
Filter unit exterior	Deterioration, corrosion, bulges, buckles, leaks			

(1) The WL-161, Cell at INTEC-604 is known to have defects in the concrete walls above the stainless-steel liner. When this cell is inspected, compare the photos in EDF-6859, located on EDMS. If no change is noted, write NO CHANGE in the Observations section. No remedial actions will be necessary. If additional deterioration is noted, write this observation down and forward to the facility support engineer for further evaluation. Remedial action for this observation will be evaluated and repairs completed, if warranted.

RCRA LWFC CELL INSPECTIONS

Containerized Hazardous Waste Stored at Location?	Inspection if Waste is Stored at Location	Normal Condition	Off-Spec Condition	Inspection	Comments
Yes/No(2)	Containers leaking?	No	Yes	No/Yes	
	Containers deteriorating?	No	Yes	No/Yes	
	Containers closed?	Yes	No	Yes/No	
	Hazardous liquids on floor?	No	Yes	No/Yes	
	Deterioration visible (3)	No	Yes	No/Yes	

(2) Inspection is not required if containerized hazardous waste is not stored at location. Inspection is required on a weekly basis if containerized hazardous waste is stored at location.

(3) Inspect stainless steel containment liner on floor and walls for cracks, gaps, corrosion, and deterioration.

Comments: ______________________________

____

____

____

____

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments

Inspector's Name (Print): ______________________________

Inspector's Signature: ______________________________

Inspection Completed; Shift Supervisor's Signature: ______________________________

Remedial Actions Completed or Not Required; Shift Supervisor's Signature: ______________________________

ABBREVIATED RCRA CELL INSPECTION

This form is the current revision per EDMS.

____
Signature/Date

Previous Inspection Checked (Initials): ____________

Cell Inspected: ________________________ Date: __________ Time: __________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous inspection form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table (Initials): __________

Equipment/Area Inspected	Types of Problems/Inspection Items	Observations	Nature of Any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions
Sump(s), floor, walls, exterior tank surfaces, piping, valves, and pumps that are visible, and waste containers [1]	Erosion, deterioration, cracks, settling, leaks, spills, debris, or corrosion			

1. Abbreviated inspections may be performed by several means (e.g., cameras, observing the area through the cell entryway, walkthroughs, etc.). Walkthrough inspections completed by personnel performing work within the cell will be limited to those areas encountered while traversing between the cell entrance and the specific work location.

Containerized Hazardous Waste Stored at Location?	Inspection if Waste is Stored at Location	Normal Condition	Off-Spec Condition	Inspection	Comments
Yes/No(2)	Containers leaking?	No	Yes	No/Yes	
	Containers deteriorating?	No	Yes	No/Yes	
	Containers closed?	Yes	No	Yes/No	
	Hazardous liquids on floor?	No	Yes	No/Yes	
	Deterioration visible (3)	No	Yes	No/Yes	

2. Inspection is not required if containerized hazardous waste is not stored at location. Inspection is required on a weekly basis if containerized hazardous waste is stored at location.

3. Inspect stainless steel containment liner on floor and walls visible through shield window for cracks, gaps, corrosion, and deterioration.

ABBREVIATED RCRA CELL INSPECTION

Comments: ______________________________

____

____

____

____

____

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments

Inspector's Name (Print) ______________________________

Inspector's Signature ______________________________

Inspection Completed:
Shift Supervisor's Signature ______________________________

Remedial Actions
Completed or Not Required:
Shift Supervisor's Signature ______________________________

RCRA MONTHLY VOICE PAGING/EVACUATION SYSTEM INSPECTIONS

Previous Inspection for this Facility Checked (Initials): ____________________ Date: ___________ Time: ___________

The Open RCRA Remedial Tracking Book Index for this form has been compared to the previous month's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): _________

NOTE 1: *The Voice Paging System and the Evacuation System use the same speakers.*

NOTE 2: *Use only one copy of this form as a "Master Copy." Ensure all areas checked are transferred to the Master Copy and keep a copy of the completed form at CPP-1683.*

Facility	Area Checked "√"(1)	Areas to Check	Requirements Met?(2)		Inspector's Initials
NWCF		All levels in the facility (including the Decon area)	Yes	No	
Waste Side		Tank Farm	Yes	No	
		CPP-604/605 (all levels in the facility)	Yes	No	
		LET&D (all levels in the facility)	Yes	No	
		CPP-1683	Yes	No	
CPP-1617		Areas in CPP-1617	Yes	No	
Solids Storage Facilities		Solids Storage Facilities I, II, III, IV, V, VI(3)	Yes	No	

(1) Place a "√" in the "Area Checked" column to indicate which area(s) was inspected; leave the other boxes blank. Only fill in the "Requirements Met" section for the area(s) inspected:

(2) Requirements are met if the Voice Paging/Evacuation System is operational and can be heard throughout the normally accessible area(s) inspected. If an area is a high noise area, the requirements are met if the visual alarms are operational.

(3) Requirements are met if the Voice Paging/Evacuation System is operational and can be heard throughout the Solids Storage Facilities area(s).

RCRA MONTHLY VOICE PAGING/EVACUATION SYSTEM INSPECTIONS

List areas where system is not operating properly (if any):

Area Where System is Not Operating Properly	Nature of any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions

Comments: ____

____

____

____

____

____

____

Open RCRA Remedials on this form:
Note: *The Open RCRA Remedial Tracking Index for this inspection form is maintained at CPP-1683.*

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments

Inspector's Name (Print): ______________________________

Inspector's Signature: ______________________________

Inspection Completed; Shift Supervisor's Signature: ______________________________

Remedial Actions Completed or NOT Required;
Shift Supervisor's Signature: ______________________________

RCRA TANK FARM DAILY INSPECTIONS AND PROCESS MONITORING SHEET

Previous Week's Inspection Checked (Initials): ________________

The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA Remedials have been recorded on the tracking table. (Initials): ___________

Date: ______________ Through ______________

Instrument No.	Normal Condition	Off-Spec. Condition	Base	Thu	Fri	Sat	Sun	Mon	Tue	Wed
		Time:								
LRA-WM-187	5–95%	< 5 or > 95%								
LRA-WM-188	5–95%	< 5 or > 95%								
LRA-WM-189	5–95%	< 5 or > 95%								
LRA-WM-190	≤5%	>5%								
WM Sump Levels										
WM-187N	≤14 in.	>14 in.								
WM-187S	≤14 in.	>14 in.								
WM-188N	≤14 in.	>14 in.								
WM-188S	≤14 in.	>14 in.								
WM-189N	≤40 in.	>40 in.								
WM-189S	≤40 in.	>40 in.								
WM-190N	≤40 in.	>40 in.								
WM-190S	≤40 in.	>40 in.								

Instrument No.	Normal Condition	Off-Spec. Condition	Base	Thu	Fri	Sat	Sun	Mon	Tue	Wed
L-WM-B9	≤5 in.	>5 in.								
L-WM-B10	≤6 in.	>6 in.								
L-WM-JB7	≤6.5 in.	>6.5 in.								
L-WM-JB8	≤6.5 in.	>6.5 in.								
A7	OFF	HIGH								
B1	OFF	HIGH								
B2	OFF	HIGH								
B11	OFF	HIGH								
C12	OFF	HIGH								
C24	OFF	HIGH								
C25	OFF	HIGH								
C32	OFF	HIGH								
C37	OFF	HIGH								
C40	OFF	HIGH								
D4	OFF	HIGH								

RCRA TANK FARM DAILY INSPECTIONS AND PROCESS MONITORING SHEET

Location	Item	Normal Condition	Off-Spec. Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
DVB-C30	Any liquid present is contained within the sump?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
CPP-635	Telephone functional?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
CPP-636	Telephone functional?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Tank Farm	Eastside Tank Farm gates locked and perimeter boundaries in place?	Yes	No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
CPP-635	Process liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
CPP-636	Process liquids on floor?	No	Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes	No/Yes
Entrances/ Gates (1)	"Danger – Unauthorized Personnel Keep Out" signs posted?	Yes	No						Yes/No	

(1) During the Tank Farm Paving Project, ensure signs are posted at entrances and on rope barriers/stanchions.

Form Review	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Supervision Initials:							

Day	Inspector's Name (Print)	Inspector's Signature	Inspection Completed Date	Nature of Any Repairs or Other Remedial Actions	Repairs/Remedial Actions Completed or Not Required Supervision Signature/Date
Thu					
Fri					
Sat					
Sun					
Mon					
Tue					
Wed					

Comments: ______________________________

RCRA TANK FARM DAILY INSPECTIONS AND PROCESS MONITORING SHEET

Open RCRA Remedials on this form:

Footnote Letter	Tracking Number	Date Remedial was Identified	Deficiency Description/Comments

Record the following information for leaks of hazardous materials from process systems:

Date/time of leak discovery	
Location of leak: System/Cell	
Component leaking (valve, fitting, etc.)	
Estimated leak volume or rate	
Continuous or occasional leak?	
If occasional, when does leak occur?	

Comments: ______________________________

IWTU—DAILY RCRA INSPECTIONS

Verify that the following have been performed: Initial

1. Previous week's inspection checked ______

2. The Open RCRA Remedials Tracking Book index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA remedials have been recorded on the tracking table. ______

Date: ____________ through ____________

		Time:							
Area	**Item**	**Normal Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
First Level	"Danger–Unauthorized Personnel Keep Out" signs—missing, damaged, or obstructed (1)(2)	No	No / Yes						
	Hazardous liquids on floor	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Supervisors' office telephone functional and accessible (526-7273)	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	Control room telephone functional and accessible (526-7271)	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	Established clear two-way (radio/cell) communication with an employee in the control room	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	SIF-1 Hydrogen deflagration protection not tripped (YS-C-401-11 is NORMAL) (3)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	SIF-2 High temperature protection system not tripped (YS-C-402-21 is NORMAL) (3)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	SIF-3 High CO detection system not tripped (YS-H-403-31 is NORMAL) (3)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A

IWTU—DAILY RCRA INSPECTIONS

Area	Item	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
First Level	4-pack cell shield plugs in place (4)(5)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	2-pack cell shield plugs in place (4)(5)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	Cell 0 shield plug in place (4)(5)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	Cell 1 shield plug in place (4)(5)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	TK-SRH-141 Visual inspection of tank revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	TK-SRH-141 Visual inspection of condensate drain line revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	TK-SRH-141 Visual inspection of transfer line to VES-SRC-131 revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	STK-SRE-140 Visual inspection of condensate drain line revealed no leaks (outside CPP-1696)	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	STK-SRE-140 No condensate accumulation or accumulated condensate removed per TPR-7915	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	SPL-SRH-941 Visual inspection of CEMS monitor revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	SPL-SRH-941 Visual inspection of condensate drain line revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No

IWTU—DAILY RCRA INSPECTIONS

Area	Item	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
First Level	F-SRH-140-A/-B/-C/-D Visual inspection of fire-water drain lines revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	F-SRH-141-A/-B Visual inspection of fire-water drain lines revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	F-SRH-131/-132 Visual inspection of fire-water drain lines revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Second Level	Hazardous liquids on floor	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	SPL-SRC-942 Visual inspection of H_2 monitor condensate drain line revealed no leaks	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	Cell 0 plug P19 in place (4)(5)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	Cell 1 plug P18 in place (4)(5)	Yes	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A	Yes / No / N/A
	Cell 2 upper cover plate in place (5)	Yes	Yes / N/A	Yes / N/A	Yes / N/A	Yes / N/A	Yes / N/A	Yes / N/A	Yes / N/A
	Established clear two-way (radio/cell) communication with an employee in the control room	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Room 301	Established clear two-way (radio/cell) communication with an employee in the control room	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No

(1) Check all exterior doors, the door leaving Corridor 133 to Room 118 (mechanical equipment room), and the door leaving Room 139 (shift operating base) to Room 118. Doors entering Room 103 (fire-water riser Room 1), Room 124B (fire-water riser Room 2), Room 125 (vestibule to change rooms), Room 135 (control room), and Room 144 (fire-water riser Room 3) do not require access control signs (Danger signs).

(2) Access control signs (Danger signs) are checked weekly.

(3) Circle N/A if the facility is in SHUTDOWN MODE or WARM STANDBY MODE.

(4) Process-confinement-area shield plug/plate positions are governed by TSR-219, AC 5.219.4, “Process Confinement Area Access Restrictions.” PROCESS CONFINEMENT AREA ACCESS is defined as “Intentional opening of a door, removing a hatch, removing a plug, or removing any other item which constitutes any part of the PROCESS CONFINEMENT AREA boundary. Access does not require a physical entry.” **(TSR-219)**

(5) Circle Yes if the shield plug/plate is in place. Circle No if the shield plug is NOT in place AND is required per Footnote 4. Circle N/A if the shield plug/plate is NOT in place AND is NOT required per Footnote 4.

IWTU—DAILY RCRA INSPECTIONS

Area	Item	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
4-pack Cell	Cameras VC-SRC-5 and VC-SRC-6 operational	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	Leaks observed in cell	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Tanks—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Secondary containment—cracks, gaps, or deterioration visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
2-pack Cell	Camera VC-SRC-23 operational	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
	Leaks observed in cell	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Tanks—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Secondary containment—cracks, gaps, or deterioration visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
Cell 0 (6)	Leaks observed in cell	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Waste pile—liquids	No	No / Yes						
	Secondary containment—cracks, gaps, or deterioration visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes

IWTU—DAILY RCRA INSPECTIONS

Area	Item	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Cell 1 (6)	Leaks observed in cell	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Waste pile—liquids	No	No / Yes						
	Secondary containment—cracks, gaps, or deterioration visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
Cell 2 (6)	Leaks observed on cell floor from overhead pipes	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
Sample Cell	Leaks observed in cell	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
GAC Bed Area	Leaks observed in area	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes
	Piping—cracks, corrosion, erosion, or leaks visible	No	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes

(6) The preferred method of inspection is visual through the cell window. Cameras or other aids may be used to perform this inspection in Cell 0 and Cell 1.

	Thu	Fri	Sat	Sun	Mon	Tue	Wed
DCS System Status displays a red indication (7)	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes	No / Yes

(7) If Yes, notify DCS support, Engineering support, and Environmental support of failed system diagnostics, and open a RCRA remedial.

Item	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Normal electrical power is available (JS-B-120-1 is NORMAL)	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No
Seismic event not tripped (either XSH023-1C or XSH023-2C is NORMAL)	Yes	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No	Yes / No

IWTU—DAILY RCRA INSPECTIONS

System	Instrument (8)	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Waste Feed Transfer Line Encasement	LSH102-2C	Normal							
Waste Feed Tank	L-C-131-2 (9)	<80 in. WC							
	D-C-131-1 (9)	>1.0 SpG							
	VOL-C-131-2 (9)	>200 gal							
Waste Feed Pump	P-C-131-1A (9)	>20 psig							
	P-C-131-1B (9)	>20 psig							
Waste Feed Pump Seal Water Tank	L-C-231-3 (9)(10)	>9 in. WC							
Waste Feed System	FC-C-540-11 (9)(11)	<105 scfm							
	FC-C-540-12 (9)(11)	<105 scfm							
	FC-C-540-13 (9)(11)	<105 scfm							
	FC-C-540-14 (9)(11)	<105 scfm							
	FC-C-540-15 (9)(11)	<105 scfm							
	FC-C-540-16 (9)(11)	<105 scfm							
	FC-C-140-1 (9)(11)	<2.5 gpm							
	FC-C-140-2 (9)(11)	<2.5 gpm							
	FC-C-140-3 (9)(11)	<2.5 gpm							
	FY-C-140-1 (9)	<2.5 gpm							

IWTU—DAILY RCRA INSPECTIONS

System	Instrument (8)	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
DMR	T-C-140-2A (9)	<680°C							
	T-C-140-2B (9)	<680°C							
	T-C-140-2C (9)	<680°C							
	T-C-140-3A (9)	<680°C							
	T-C-140-3B (9)	<680°C							
	T-C-140-3C (9)	<680°C							
	T-C-140-4 (9)	<680°C							
	T-C-140-5A (9)	<680°C							
	T-C-140-5B (9)	<680°C							
	T-C-140-5C (9)	<680°C							
	T-C-140-12A (9)	<680°C							
	T-C-140-12B (9)	<680°C							
	T-C-140-12C (9)	<680°C							
	TC-C-140-9 (9)	580–680°C							
	TDY-C-140-9 (9)	<50°C							
	D-C-140-4 (9)	<1.87 SpG							
	P-C-140-1 (9)	<10 psig							
	P-C-140-7 (9)	<10 psig							
	LY-C-140-1 (9)	<70 in.							
DMR Fluidizing Gas	FC-B-365-5 (9)	<1.5 ft/sec							
	FC-B-365-2 (9)	<1.5 ft/sec							
	FY-B-365-1 (9)	0.4–1.6 ft/sec							
	T-B-365-17 (9)	>430°C							
	P-B-365-11A (9)	<45 psig							
PGF	PD-C-153-1 (9)	<81 in. WC							
	AC-C-153-1 (9)	1.5–15% H_2							
	A-C-153-1A (9)	1.5–15% H_2							
	A-C-153-1B (9)	1.5–15% H_2							
	A-C-153-1C (9)	1.5–15% H_2							
	P-C-153-3 (9)	1–7 psig							
	P-C-153-11	<12 psig							

IWTU—DAILY RCRA INSPECTIONS

System	**Instrument** (8)	**Normal Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
CRR	T-C-160-4 (9)	<1,100°C							
	T-C-160-8 (9)	<1,100°C							
	T-C-160-12 (9)	<1,100°C							
	T-C-160-16 (9)	<1,100°C							
	T-C-160-25 (9)	<1,100°C							
	T-C-160-26 (9)	<1,100°C							
	TC-C-160-4 (9)	850–1,100°C							
	TDY-C-160-4 (9)	<50°C							
	P-C-760-10 (9)	<0 in. WC							
	P-C-760-16 (9)	<0 in. WC							
	D-C-160-1 (9)	1.30–1.73 SpG							
	AC-C-760-1 (9)	1–8 vol%							
	A-C-760-1A (9)	<8 vol%							
	A-C-760-1B (9)	<8 vol%							
	A-C-760-1C (9)	<8 vol%							
	T-C-160-2 (9)	<325°C							
CRR and Crossover Duct	T-C-160-3 (9)	<325°C							
	T-C-160-7 (9)	<325°C							
	T-C-160-11 (9)	<325°C							
	T-C-760-9 (9)	<325°C							
	T-C-760-13 (9)	<325°C							
OGC	T-C-160-1A (9)	130–204°C							
	T-C-160-1B (9)	130–204°C							
	PD-C-160-3 (9)	<81 in. WC							
	PSH-C-160-13	Not tripped (NT)	☐ NT ☐ Tripped	☐ NT ☐ Tripped	☐ NT ☐ Tripped	☐ NT ☐ Tripped	☐ NT ☐ Tripped	☐ NT ☐ Tripped	☐ NT ☐ Tripped
OGF	P-C-160-3A (9)	-3 to 0 psig							
	P-C-160-3B (9)	-3.5 to 0 psig							

IWTU—DAILY RCRA INSPECTIONS

System	**Instrument** (8)	**Normal Condition**	**Thu**	**Fri**	**Sat**	**Sun**	**Mon**	**Tue**	**Wed**
OGBs	I-H-260-1A (9)(11)	<223 amps							
	I-H-260-1B (9)(11)	<223 amps							
	PSH-H-140-8	No trouble (NT)	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble
	PSH-H-140-9	No trouble (NT)	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble	☐ NT ☐ Trouble
Process HEPA Filters	PD-H-140-4A (9)	<8 in. WC							
	PD-H-140-5A (9)	<8 in. WC							
	PD-H-140-6A (9)	<8 in. WC							
	PD-H-140-4B (9)	<8 in. WC							
	PD-H-140-5B (9)	<8 in. WC							
	PD-H-140-6B (9)	<8 in. WC							
	PD-H-140-4C (9)	<8 in. WC							
	PD-H-140-5C (9)	<8 in. WC							
	PD-H-140-6C (9)	<8 in. WC							
	PD-H-140-4D (9)	<8 in. WC							
	PD-H-140-5D (9)	<8 in. WC							
	PD-H-140-6D (9)	<8 in. WC							
	T-H-140-2 (9)	>130°C							
	T-H-140-3A (9)	130–175°C							
	T-H-140-3B (9)	130–175°C							
GAC Beds	P-H-141-7A	<0.5 psig							
	P-H-141-7B	<0.5 psig							
	T-H-141-7A (9)	<200°C							
	T-H-141-7B (9)	<200°C							
PEBs	I-H-240-10A (9)(11)	<223 amps							
	I-H-240-10B (9)(11)	<223 amps							
CEMS	A-H-941-3A (9)	<100 ppm							
	A-H-941-3B (9)	<100 ppm							

IWTU—DAILY RCRA INSPECTIONS

System	Instrument (8)	Normal Condition	Thu	Fri	Sat	Sun	Mon	Tue	Wed
N_2 Supply	P-B-357-2A (9)	>80 psig							
	P-B-357-2B (9)	>80 psig							
	L-E-121-5 (9)	>25 in. WC							
O_2 Supply	P-B-146-3A (9)	>75 psig							
	P-B-146-3B (9)	>75 psig							
	L-E-124-5 (9)	>30 in. WC							
Compressed Air	P-B-166-2A (9)	>70 psig							
	P-B-166-2B (9)	>70 psig							
4-pack Cell Sump	L-C-190-1	≤17 in. WC							
2-pack Cell Sump	L-C-180-1	≤17 in. WC							
Cell 0 Sump	L-C-150-1	≤17 in. WC							
Cell 1 Sump	L-C-151-1	≤17 in. WC							
Sample Cell Sump	L-C-194-1	≤17 in. WC							
Off-Gas Condensate Collection Tank	L-H-141-1	<20.5 in. WC							
Fire-Water Collection Tank	L-E-196-1	<95 in. WC							
Fire-Water Collection Tank	MSH-E-196-6	Normal							
Fire-Water Collection Tank Annulus	MSH-E-196-2	Normal							

(8) If an instrument does NOT meet its normal condition for a short period of time because of routine maintenance, a RCRA remedial is NOT required.

(9) If the cause of the out-of-spec reading is evident due to current plant conditions and NOT due to an upset condition or equipment malfunction, a RCRA remedial is NOT required. Circle the reading, identify it with a number, and explain the out-of-spec condition in the Comments section.

(10) If L-C-231-3 has been taken out of service and the IWTU project environmental lead (PEL) has approved taking the instrument out of service, record N/A. A RCRA remedial is NOT required.

(11) If the standby equipment/instrument is off-line and available, record these items as SD. A RCRA remedial is NOT required.

Form Review	Thu	Fri	Sat	Sun	Mon	Tue	Wed
Supervision Initials:							

IWTU—DAILY RCRA INSPECTIONS

Day	Inspector's Name (Print)	Inspector's Signature	Inspection Completed Date	Nature of Any Repairs or Other Remedial Actions	Repairs/Remedial Actions Completed or Not Required Supervision Signature/Date
Thu					
Fri					
Sat					
Sun					
Mon					
Tue					
Wed					

Comments: ____

IWTU—DAILY RCRA INSPECTIONS

Open RCRA remedials on this form:

Footnote Letter	Tracking Number	Date Remedial Was Identified	Deficiency Description/Comments

Record the following information for leaks of hazardous materials from process systems:

Date and time of leak discovery	
Location of leak (for example, system, cell, or area)	
Component leaking (for example, valve, fitting, or pipe)	
Estimated leak volume or rate	
Continuous or occasional leak? If occasional, when does the leak occur?	

Comments: ____

IWTU—MONTHLY RCRA INSPECTIONS

This form is the current revision per EDMS.

____
Signature/Date

Date and time these inspections were performed: Date: __________ Time: ________

Verify that the following have been performed: Initial

1. Previous month's inspection checked ________
2. The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous month's form, the index has been updated, and the current open RCRA remedials have been recorded on the tracking table. ________

Fire Extinguishers: Check for accessibility, damage, seal, and gauge indication in green (if equipped). If problems are noted, notify Fire Protection.

Item	Location	Equipment Identifier	Condition SAT		Problem(s) Found
1	Room 135, control room, north wall	9719	Yes	No	
2	Room 135, control room, south wall	9699	Yes	No	
3	Room 133, corridor, north wall	9716	Yes	No	
4	Room 143, product storage building, southwest exit	9698	Yes	No	
5	Room 143, product storage building, west exit, middle	9708	Yes	No	
6	Room 143, product storage building, northwest exit	9704	Yes	No	
7	Room 143, product storage building, northeast exit	9713	Yes	No	
8	Room 143, product storage building, southeast wall, middle	9697	Yes	No	
9	Room 143, product storage building, southeast wall	9725	Yes	No	
10	Room 141, vestibule, northwest exit	9727	Yes	No	
11	Room 118, mechanical equipment room, east exit	9707	Yes	No	
12	Room 118, mechanical equipment room, north wall near Room 133, control room hallway	9723	Yes	No	
13	Room 118, mechanical equipment room, south wall near Room 119, additive airlock	9687	Yes	No	
14	Room 118, mechanical equipment room, southwest wall, middle	9709	Yes	No	
15	Room 118, mechanical equipment room, west next to rollup door	9683	Yes	No	
16	Room 118, mechanical equipment room, northwest wall	9682	Yes	No	

IWTU—MONTHLY RCRA INSPECTIONS

Item	Location	Equipment Identifier	Condition SAT		Problem(s) Found
17	Room 124, additives storage room, north exit	9685	Yes	No	
18	Room 301, I&C cabinets, north wall	9693	Yes	No	
19	Room 206, superheater mezzanine, west wall	9715	Yes	No	
20	Room 124, additives storage room, second level to the stairway	9700	Yes	No	
21	Room 109, process room, northeast wall	9712	Yes	No	
22	Room 109, process room, north wall, middle	9705	Yes	No	
23	Room 109, process room, northwest wall	9703	Yes	No	
24	Room 109, process room, west wall	9692	Yes	No	
25	Room 109, process room, southwest wall	9722	Yes	No	
26	Room 109, process room, south wall, middle west	9695	Yes	No	
27	Room 109, process room, south wall, middle east	9694	Yes	No	
28	Room 109, process room, southeast wall	9701	Yes	No	
29	Room 117, cask loading, northeast exit	9702	Yes	No	
30	Room 117, cask loading, southeast wall	9686	Yes	No	
31	Room 107, truck airlock, northeast wall	9684	Yes	No	
32	Room 107, truck airlock, southeast exit	9690	Yes	No	
33	Room105, blower room, east wall	9714	Yes	No	
34	Room105, blower room, southeast exit	9720	Yes	No	
35	Room 102, blower room, northeast wall	9696	Yes	No	
36	Room 102, blower room, north wall, middle	9721	Yes	No	
37	Room 102, blower room, south wall, middle	9688	Yes	No	
38	Room 102, blower room, southwest exit	9717	Yes	No	

IWTU—MONTHLY RCRA INSPECTIONS

Item	Location	Equipment Identifier	Condition SAT		Problem(s) Found
39	Room 102, blower room, northwest wall	9711	Yes	No	
40	Room 102, blower room, west exit to stairway	9706	Yes	No	
41	Room 204, HVAC supply room, northeast exit to stairway	9732	Yes	No	
42	Room 204, HVAC supply room, north wall, middle	9741	Yes	No	
43	Room 204, HVAC supply room, south wall	9691	Yes	No	
44	Room 204, HVAC supply room, northwest wall	9736	Yes	No	
45	Room 201, HEPA room, northeast wall	9734	Yes	No	
46	Room 201, HEPA room, southeast wall	9731	Yes	No	
47	Room 201, HEPA room, south wall, middle	9738	Yes	No	
48	Room 201, HEPA room, west wall	9739	Yes	No	
49	Room 201, HEPA room, northwest wall	9733	Yes	No	
50	Room 205, process room mezzanine, northeast wall	7861	Yes	No	
51	Room 205, process room mezzanine, northwest of DMR additive skid	9729	Yes	No	
52	Room 205, process room mezzanine, west wall, north	9525	Yes	No	
53	Room 205, process room mezzanine, west wall, south	7910	Yes	No	
54	Room 205, process room mezzanine, southwest exit	9730	Yes	No	
55	Room 205, process room mezzanine, south wall, middle	9689	Yes	No	
56	Room 205, process room mezzanine, southeast wall	9549	Yes	No	
57	Elevation 116 canister fill mezzanine, northeast wall next to stairs	9735	Yes	No	

IWTU—MONTHLY RCRA INSPECTIONS

Safety Showers and Eyewashes: Check for PM tag periodicity, leaks, accessibility, RCRA portable eyewash tag present (if applicable), and supply valve open (if applicable).

Item	Location	Condition SAT		Problem(s) Found
58	Room 118, mechanical equipment room, north by the nitric acid tote	Yes	No	
59	Room 205, process room mezzanine (portable safety shower and eyewash)	Yes	No	

Fire Alarm Manual Pull Boxes: Check for accessibility.

Item	Location	Pull Box No.	Condition SAT		Problem(s) Found
60	Room 143, product storage building, northwest exit	FAS-MFA1696-06	Yes	No	
61	Room 143, product storage building, west exit	FAS-MFA1696-07	Yes	No	
62	Room 143, product storage building, southwest exit	FAS-MFA1696-08	Yes	No	
63	Room 143, product storage building, northeast exit	FAS-MFA1696-05	Yes	No	
64	Room 141, vestibule, northwest exit	FAS-MFA1696-04	Yes	No	
65	Room 118, mechanical equipment room, east exit	FAS-MFA1696-02	Yes	No	
66	Room 118, mechanical equipment room, west exit	FAS-MFA1696-11	Yes	No	
67	Room 125, vestibule to change rooms, north exit	FAS-MFA1696-01	Yes	No	
68	Room 135, control room, north wall	FAS-MFA1696-03	Yes	No	
69	Room 124, additives storage room, north exit	FAS-MFA1696-09	Yes	No	
70	Room 206, superheater mezzanine, northwest exit to stairway	FAS-MFA1696-21	Yes	No	
71	Room 124A, Stairway 3, west exit	FAS-MFA1696-10	Yes	No	
72	Room 117, cask loading, northeast exit	FAS-MFA1696-20	Yes	No	

IWTU—MONTHLY RCRA INSPECTIONS

Item	Location	Pull Box No.	Condition SAT		Problem(s) Found
73	Room 117, cask loading, southeast wall	FAS-MFA1696-18	Yes	No	
74	Room 108, Stairway 2, east exit	FAS-MFA1696-19	Yes	No	
75	Room 109, process room, northwest exit	FAS-MFA1696-12	Yes	No	
76	Room 107, truck airlock, southeast exit	FAS-MFA1696-17	Yes	No	
77	Room 102, blower room, southwest exit	FAS-MFA1696-15	Yes	No	
78	Room 105, blower room, southeast exit	FAS-MFA1696-16	Yes	No	
79	Room 102, blower room, west exit to stairway	FAS-MFA1696-13	Yes	No	
80	Room 101, Stairway 1, west exit	FAS-MFA1696-14	Yes	No	
81	Room 204, HVAC supply room, northeast exit to stairway	FAS-MFA1696-26	Yes	No	
82	Room 202, 2nd level HVAC corridor, northwest exit to stairway	FAS-MFA1696-22	Yes	No	
83	Room 205, process room mezzanine, southwest exit	FAS-MFA1696-25	Yes	No	

IWTU—MONTHLY RCRA INSPECTIONS

SPILL CONTROL EQUIPMENT INVENTORY SHEET

Instructions:

NOTE: *The two spill-control cabinets are located in Room 118 (mechanical equipment room).*

1. Ensure access to the spill cabinet is NOT obstructed.
2. If the seal number is the same and the seal has NOT been broken, an inventory need not be taken and the inventory column may be left blank.
3. Place √ if minimum quantity (or greater) is present. Notify supervision of any usage so that cabinet can be restocked.
4. The quantities listed are minimum requirements. Replacements should be obtained before quantities reach the minimum required.
5. If the seal was missing or removed, install a new seal after completing inspection/restocking.

	Cabinet 1	Cabinet 2
Previous inspection's seal number for cabinet		
Seal number for cabinet		
Was the cabinet seal broken?	No / Yes	No / Yes

Item	Quantity Required	√
Cabinet 1 Inventory		
Plastic buckets	2	
Spill-control pillows	24	
Shovel (flat head)	1	
Utility knife	1	
Smear paper and envelopes	1 box	
Pencils, grease pencils	2 each	
Hazardous-material bags (1)	12	
Hazardous-material pigs	12	
Mop handles	1	
Mop heads	3	
Safety rope	At least 25 ft	
Signs (5 total)	4 - "Danger Acid Spill" 1 - "Chemical Spill"	
pH paper	2 rolls	
Cabinet 2 Inventory		
Nonradiological acid suits (green; reusable) (1)	6	
Acid boots (1)	6 pair (2 greater than size 15)	
Radiological acid suits (yellow) (1)	6	
Acid gloves (neoprene) (1)	12 pair	
Duct tape (white) (1)	2 rolls	
Face shields	4	
Splash goggles	4	
Acid neutralizer	5-gal bucket	
Caustic neutralizer	5-gal bucket	

(1) Replace these items every July.

IWTU—MONTHLY RCRA INSPECTIONS

Item No.	Action(s) Taken To Correct Problem(s) Found	Action Date	Completion Date

Comments: ______________________________

Open RCRA remedials on this form:

Footnote Letter	Tracking Number	Date Remedial Was Identified	Deficiency Description/Comments

Inspector's Name (print): ______________________________

Inspector's Signature: ______________________________

Inspection Completed; Supervision's Signature: ______________________________

Remedial Actions Completed or Not Required; Supervision's Signature: ______________________________

IWTU—MONTHLY RCRA VOICE PAGING/EVACUATION SYSTEM TEST

____
Signature/Date

Date and time this test was performed: Date: __________ Time: __________

Verify that the following have been performed: Initial

1. Previous month's inspection checked __________

2. The Open RCRA Remedial Tracking Book Index for this form has been compared to the previous month's form, the index has been updated, and the current open RCRA remedials have been recorded on the tracking table. __________

NOTE: *The voice paging system and the evacuation system use the same speakers.*

Areas to Check	**Requirements Met?** (1)	**Inspector's Initials**
Room 118 (mechanical equipment room)	Yes / No	
Room 109 (process room), different levels (ground level, 116 level, 205 level)	Yes / No	
Room 102 (blower room)	Yes / No	
Room 201 (HEPA room)	Yes / No	
Room 204 (HVAC supply room)	Yes / No	
Room 206 (superheater mezzanine)	Yes / No	

(1) Could the announcement be understood in the room/level being evaluated? The announcement has to be intelligible (of sufficient volume and clarity) in each area identified. If the announcement cannot be understood, move to an area where the announcement can be understood.

List areas where the system is <u>not</u> operating properly (if any):

Area Where System is Not Operating Properly	**Nature of Any Repairs or Other Remedial Actions**	**Completion Date for Repairs/Remedial Actions**

IWTU—MONTHLY RCRA VOICE PAGING/EVACUATION SYSTEM TEST

Comments: ____

Open RCRA remedials on this form:

Footnote Letter	Tracking Number	Date Remedial Was Identified	Deficiency Description/Comments

Inspector's Name (print): ______________________

Inspector's Signature: ______________________

Inspection Completed; Supervision's Signature: ______________________

Remedial Actions Completed or Not Required; Supervision's Signature: ______________________

FRM-1118
06/26/17
Rev. 6

Used with MCP-3054, FRM-1124
DRF No. 354941

IWTU—RCRA CELL INSPECTIONS

This form is the current revision per EDMS.

____
Signature/Date

Verify that the following have been performed: Initial

1. Previous inspection checked ________
2. The Open RCRA Remedials Tracking Book index for this form has been compared to the previous form, the index has been updated, and the current open RCRA remedials have been recorded on the tracking table ________
3. The inspected cell is indicated below.

√	Cell
	4-pack cell (Room 110)
	2-pack cell (Room 111)

√	Cell
	Canister fill Cell 0 (Room 112)
	Canister fill Cell 1 (Room 113)

√	Cell
	Sample cell (Room 115)

Date and time the inspection was performed: Date: __________ Time: __________

Equipment/Area Inspected (1)(2)	**Types of Problems/ Inspection Items**	**Observations**	**Nature of Any Repairs or Other Remedial Actions**	**Completion Date for Repairs/Remedial Actions**
Sump	Erosion, cracks, debris, settling, spills			
Sump jet	Steam leaks			
Concrete floor or stainless liner	Cracks, gaps, deterioration, uneven settling, spills			
Concrete walls or stainless liner	Gaps, deterioration, settlement			
Concrete walls or epoxy paint	Cracks, deterioration, settlement, paint			
Tank exteriors (if equipped)	Corrosion, erosion, leaks, cracks, discoloration			
Piping	Corrosion, erosion, leaks, cracks, loose or corroded connections			

IWTU—RCRA CELL INSPECTIONS

Equipment/Area Inspected (1)(2)	Types of Problems/ Inspection Items	Observations	Nature of Any Repairs or Other Remedial Actions	Completion Date for Repairs/Remedial Actions
Valves (if equipped)	Leaks (internal and external), corrosion			
Shield plug or door	Deterioration, corrosion			

(1) Perform inspection when a cell entry is made for the first time during a shift.

(2) Inspect all areas of the cell that are accessible, including those areas that are accessed using installed platforms and ladders.

Comments: ______________________________

____

____

Open RCRA remedials on this form:

Footnote Letter	Tracking Number	Date Remedial Was Identified	Deficiency Description/Comments

Inspector's Name (print): ______________________________

Inspector's Signature: ______________________________

Inspection Completed; Supervision's Signature: ______________________________

Remedial Actions Completed or Not Required; Supervision's Signature: ______________________________

IWTU—WEEKLY RCRA VAULT INSPECTIONS

This form is the current revision per EDMS.

Signature/Date

Verify that the following have been performed: Initial

1. Previous week's inspection checked
2. The Open RCRA Remedials Tracking Book Index for this form has been compared to the previous week's form, the index has been updated, and the current open RCRA remedials have been recorded on the tracking table.

Locations where full canisters may be stored:

Location	Vaults Containing Full Canisters Stored at Location?	Inspection	Inspection Date/Time: /		Comments
			Normal Condition	Inspection	
Room 143 (product storage building) (1)	Yes / No	Vaults leaking?	No	SAT / UNSAT	
		Vaults damaged?	No	SAT / UNSAT	
		Vaults deteriorating?	No	SAT / UNSAT	
		Vaults open?	No	SAT / UNSAT	
		Liquid on floor?	No	SAT / UNSAT	
Room 116 (vault loading station) (1)(2)	Yes / No	Canisters leaking?	No	SAT / UNSAT	
		Canisters damaged?	No	SAT / UNSAT	
		Canisters deteriorating?	No	SAT / UNSAT	
		Vault damaged?	No	SAT / UNSAT	
		Vault deteriorating?	No	SAT / UNSAT	
		Leakage on floor? (3)	No	SAT / UNSAT / N/A	

(1) Inspections are not required if full canisters are NOT stored in this location.

(2) Camera(s) are used within the limits of their capability for this inspection.

(3) When the vault loading doors are open for maintenance, repairs, or operational activities, look for leakage on the floor. When the vault loading doors are closed, circle N/A.

Comments:

IWTU—WEEKLY RCRA VAULT INSPECTIONS

Open RCRA remedials on this form:

Footnote Letter	Tracking Number	Date Remedial Was Identified	Deficiency Description/Comments

Inspector's Name (print): ______________________

Inspector's Signature: ______________________

Inspection Completed; Supervision's Signature: ______________________

Remedial Actions Completed or Not Required; Supervision's Signature: ______________________

APPENDIX F-2

CPP-604 Inspection Schedule

CPP-604 Inspection Schedule

Equipment Inspected	Types of Problems or Observations	Frequency	Inspecting Organization
MONITORING EQUIPMENT INSPECTION			
Panel-Mounted Instrumentation	Instrument operability, out of spec readings	Daily	Shift Operations
Distributed Control System (DCS)	Internal automatic diagnostics	Daily	Shift Operations
FIRE PROTECTION SYSTEM INSPECTIONS			
Fire Sprinkler System	System Damage, Water Pressure, Leaks	Monthly	Life Safety Systems
Portable Fire Extinguishers	Physical Damage, Charge (if equipped), Accessibility and Sealed	Monthly	Shift Operations
EMERGENCY EQUIPMENT INSPECTIONS			
Safety Showers and Eyewashes	Supply Valve is Open, Accessibility, Check for Leaks	Monthly	Shift Operations
Spill Control Cabinets	Broken Seals, Inventory Equipment	Monthly	Shift Operations
Plant Voice Paging and Evacuation Alarm System	Operation, Coverage	Monthly	Shift Operations
Communication Devices	Operation at Each Building Level	Daily	Shift Operations
FACILITY INSPECTIONS			
Access Warning Signs	Missing, Damaged, or Obstructed Signs	Weekly	Shift Operations
CPP-604 SYSTEM INSPECTIONS			
VES-WL-132, VES-WL-133 VES-WL-109, VES-WL-131 VES-WL-129, VES-WL-161 VES-WL-134, VES-WL-106 VES-WL-107, VES-WL-163 VES-WL-111, VES-WM-100 VES-WM-101, VES-WM-102 VES-WL-101, VES-WL-102 VES-WL-135, VES-WL-136 VES-WL-137, VES-WL-138 VES-WL-139, VES-WL-142 VES-WL-144, VES-WL-150	Out of Spec Level	Daily	Shift Operations
Vault/Cell Sump Liquid Monitors	Alarm Condition	Daily	Shift Operations
Cell inspections VES-WL-132 VES-WL-133 EVAP-WL-161/VES-WL-109/VES-WL-111 (via camera)* EVAP-WL-129 VES-WL-101/VES-WL-102/VES-WL-150 VES-WL-106/-107/-163/VES-WL-131/VES-WL-134	Cracks, Deterioration, Leaks, Spills	Daily* and upon Initial Cell Entry	Shift Operations

CPP-604 Inspection Schedule (continued)

Equipment Inspected	Types of Problems or Observations	Frequency	Inspecting Organization
(via camera)*			
VES-WM-100			
VES-WM-101/VES-WM-102			
VES-WM-103			
VES-WL-104/VES-WL-105			
VES-WL-135			
VES-WL-136			
VES-WL-137			
VES-WL-138			
VES-WL-139			
VES-WL-142 (via camera)*			
VES-WL-144 (via camera)*			
Pump Pit Sump (via camera)*			

APPENDIX F-3

CPP-1618 Inspection Schedule

CPP-1618 Inspection Schedule

Equipment Inspected	Types of Problems or Observations	Frequency	Inspecting Organization
MONITORING EQUIPMENT INSPECTION			
Distributed Control System (DCS)	Internal automatic diagnostics	Daily	Shift Operations
FIRE PROTECTION SYSTEM INSPECTIONS			
Fire Sprinkler System	System Damage, Water Pressure, Leaks	Monthly	Life Safety Systems
Portable Fire Extinguishers	Physical Damage, Charge (if equipped), Accessibility and Sealed	Monthly	Shift Operations
EMERGENCY EQUIPMENT INSPECTIONS			
Safety Showers and Eyewashes	Supply Valve is Open, Accessibility, Check for Leaks	Monthly	Shift Operations
Spill Control Cabinets	Broken Seals, Inventory Equipment	Monthly	Shift Operations
Plant Voice Paging and Evacuation Alarm System	Operation, Coverage	Monthly	Shift Operations
Communication Devices	Operation at Each Building Level	Daily	Shift Operations
FACILITY INSPECTIONS			
Access control signs	Missing, Damaged or Obstructed Signs	Weekly	Shift Operations
CPP-1618 SYSTEM INSPECTIONS			
VES-WLK-197, VES-WLL-195, VES-WLK-171, VES-WLL-170	Out of Spec Level	Daily	Shift Operations
Feed Solution	TOC, Aluminum:Fluoride Ratio	Each feed batch	Shift Operations
Cell inspections FRAC-WLK-171/VES-WLK-197 FRAC-WLL-170	Deterioration, Cracks, Leaks, Spills	Daily, when not operating	Shift Operations
Leak Detection Bottles	Liquid in Bottle	Daily	Shift Operations

APPENDIX F-4

CPP-659 Inspection Schedule

CPP-659 Inspection Schedule

Equipment Inspected	Types of Problems or Observations	Frequency	Inspecting Organization
MONITORING EQUIPMENT INSPECTION			
Distributed Control System (DCS)	Internal automatic diagnostics	Daily	Shift Operations
FIRE PROTECTION SYSTEM INSPECTIONS			
Fire Sprinkler System	System Damage, Water Pressure, Leaks	Monthly	Life Safety Systems
Portable Fire Extinguishers	Physical Damage, Charge (if equipped), Accessibility and Sealed	Monthly	Shift Operations
EMERGENCY EQUIPMENT INSPECTIONS			
Safety Showers and Eyewashes	Supply Valve is Open, Accessibility, Check for Leaks	Monthly	Shift Operations
Spill Control Cabinets	Broken Seals, Inventory Equipment	Monthly	Shift Operations
Plant Voice Paging and Evacuation Alarm System	Operation, Coverage	Monthly	Shift Operations
Communication Devices	Operation at Each Building Level	Daily	Shift Operations
FACILITY INSPECTIONS			
Access control signs	Missing, Damaged or Obstructed Signs	Weekly	Shift Operations
VES-NCR-171 VES-NCC-152 VES-NCC-150 VES-NCC-101 VES-NCC-102 VES-NCC-103 VES-NCC-119 VES-NCC-122 VES-NCC-108 VES-NCC-136 VES-NCC-116	Out of Spec Level	Daily and Initial cell entry[1]	Shift Operations
Vault/Cell Sump Liquid Monitors	Alarm Condition	Daily	Shift Operations
Cell inspections VES-NCR-171[1] VES-NCC-101, VES-NCC-102, VES-NCC-103, VES-NCC-152, VES-NCC-150 VES-NCC-108, VES-NCC-116, VES-NCC-136 VES-NCC-119, VES-NCC-122	Deterioration, Cracks, Leaks, Spills	Initial cell entry[2]	Shift Operations

1 Mirrors and other aids may be used for daily inspections of VES-NCR-171.
2 VES-NCR-171 will be inspected daily; all other tanks listed under cell inspections will be inspected on initial cell entry.

APPENDIX F-5

CPP-1696 Inspection Schedule

CPP-1696 Inspection Schedule

Equipment Inspected	Types of Problems or Observations	Frequency	Inspecting Organization
MONITORING EQUIPMENT INSPECTION			
Distributed Control System (DCS)	Internal automatic diagnostics	Daily	Shift Operations
FIRE PROTECTION SYSTEM INSPECTIONS			
Fire Sprinkler System (except the shielded process cells)	System Damage, Water Pressure, Leaks	Monthly	Life Safety Systems
Portable Fire Extinguishers	Physical Damage, Charge (if equipped), Accessibility and Sealed	Monthly	Shift Operations
EMERGENCY EQUIPMENT INSPECTIONS			
Safety Showers and Eyewashes	Supply Valve is Open, Accessibility, Check for Leaks	Monthly	Shift Operations
Spill Control Cabinets	Broken Seals, Inventory Equipment	Monthly	Shift Operations
Plant Voice Paging and Evacuation Alarm System	Operation, Coverage	Monthly	Shift Operations
Communication Devices	Operation at Each Building Level	Daily	Shift Operations
FACILITY INSPECTIONS			
Access control signs	Missing, Damaged or Obstructed Signs	Weekly	Shift Operations
CPP-1696 System Inspections	Out of Spec Level		Shift Operations
VES-SRC-131		Daily[1]	
VES-SRC-133		Daily[1]	
VES-SRC-134		Daily[1]	
VES-SRC-140		Daily[1]	
VES-SRC-160		Daily[1]	
F-SRC-153		Daily[1]	
F-SRC-160		Daily[1]	
VES-SRC-190/191		Daily[1]	
F-SRC-191		Daily[1]	
F-SRC-190		Daily[1]	
F-SRH-141A/B		Daily	
TK SRH-141		Daily[2]	
TK-SRE-196		Daily [2]	
Vault/Cell Sump Liquid Monitors	Alarm Condition	Daily	Shift Operations
Cell inspections	Deterioration, Cracks, Leaks, Spills		Shift Operations
Process Module		Daily[1]	
CRR Enclosure		Daily[1]	
Canister Filling Cells		Daily[1]	
Mercury Adsorber Area		Daily	
Product load-out Cells Waste Piles	Liquids	Weekly[1]	
IWTU Stack Condensate Drain Line	Liquid Waste/Condensate Accumulation	Daily	
Vault Storage and Loading Areas (due to radiological exposure concerns, inspect portable storage vaults only)		Weekly[1]	

1 Cameras or other aids may be used to perform inspection.
2 Monitor leak detection

APPENDIX F-6

Tank System Inspections for the
INTEC Liquid Waste Management System

TANK SYSTEM INSPECTIONS FOR THE INTEC LIQUID WASTE MANAGEMENT SYSTEM

INTRODUCTION

According to the tank system inspection requirements found in Title 40 of the Code of Federal Regulations (CFR), Section 264.195(b):

The owner or operator must inspect at least once each operating day:

(1) Aboveground portions of the tank system, if any, to detect corrosion or releases of waste;
(2) Data gathered from monitoring and leak detection equipment (e.g., pressure or temperature gauges, monitoring wells) to ensure that the tank system is being operated according to its design; and
(3) The construction materials and the area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system (e.g., dikes) to detect erosion or signs of releases of hazardous waste (e.g., wet spots, dead vegetation).

Requirement (2) above is addressed in Sections D-2d, D-2f, F-2b(2)(b), and F-2b(2)(e) of the Hazardous Waste Management Act (HWMA)/Resource Conservation and Recovery Act (RCRA) Volume 14 permit, which discuss the monitoring and leak detection systems utilized for the Idaho Nuclear Technology and Engineering Center (INTEC) Liquid Waste Management System (ILWMS). Requirements (1) and (3) are addressed in Section F-2b(2)(b) of the application, which states, "Visual inspections are limited to infrequent occasions during equipment maintenance and repair. Radiation levels prevent visual inspections of these items on a daily basis. Complete inspections of the cells/vaults will be conducted when the cell is first entered for maintenance or repairs and repeated at least weekly when such activities are prolonged."

In permit condition III.E.3. of the draft final partial permit for the ILWMS issued in March 2004, the Idaho Department of Environmental Quality (DEQ) proposed that, "The Permittee shall visually inspect all tanks and ancillary equipment, located within radiological containment areas, daily whenever the cells are entered. The inspection protocols for the initial entrance inspection, and on-going daily inspections, may be established as part of the specific work permit."

As a result of public comments received on the draft final partial permit, the DEQ has requested information on the radiological conditions encountered in the system and a description of controls to further justify the proposed inspection frequency.

This paper provides: (1) a regulatory analysis of the inspection requirements and Environmental Protection Agency (EPA) guidance related to the externally accessible portion of the system; (2) a discussion of system controls that guarantee the integrity of the system and ensure leaks are detected in a timely manner; (3) a description of potential hazards to personnel that limit the ability to perform daily visual inspections for some ILWMS tank systems; and (4) a discussion of the feasibility of installing camera systems in lieu of performing daily visual inspections.

DISCUSSION

Regulatory Analysis

40 CFR 264.15(b)(1) requires an owner/operator to develop and follow a written schedule for inspecting monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that are important to preventing, detecting, or responding to environmental or human health hazards. Section 264.15(b)(4) provides that the frequency of inspection may vary for the items on the schedule but that it should be based on the rate of deterioration of the equipment and the probability of an environmental or human health incident if a problem goes undetected between inspections. Further, that at a minimum, the inspection schedule must include the frequencies called for in 40 CFR 264.195(b). That section specifically requires daily inspections for aboveground portions of the tank system, data gathered from monitoring and leak detection equipment, and the construction materials and area immediately surrounding the externally accessible portion of the tank system, including the secondary containment system to detect erosion or signs of releases of hazardous waste. Section 270.14(b)(5) requires that the inspection schedule be included in the Part B submission. The comment at section 264.15(b)(4) indicates that the inspection schedule will be evaluated to ensure that it adequately protects human health and the environment and that as part of the review, the regulator may modify or amend the schedule as may be necessary.

In Faxback 12921, May 1987, EPA was asked whether, for a flat-bottomed tank containing hazardous waste that sat on a concrete pad, inspection of the visible portions of the tank was a satisfactory method for detecting leaks and corrosion as required by 40 CFR 264.195. EPA responded that the intent of section 264.195 was that all accessible and visible aboveground portions of tank systems be inspected at least once each operating day. However, in a case where the tank bottom was obscured from view (e.g., sitting on concrete), such an inspection was not feasible. EPA also noted that in such a case, special efforts should be made to carefully observe any leakage around the base of the tank. The situation with some of the Volume 14 tanks is analogous. Just as the bottom of the aboveground tank addressed in Faxback 12921 couldn't be inspected, ALARA (maintaining radiological exposure to personnel as low as reasonably achievable) concerns associated with many of the Volume 14 tank systems prevent daily visual inspections. The note following 40 CFR 164.15(b)(4), addressed above, contemplates such situations and allows the regulator, through the permitting process, to address such issues.

It should also be noted that in Faxback 12868, March 1987, EPA acknowledged that the regulations don't specify any particular methods that have to be used to meet the inspection requirements and that as a result, video monitoring is not categorically excluded as a way to meet the requirement. The effectiveness of such a system would, however, be subject to scrutiny.

Hazards to Personnel

High radiation, hazardous materials, and industrial safety issues prevent daily personnel access and visual inspections of certain tank systems on a routine basis. Attachment 1 provides a detailed account of the radiation levels for each cell of the ILWMS where tanks reside. The estimated personnel radiation exposure for a 15-minute entry (the estimated time to complete an inspection) poses an unacceptable risk to personnel for many of the ILWMS tank systems.

Apart from radiological concerns, risks resulting from hazardous materials/wastes and other industrial hazards such as confined space entries, temperature, and spatial limitations inhibit the ability to complete daily visual inspections. For instance, some tanks reside in cells where confined space entry is required and transfer piping and equipment must be traversed. During operation of the miscellaneous treatment units, the potential for exposure to nitric acid fumes exists. Furthermore, extreme temperatures, up to 200° F, may be encountered.

Since the estimated radiological exposures are comparatively low and hazardous material and industrial safety risks are minimal, the following areas will be visually inspected by facility personnel daily. In cases where limited access or industrial hazards exist, use of mirrors or other aids may be used to the extent practicable to visualize components of the tank system and sump(s).

- Process Waste Liquid (PWL) System
  - VES-WL-142, located in the CPP-604 Middle Cell
  - VES-WL-144, located in the CPP-604 North Cell
- Acid Recycle Tank Vault
  - VES-NCR-171
  - VES-NCR-173

Since the estimated radiological exposures are comparatively low, but hazardous material and industrial safety risks are significant during operation of the fractionators, the Permittee proposes that facility personnel will visually inspect the following areas daily **when the fractionators are not operating**:

- Fractionator Cell 1
  - VES-WLK-197
  - VES-WLK-171
- Fractionator Cell 2
  - VES-WLL-170

System Controls

ILWMS miscellaneous treatment units are remotely operated from the distributed control system (DCS) for facility operations. The process components that comprise the ILWMS DCS contain instrumentation and a control system to monitor and control process variables and provide for safe and efficient shutdown, if necessary. In addition, the DCS monitors and controls waste transfers through tanks and ancillary equipment to detect any leaks within the system. Upon detection, the condition is investigated and appropriate action taken.

As discussed in Section F-4d of the permit, the ILWMS is equipped with redundant systems. The ILWMS has the capability to allow for the isolation and removal from service of any tank or line supported by the DCS where a leak has been detected. This ensures that if a leak does occur within the system, measures can be taken to protect human health and the environment. The ILWMS is specifically designed and operated to prevent corrosion that may cause leaks, for all system components as discussed in the permit.

Another safeguard within the ILWMS is the monitoring of radiation from particulate loading on the facility's ventilation Atmospheric Protection System (APS) filters, Process Off Gas (POG) filters, Vessel Off Gas (VOG) filters, and at the Main Stack. Any unexpected rise in the radiation levels on these filters or at the Main Stack radiation monitor alerts operations that a leak may have occurred, and measures are taken to determine the nature and extent of a possible leak.

Moreover, as discussed in the permit, all ILWMS tank systems are equipped with secondary containment and leak detection devices to alert personnel to potential leaks or spills. Liquid level instrumentation associated with the secondary containment systems initiates an alarm on the DCS to alert operations personnel of potential upset conditions.

Camera Systems
To avoid routine entries into areas where high radiation and industrial hygiene/safety concerns exist, the use of remote camera systems has been considered to supplement current practices. As illustrated in Attachment 1, the estimated personnel radiation exposure to install cameras in certain cells poses an unacceptable risk to personnel. Furthermore, the typical life expectancy for cameras installed in the radiological fields that would be encountered in these cells is from 2 weeks to 6 months. In order to replace these cameras, significant quantities of decontamination solutions and associated solid mixed waste (i.e., personal protective equipment) would be generated and personnel exposure to radiation would be increased.

Attachment 2 provides in detail the logistics and safety issues that would be present if remote camera systems were to be installed in the ILWMS. This attachment also outlines the radiation, temperature, feasibility, and practicality issues for installation of a camera system. Lowering cameras into cells and then removing them is also impractical since: (1) access ports for cameras are not readily available; (2) confined space entries would be required for certain cells; (3) entry into some cells would require personnel to pass through other cells; and (4) estimated radiological exposure to personnel is unacceptable.

Although not initially installed for RCRA inspection purposes, cameras are located in the following ILWMS areas and will be utilized to conduct daily inspections for the coverage area:

- EVAP-WL-161 Evaporator Cell – one installed in the lower level of the cell to visually inspect the sump (estimated cell coverage – <10%)
- Condensate Collection Cell – one installed in the center of the west wall and another installed in the northeast corner of the cell (estimated cell coverage – 25-30%)
- Pump Pit Sump – one directed into the sump only

The Permittee proposes that tank systems not identified for inspection in this and the "Hazards to Personnel" section (bulleted items) will not be visually inspected daily. Rather than daily visual inspections, facility personnel will rely on the system controls discussed above and the secondary containment and leak detection systems to ensure protection of human health and the environment.

CONCLUSION

State and federal regulations require owners and operators to inspect the externally accessible portions of tank systems for evidence of deterioration or signs of a release. EPA guidance suggests that daily inspections of tank systems or components are not necessary in cases where those systems are not readily accessible or visible. The EPA stresses that in these instances special efforts should be made to inspect for leaks from such systems.

Due to the unique mixture of radiological, hazardous, and industrial safety conditions associated with the ILWMS, many of the tank systems are neither visible nor readily accessible. In those cases where the hazards to personnel are comparatively low, daily visual inspections will be performed; although for the fractionators and tank systems associated with the Liquid Effluent Treatment and Disposal facility, the Permittee proposes that daily visual inspections will only occur when the fractionators are not operating.

Camera systems have only limited application due to the harsh radiological, corrosive, and thermal conditions of the system. Where camera use is feasible, daily inspections will be conducted for the limited coverage area.

Other tank systems associated with the ILWMS that cannot be visually inspected daily either through manned entries or remotely, via cameras, due to the unacceptable risk to personnel, are protected through a combination of other system controls including containment and leak detection systems; continuous DCS controls; and tank, process, and stack offgas monitoring.

ATTACHMENT 1

TANK # **DESCRIPTION**	**LOCATION (CELL)**	**TYPE OF RADIOLOGICAL AREA-** Contamination Area (CA), High Contamination Area (HCA), Radiation Area (RA), High Radiation Area (HRA), Airborne Radioactivity Area (ARA).	**RADIATION LEVELS-** Estimated General Area Radiation Levels During Operation	**ESTIMATED PERSONNEL RADIATION EXPOSURE PER ENTRY** estimation of 15 minutes inspection time for each tank at the highest estimated radiation level in the cell except for the last 8 identified areas which are < 5 mrem)
VES-WL-132 Evaporator Feed Sediment	PEWE System Feed Sediment and Feed Collection Vaults	HCA, HRA, ARA	100 to >25,000 mR/hr	> 5000 mrem
VES-WL-133 Evaporator Feed Collection	PEWE System Feed Sediment and Feed Collection Vaults	HCA, HRA, ARA	100 to >25,000 mR/hr	> 5000 mrem
VES-WL-102 Surge Tank for VES-WL-133	VES-WL-101/102 Cell	HCA, HRA, ARA	100 to >25,000 mR/hr	> 5000 mrem
VES-WL-101 Bottoms Collection	VES-WL-101/102 Cell	HCA, HRA, ARA	100 to 10,000 mR/hr	> 2500 mrem
VES-WL-150	VES-WL-101/102 Cell	HCA, HRA, ARA	100 to 10,000 mR/hr	> 2500 mrem
VES-WL-109 Evaporator Head	Evaporator 161 Cell	HCA, HRA, ARA	100 to 10,000 mR/hr	> 2500 mrem
VES-WL-161 Evaporator	Evaporator 161 Cell	HCA, HRA, ARA	100 to 10,000 mR/hr	> 2500 mrem
VES-WL-111 Bottoms Collection	Evaporator 161 Cell	HCA, HRA, ARA	100 to 10,000 mR/hr	> 2500 mrem

ATTACHMENT 1

VES-WL-129 Evaporator	Evaporator 129 Cell	HCA, HRA, ARA	100 to 10,000 mR/hr	> 2500 mrem
VES-WL-131 Condensate Surge	Condensate Collection Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-134 Condensate Surge	Condensate Collection Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-106 Process Condensate Collection Tank	Condensate Collection Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-107 Process Condensate Collection Tank	Condensate Collection Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-108 Process Condensate Knock-out Pot	Condensate Collection Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-163 Process Condensate Collection Tank	Condensate Collection Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WM-100 CPP-604 TFT	WM Vault	HCA, HRA, ARA	100 to >25,000 mR/hr	> 5000 mrem
VES-WM-101 CPP-604 TFT	WM Vault	HCA, HRA, ARA	100 to >25,000 mR/hr	> 5000 mrem
VES-WM-102 CPP-604 TFT	WM Vault	HCA, HRA, ARA	100 to >25,000 mR/hr	> 5000 mrem

ATTACHMENT 1

VES-WL-135	D-5 Valve Box	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-136	D-8 Valve Box	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-137	CPP-649 Filter Cell	HCA, HRA, ARA	5 to 100 mR/hr	> 25 mrem
VES-WL-138	CPP-604 Off-Gas Blower Cell	HCA, HRA, ARA	100 to 5000 mR/hr	> 1250 mrem
VES-WL-139	CPP-604 Off-Gas Blower Cell	HCA, HRA, ARA	100 to 5000 mR/hr	> 1250 mrem
VES-WL-142	CPP-604 Middle Cell	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-WL-144	CPP-604 North Cell	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-WLK-197	Fractionator Cell 1	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-WLK-171	Fractionator Cell 1	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-WLL-170	Fractionator Cell 2	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-WLL-195	Fractionator Cell 2	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-NCR-171	Acid Recycle Tank Vault	CA, RA	5 to 100 mR/hr	< 5 mrem
VES-NCR-173	Acid Recycle Tank Vault	CA, RA	5 to 100 mR/hr	< 5 mrem

ATTACHMENT 2

Due to radiological conditions, chemical hazards, confined space entries, waste generation, and limited access, the installation of monitoring cameras for detection of leaks from vessels and associated piping within vaults and cells is not considered practical for all the tank systems in the ILWMS where cameras are not currently installed. Information regarding the logistics to install cameras in each cell of the ILWMS is as follows:

1. VES-WL-132 is only accessible through a hatch in the ceiling of its vault. There are no available penetrations for cable runs and there is no lighting in this vault. Radiation levels are extremely high with an estimated exposure of over 5 Rem for a 15-minute access. All flanged piping connections are located along the top or sides of the tank and thus the top and upper sides of the vessel would be the key location to observe for any small volume leakage. To observe these areas would require a minimum of 2 cameras located near the ceiling on both the east and west walls of the vault. Even greater coverage could be achieved with a third camera down very near the floor on either the east or the west walls with its view directed underneath the tank through the access hole in the support skirt of the tank. VES-WL-132 is a vertical tank and rests on a 360-degree support skirt with 3 cradles, designed for remote removal and used to stabilize the tank. Given the very high radiation levels, the difficulty of access, and the absence of any cable penetrations, the most effective means for both initial placement and long term maintenance of cameras into this vault would be to core drill dedicated penetrations through the vault ceiling/hatch cover and suspend the cameras with remotely retrievable supports so the entire assembly can be remotely maintained. The core-drilled holes will need shielding to prevent radiation streaming and will be difficult to install since there is no additional access to install the core catcher. Without this core catcher, the core-drilled concrete pieces could fall into the vault and cause damage to the vault liner or the tank. Routine personnel entry is not possible or acceptable due to the high radiation exposure, confined space entry, and the acid exposure if a leak should occur. It is not possible to drain, flush, empty, or decontaminate this tank on a daily basis for routine cell entries, or for any construction work of installing cameras.

2. VES-WL-133 is only accessible through the vault containing VES-WL-132 (see Item 1 above) via a small man-way in the wall separating the two vaults. There are no penetrations for cable runs and there is no lighting in this vault. As with VES-WL-132, radiation levels are extremely high with an estimated exposure of over 5 Rem for a 15-minute access. VES-WL-133 is a horizontal tank setting in low cradles arrayed with its long axis north to south and with all flanged penetrations running along the top of the tank. Remote observations of the tank would require cameras inserted through core-drilled holes from the sample corridor positioned so they would be able to view the east and west sides and top of the tank. Lighting would be required to illuminate a distance of about 30 feet to allow viewing of the entire length of the tank. A third camera could also be installed lower in the vault to view the underside of the tank. The remotely maintained cameras, shielding, difficult core drilling, etc. associated with the VES-WL-132 tank would also apply to this tank. Routine personnel entry is not possible or acceptable due to the high radiation exposure, confined space entry, and the acid exposure if a leak should occur. It is not possible to drain, flush, empty, or decontaminate this tank on a daily basis for routine cell entries, or for any construction work of installing cameras.

3. VES-WL-101 and VES-WL-102 share a vault and are arrayed in much the same way as VES-WL-133 discussed above (i.e., their long axis is north to south). They are each setting in a pair of low cradles and all flanged penetrations run along the top of the tanks. This vault is accessible through a small man-way from the sample corridor in the southwest corner of the vault. Radiation levels are extremely high with an estimated exposure of over 2.5 Rem for a 15-minute access. There are believed to be available penetrations into this vault for cable runs but the cameras could not be remotely maintained and there is no lighting in this vault. Acceptable closed-circuit television (CCTV) coverage of these tanks could be achieved with a minimum of 3 cameras core drilled into the vault from the sample corridor; one located near the ceiling on the east wall, another similarly placed along the west wall and the third placed near the ceiling midway between the two tanks.

ATTACHMENT 2

The sump is located between the two tanks and this third camera could be placed to provide a remote view into the sump. Greater coverage could be provided with a fourth camera located near the floor in a position to observe underneath the central portions of both tanks. The remotely maintained cameras, shielding, difficult core drilling, etc. associated with the VES-WL-132 tank would also apply to this tank. Routine personnel entry on a daily basis is not possible or acceptable due to the high radiation exposure, confined space entry, and the acid exposure if a leak should occur. It would be possible to empty, flush, and partially decontaminate the VES-WL-101 tank, with the use of between 10,000 and 25,000 gallons of water that would then have to be processed in the INTEC Liquid Waste Management System (ILWMS), however this could not be accomplished on a daily basis. The VES-WL-102 tank can be filled with about 12,000 gallons of water for some shielding but the decontamination would be minimal due to the large volume of solids now in this tank.

4. VES-WM-101 and VES-WM-102 share a vault with layout and properties essentially identical to that described for VES-WL-101 and VES-WL-102 in Item 3 above, with higher radiation fields. Required number and placement of cameras would essentially be identical to that discussed above. Routine personnel entry is not possible or acceptable during operations due to the high radiation exposure, confined space entry, and the acid exposure if a leak should occur. It would be possible to empty, flush, and partially decontaminate these tanks, with the use of between 10,000 and 25,000 gallons of water per tank that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

5. VES-WM-100 sits in its own vault but is otherwise arrayed in much the same fashion as the tanks described in Items 2, 3, and 4 above. Radiation levels in this vault are similar to those around VES-WL-132 and -133 (i.e., estimated exposure for a 15-minute access would be greater than 5 Rem). Required number and placement of cameras would essentially be identical to that discussed in Item 2 above. Routine personnel entry is not possible or acceptable during operations due to the high radiation exposure, confined space entry, and the acid exposure if a leak should occur. It would be possible to empty, flush, and partially decontaminate this tank, with the use of between 10,000 and 25,000 gallons of water that would have to be processed in the ILWMS, however due to the solids expected in this tank the flushing may still not allow entry into this vault on a routine basis.

6. VES-WL-150 is a small tank installed in the VES-WL-101/-102 vault, as part of the VES-WL-102 isolation project. It should be observable with the cameras already discussed in Item 3 above. The entry requirements would also be identical to the discussion in Item 3 above.

7. VES-WL-161 is positioned vertically, in the center of the Evaporator 161 Cell. It rises through nearly the entire height of the cell from the floor to the ceiling and is surrounded by multiple levels of access decking. This decking would prohibit a full scan of the sides of the vessel with a CCTV camera at any single elevation. The diameter of the tank is such that complete coverage of the vessel could only be achieved with at least 2 cameras on opposite sides at each decking level. There are manned access and cable penetrations into this cell, however radiation levels are very high during operation with an estimated exposure of 2.5 Rem for a 15-minute entry. In addition, this cell becomes thermally hot during operation, achieving temperatures in excess of 200° F, a condition that would prohibit the use of commercial grade camera equipment and would instead require thermally shielded equipment with a cooling air circulation system. Remotely repairable cameras would not be a mandatory requirement in this cell, as described for the vaults above, but would be highly recommended if the cameras are to be used routinely for cell inspections. Remote cameras could be installed with core-drilled holes from access, pipe, sample, and operating corridors or the ceiling. Routine personnel entry is not possible or acceptable during operations due to the high radiation exposure, high temperatures, and the acid exposure if a leak should occur. It would be possible to empty, flush, and partially decontaminate this system, with the use of between 1,000 and 2,500 gallons of decontamination solution that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

ATTACHMENT 2

8. VES-WL-109 shares the Evaporator 161 Cell with VES-WL-161. It is located high on the east wall in the southeast corner of the cell. It is a small tank and should be partially viewed with the cameras used in Item 7 above. An additional camera would be required to view the southeast side of this tank. The entry and decontamination requirements are the same as Item 7 above.

9. VES-WL-111 also shares the Evaporator 161 Cell with VES-WL-161. It is a rectangular tank 12' long lying along the north wall of the cell with its long axis running east and west. All flanged penetrations are along the top of the tank and like the other large tanks with this configuration would need at least two camera positions for full coverage, which could possibly also be used for some of the VES-WL-161 inspections. The entry and decontamination requirements are the same as Item 7 above.

10. VES-WL-129 is positioned vertically, in the center of the Evaporator 129 Cell and is identical to VES-WL-161 in item 7 above. VES-WL-129 experiences the same thermal and radiation concerns associated with VES-WL-161. However, the WL-129 cell is different from the VES-WL-161 cell in that it is fully lined with stainless steel and any core drilling would damage the liner, which would need to be repaired. Moreover, since this cell does not share common walls with the corridors, all core drills would have to be made from outside (from either the ceiling or the north, east, or south walls). Routine personnel entry during operations is not possible or acceptable due to the high radiation exposure, high temperatures, and the acid exposure if a leak should occur. It would be possible to empty, flush, and partially decontaminate this system, with the use of between 1,000 and 2,500 gallons of decontamination solution that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

11. VES-WL-131, VES-WL-134, VES-WL-106, VES-WL-107, VES-WL-163, and VES-WL-108 are all contained within the Separation and Condensation Cell. The cell is accessible with cable penetrations and has a relatively low exposure estimate of 25 mrem for a 15-minute entry. The cell is configured similarly to the Evaporator 161 Cell in that four of the vessels; VES-WL-106, -107, -163, and -134 all stand upright within the cell and are surrounded by multiple levels of access decking, thereby requiring multiple camera positions at each level. VES-WL-131 sits horizontally and is located in the middle of the cell. VES-WL-108 sits high on the east wall in the southeast corner of the cell. Remotely repairable cameras would not be a mandatory requirement in this cell as described for the vaults above, but would be highly recommended if the cameras are to be used routinely for cell inspections due to the difficulty in repairing equipment in contaminated cells. Remote cameras could be installed with core-drilled holes from access, pipe, and operating corridors or the ceiling. Routine personnel entry is possible but not recommended due to the mechanical equipment and acidic nature of the liquid in the equipment. It would be possible to drain this system resulting in a volume of liquid from 5,000 to 15,000 gallons that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

12. VES-WL-135 and VES-WL-136 are located in individual valve boxes about 8 feet below ground level. Both valve boxes are confined space entries, have very limited access for cabling, and lack lighting for inspections. Each tank could be adequately covered with a single camera deployed from the valve box lid. Cabling for the camera equipment would need to be protected when running from the valve boxes into CPP-604. Remotely maintainable cameras would be required due to the difficulty of maintaining equipment in contaminated valve boxes and being located outside. Personnel entry is possible, but not recommended, due to the acidic nature of the off-gas in the equipment, the confined space, and the contamination levels. It would be possible to decontaminate these valve boxes with minimal increase of liquid volume that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

ATTACHMENT 2

13. VES-WL-137, VES-WL-138, VES-WL-139, VES-WL-142 and VES-WL-144 are all relatively small tanks contained in concrete sumps lined with stainless steel and covered with a stainless steel grating located in various of the offgas system cells. Each can be adequately covered with a single camera installed below the grating. Remotely maintainable cameras would be required due to the difficulty of maintaining equipment in contaminated cells. Routine personnel entry to VES-WL-137, -138, and -139 is possible but not recommended due to the radiation and contamination levels. It would be possible to decontaminate these cells with minimal increase of liquid volume that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

14. VES-WLK-197, FRAC-WLK-171, FRAC-WLL-170, and VES-WLL-195 are components in the Liquid Effluent Treatment and Disposal (LET&D) system. Their cells are accessible and have relatively low radiological levels with exposure estimates of 5 mrem for a 15-minute exposure. However, when the system is in operation both cells become very thermally hot; on the order of 200 degree F. This temperature precludes the use of commercial grade CCTV equipment and would instead require thermally shielded equipment with a cooling air circulation system. Remotely maintainable cameras would be required due to the difficulty of maintaining equipment in contaminated cells and the very high levels of nitric acid contained in the system. It would be possible to empty, flush, and partially decontaminate this system, with the use of between 1,000 and 2,500 gallons of decontamination solution that would have to be processed in the ILWMS, however this could not be accomplished on a daily basis.

15. VES-NCR-171 and VES- NCR-173 are in readily accessible locations and can be easily inspected on a daily basis. This cell has relatively low radiological levels with exposure estimates of 5 mrem for a 15-minute exposure. Remotely maintainable cameras should be considered due to the very high levels of nitric acid contained in the system. If a leak should occur no entries would be allowed without full acid suits and supplied air-breathing equipment. The atmosphere in the cell would have to be continually monitored for routine cell entries due to the high concentrations of nitric acid fumes possible in the cell.

ATTACHMENT 3

RCRA Tank Inspection Cameras

Summary of Estimated Costs, Feasibility, and Practicality

PEWE Tanks.

Tank Number/ Description	Year of Operation	Location (Cell)	Last Date Entered	Known Leaks/ Brief History	Concept and Estimate for Design and Installation of Camera	Estimated Cell Coverage (%)	Remotely Retrievable?	Radiation Exposure to Install	Practical ?
VES-WL-132 Evaporator Feed Sediment	1983	PEWE System Feed Sediment and Feed Collection Vault	1983	No known leaks.	Note 1. 3 cameras $129,000	75	Y	1600 mR	N
VES-WL-133 Evaporator Feed Collection	1983				Note 2. 3 cameras $129,000	75	Y	1600 mR	N
VES-WL-102 Surge Tank For VES-WL-133	1951	VES-WL-101/102 Cell	1996	No known leaks. Cell liner, (Hypalon) was installed and a P.E. Certification was received in June 1993 on the newly installed liner. Cell was entered in 1996 to reroute a transfer line from WL-101 to the tank farm.	Note 3. 4 cameras $140,000	75	Y	2000 mR	N
VES-WL-101 Bottoms Collection	1951	VES-WL-101/102 Cell			Included Above	75	Included Above	Included Above	N
VES-WL-150	1996	VES-WL-101/102 Cell			Note 6. Included Above	75	Included Above	Included Above	N

ATTACHMENT 3

Tank Number/ Description	Year of Operation	Location (Cell)	Last Date Entered	Known Leaks/ Brief History	Concept and Estimate for Design and Installation of Camera	Estimated Cell Coverage (%)	Remotely Retrievable?	Radiation Exposure to Install	Practical ?
VES-WL-109 Evaporator Head	1953	Evaporator 161 Cell	1999	Known leaks from the valves and flanges on the original evaporator, WL-113 prior to ~1992. Equipment has been replaced, removed or rerouted. Cell entered in 1996 to install sump. Entered in 1999 to isolate VES-111. No known leaks presently.	Note 8. 1 camera $41,000	75	Y	800 mR	N
VES-WL-161 Evaporator	1984	Evaporator 161 Cell			Note 7. 4 cameras (minimum) $164,000	75	Y	2000 mR	1 camera in place
VES-WL-111 Bottoms Collection	N/A	Evaporator 161 Cell			Note 9. 2 cameras $82,000	100	Y	1200 mR	N
VES-WL-129 Evaporator	1985	Evaporator 129 Cell	2003	Sump Level indicator detected leak. Entered cell to replace leaking elbow on feed line. No known leaks presently	Note 10. 3 cameras $123,000	75	Y	1600 mR	1 camera in Pump Pit

ATTACHMENT 3

Tank Number/ Description	Year of Operation	Location (Cell)	Last Date Entered	Known Leaks/ Brief History	Concept and Estimate for Design and Installation of Camera	Estimated Cell Coverage (%)	Remotely Retrievable?	Radiation Exposure to Install	Practical ?
VES-WL-131 Condensate Surge	1975	Condensate Collection Cell	2004	No known Leaks. Cell entered to replace condensate pump. Cell also entered to perform removal of equipment per Voluntary Consent Order.	Note 11. 1 camera $36,000	75	Not Req'd	800 mR	N
VES-WL-134 Condensate Surge	1984	Condensate Collection Cell			Note 11. 4 - 8 cameras $288,000	75	Not Req'd	3600 mR	N
VES-WL-106 Process Condensate Collection Tank	1953	Condensate Collection Cell			Note 11. 4 - 8 cameras $288,000	75	Not Req'd	3600 mR	2 cameras in place
VES-WL-107 Process Condensate Collection Tank	1953	Condensate Collection Cell			Note 11. 4 - 8 cameras $288,000	75	Not Req'd	3600 mR	N
VES-WL-163 Process Condensate Collection Tank	1984	Condensate Collection Cell			Note 11. 4 - 8 cameras $288,000	75	Not Req'd	3600 mR	N
VES-WL-108 Process Condensate Knock-out Pot	1951	Condensate Collection Cell			Note 11. 1 camera $36,000	75	Not Req'd	800 mR	N

ATTACHMENT 3

Tank Number/ Description	Year of Operation	Location (Cell)	Last Date Entered	Known Leaks/ Brief History	Concept and Estimate for Design and Installation of Camera	Estimated Cell Coverage (%)	Remotely Retrievable?	Radiation Exposure to Install	Practical ?
VES-WM-100 CPP-604 TFT	1953	WM Vault	1953	No known leaks. Remote TV inspection was performed in ~1988 to check for deterioration and evidence of leaks. No leaks were detected. Deteriorated concrete was found around embedded lines. Lines were upgraded (from outside of the vault) to meet regulatory compliance.	Note 5. 4 cameras $140,000	75	Y	2000 mR	N
VES-WM-101 CPP-604 TFT	1953	WM Vault			Note 4. 4 cameras $140,000	75	Y	2000 mR	N
VES-WM-102 CPP-604 TFT	1953	WM Vault			Included Above	75	Included Above	Included Above	N
VES-WL-135	1991	D-5 Valve Box	2003	Leaking flange on NWCF O.G. Line. Piping repaired in 1998. No known leaks. P.E. Certified on 7/94.	Note 12. 1 camera $43,000	50	Y	800 mR	N

ATTACHMENT 3

Tank Number/ Description	Year of Operation	Location (Cell)	Last Date Entered	Known Leaks/ Brief History	Concept and Estimate for Design and Installation of Camera	Estimated Cell Coverage (%)	Remotely Retrievable?	Radiation Exposure to Install	Practical ?
VES-WL-136	1991	D-8 Valve Box	2003	Entered D-8 to perform cleanup of dirt, gravel and debris. No known leaks. P.E. Certified on 7/94	Note 12. 1 camera $43,000	50	Y	800 mR	N
VES-WL-137	1991	CPP-649 APS Filter Cell	2004	No known leaks. Filter in cell is DOP tested annually. P.E. Certified on 7/94	Note 13. 1 camera $28,000	50	Not Req'd	800 mR	N
VES-WL-138	1991	CPP-604 Offgas Blower Cell	2002	No known leaks. Cell entered in 2002 to replace filter. P.E. Certified on 7/94	Note 13. 1 camera $28,000	50	Not Req'd	800 mR	N
VES-WL-139	1991	CPP-604 Offgas Blower Cell			Note 13. 1 camera $28,000	50	Not Req'd	800 mR	N
VES-WL-142	1991	CPP-604 Middle Cell	2002	No known leaks. Cells entered occasionally for maintenance. P.E. Certified on 7/94	Note 13. 1 camera $28,000	50	Not Req'd	40 mR	N
VES-WL-144	1991	CPP-604 North Cell			Note 13. 1 camera $28,000	50	Not Req'd	40 mR	N

ATTACHMENT 3

LET&D Tanks

Tank Number/ Description	Year of Operation	Location (Cell)	Last Date Entered	Known Leaks/Brief History	Concept and Estimate for Design and Installation of Camera	Estimated Cell Coverage (%)	Remotely Retrievable?	Radiation Exposure to Install	Practical?
VES-WLK-197	1993	Fractionator Cell 1	2004	Cells entered periodically to perform maintenance (e.g. rupture disk replacement). Occasionally during a cell inspection, evidence of minimal leaks is found under the fractionators. Areas are cleaned up. No known leaks presently. LET&D was P.E. Certified on 4/92	Note 14. 2 cameras, $86,000	90	Y	60 mR	N
VES-WLK-171	1993	Fractionator Cell 1			Note 14. 4 - 8 cameras, $344,000	50	Y	180 mR	N
VES-WLL-170	1993	Fractionator Cell 2			Note 14. 4 - 8 cameras, $344,000	50	Y	180 mR	N
VES-WLL-195	1993	Fractionator Cell 2			Note 14. 2 cameras, $86,000	90	Y	60 mR	N
VES-NCR-171	1995	Acid Recycle Tank Vault	2004	No known leaks. Vault level instrumentation is monitored once per shift. Occasional maintenance. P.E. Certified on 6/95	Note 15. No cameras needed	100	NA	NA	NA
VES-NCR-173	1995	Acid Recycle Tank Vault			Note 15. No cameras needed	100	NA	NA	NA

ATTACHMENT 4

Cost Estimate for RCRA Cell Inspection Cameras

Preliminary Rough Order of Magnitude Costs

NOTES:

1. Due to the general definition of this project's scope, this estimate is intended to be used for planning purposes only. More specific details are needed to develop estimates for cost baseline and budgeting purposes.

2. Costs include design, materials, equipment, and installation labor costs.

3. The following costs are not included in this estimate and would significantly increase overall project cost:

   - project management
   - special worker PPE
   - drilling through soil to reach underground vaults VES-WL-132 and 133 (see notes at end of document)
   - operations and radcon support (charged to facility numbers instead of projects)
   - costs required to empty, flush, and partially decon vessels with water, where required to reduce radiation levels
   - costs required to process wastewater from decon operations, through the PEWE system
   - operational impacts to facilities due to system shutdowns and activities described above
   - design, fabrication, and installation of radiological shielding where required
   - radiological engineering support
   - permits and characterization work
   - escalations and contingencies

ATTACHMENT 4

4. Costs are computed based on the following assumptions:

Base cost per camera
(includes wiring, video monitors, misc. hardware): $28,000

Based on IFSF Video Camera Upgrade in CPP-603, Spring / Summer 2004

Additional costs:

High Temperature Camera (Camera cost increases from $2000 to $8000)	$6,000
Acid Resistant Camera (Camera cost increases from $2000 to $10,000) This $8000 adder is sufficient where cameras with both acid resistance and high temperature capabilities are needed.	$8,000
Core Drilling, per camera (9” diameter hole thru concrete ceiling or wall, 4 ft. avg. thickness. Subsurface and engineering evaluations included. Scaffolding and core catch assembly included.)	$7,000

ATTACHMENT 4

<table>
<tr><th>Tank Number/ Description</th><th>Location (Cell)</th><th>Number of Cameras Needed</th><th>High Temp. Cameras Required?</th><th>Acid Resist. Cameras Required?</th><th>Core Drilling Required?</th><th>Total Costs</th></tr>
<tr><td>VES-WL-132 Evaporator Feed Sediment</td><td rowspan="2">PEWE System Feed Sediment and Feed Collection Vault</td><td>3</td><td>NO</td><td>YES</td><td>YES *</td><td>$129,000 *</td></tr>
<tr><td>VES-WL-133 Evaporator Feed Collection</td><td>3</td><td>NO</td><td>YES</td><td>YES *</td><td>$129,000 *</td></tr>
<tr><td>VES-WL-102 Surge Tank For VES-WL-133</td><td>VES-WL-101/102 Cell</td><td rowspan="3">4</td><td rowspan="3">NO</td><td rowspan="3">NO</td><td rowspan="3">YES</td><td rowspan="3">$140,000</td></tr>
<tr><td>VES-WL-101 Bottoms Collection</td><td>VES-WL-101/102 Cell</td></tr>
<tr><td>VES-WL-150</td><td>VES-WL-101/102 Cell</td></tr>
<tr><td>VES-WL-109 Evaporator Head</td><td>Evaporator 161 Cell</td><td>1</td><td>YES</td><td>NO</td><td>YES</td><td>$41,000</td></tr>
<tr><td>VES-WL-161 Evaporator</td><td>Evaporator 161 Cell</td><td>4</td><td>YES</td><td>NO</td><td>YES</td><td>$164,000</td></tr>
<tr><td>VES-WL-111 Bottoms Collection</td><td>Evaporator 161 Cell</td><td>2</td><td>YES</td><td>NO</td><td>YES</td><td>$82,000</td></tr>
<tr><td>VES-WL-129 Evaporator</td><td>Evaporator 129 Cell</td><td>3</td><td>YES</td><td>NO</td><td>YES</td><td>$123,000</td></tr>
</table>

ATTACHMENT 4

Tank Number/ Description	Location (Cell)	Number of Cameras Needed	High Temp. Cameras Required?	Acid Resist. Cameras Required?	Core Drilling Required?	Total Costs
VES-WL-131 Condensate Surge	Condensate Collection Cell	1	NO	YES	NO	$36,000
VES-WL-134 Condensate Surge	Condensate Collection Cell	4 to 8	NO	YES	NO	$288,000
VES-WL-106 Process Condensate Collection Tank	Condensate Collection Cell	4 to 8	NO	YES	NO	$288,000
VES-WL-107 Process Condensate Collection Tank	Condensate Collection Cell	4 to 8	NO	YES	NO	$288,000
VES-WL-163 Process Condensate Collection Tank	Condensate Collection Cell	4 to 8	NO	YES	NO	$288,000
VES-WL-108 Process Condensate Knock-out Pot	Condensate Collection Cell	1	NO	YES	NO	$36,000

ATTACHMENT 4

Tank Number/ Description	Location (Cell)	Number of Cameras Needed	High Temp. Cameras Required?	Acid Resist. Cameras Required?	Core Drilling Required?	Total Costs
VES-WM-100 CPP-604 TFT	WM Vault	4	NO	NO	YES	$140,000
VES-WM-101 CPP-604 TFT VES-WM-102 CPP-604 TFT	WM Vault	4	NO	NO	YES	$140,000
VES-WL-135	D-5 Valve Box	1	NO	YES	YES	$43,000
VES-WL-136	D-8 Valve Box	1	NO	YES	YES	$43,000
VES-WL-137	CPP-649 APS Filter Cell	1	NO	NO	NO	$28,000
VES-WL-138	CPP-604 Offgas Blower Cell	1	NO	NO	NO	$28,000
VES-WL-139	CPP-604 Offgas Blower Cell	1	NO	NO	NO	$28,000
VES-WL-142	CPP-604 Middle Cell	1	NO	NO	NO	$28,000

ATTACHMENT 4

Tank Number/ Description	Location (Cell)	Number of Cameras Needed	High Temp. Cameras Required?	Acid Resist. Cameras Required?	Core Drilling Required?	Total Costs
VES-WL-144	CPP-604 North Cell	1	NO	NO	NO	$28,000
VES-WLK-197	LET&D Fractionator Cell 1	2	YES	YES	YES	$86,000
VES-WLK-171	LET&D Fractionator Cell 1	4 to 8	YES	YES	YES	$344,000
VES-WLL-170	LET&D Fractionator Cell 2	4 to 8	YES	YES	YES	$344,000
VES-WLL-195	LET&D Fractionator Cell 2	2	YES	YES	YES	$86,000
VES-NCR-171	Acid Recycle Tank Vault	0	N/A	N/A	N/A	$0 (direct inspection is practical)
VES-NCR-173	Acid Recycle Tank Vault	0	N/A	N/A	N/A	$0 (direct inspection is practical)
TOTAL						$3,398,000

* The core drilling required for installing cameras for VES-WL-132 and 133 would likely require drilling through over 40 feet of soil just to access the concrete above the tank vault. This installation is not considered feasible or practical. The costs of these extra requirements could be quite high, and they aren't included here.

ATTACHMENT 5 - SECTION H - PERSONNEL TRAINING

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 5, Section H
Personnel Training

Revision Date: September 5, 2019

CONTENTS

TABLES

ACRONYMS

CFR	Code of Federal Regulations
EAM	Emergency Action Manager
ED	Emergency Director
ERO	Emergency Response Organization
GERT	General Employee Radiological Training
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTS	Integrated Waste Tracking System
IWTU	Integrated Waste Treatment Unit
OJT	on-the-job training
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation and Recovery Act
SAT	systematic approach to training
TSD	treatment, storage and disposal
WGS	Waste Generator Services

H. PERSONNEL TRAINING

This section outlines and describes the training program for personnel involved in the management of hazardous and mixed waste at treatment, storage, and disposal (TSD) units at the Idaho Nuclear Technology and Engineering Center (INTEC), including units addressed in this permit.

A training program has been implemented to ensure that personnel involved in the management of hazardous and mixed waste at INTEC TSD units receive training consistent with the requirements of IDAPA 58.01.05.008 and 58.01.05.012 [Title 40 Code of Federal Regulations (CFR) Part 264.16 and 270.14]. The training program is designed to ensure that personnel are trained to hazardous waste management procedures including, but not limited to, inspections, normal operations, emergency procedures, equipment, systems, and contingency plan implementation. Duties performed at the TSD units will be performed in a safe, disciplined, and professional manner.

H-1. Outline of Training Program [IDAPA 58.01.05.008; 40 CFR § 264.16(a)(1)]

Training programs are developed using a systematic approach to training (SAT). The SAT process involves:

- Analyzing tasks to determine the training requirements
- Designing a plan to satisfy the training requirements
- Developing plans and all supporting training materials
- Implementing the training plans
- Evaluating the effectiveness of the training and making recommendations for changes.

The SAT process is used to determine the training requirement for each task listed in Table H-1. The training program for TSD unit personnel involves a combination of formal [classroom, group instruction, on-the-job training (OJT), etc.] and informal training sessions (one-on-one instruction, required reading, etc.). The training requirements for each position are identified in Table H-1. Lesson plans and OJT guides are developed to support tasks identified in Table H-1.

Programs prepared by the TSD training organization provide the requirements to be completed by the individual during training. As the program is satisfactorily completed, it is verified and documented in their training records.

The training program is upgraded as needed in response to changes in job descriptions, job reassignment, process or procedural changes, technological changes, or implementation of new regulatory requirements that affect TSD unit operations. Revisions to the training program are approved by the training manager and the TSD unit manager (Training Director) for the specific TSD unit and the job analysis data is updated to reflect the changes in the training requirements.

TSD unit management works with subject matter experts to identify personnel training requirements. The TSD unit training organization: (1) schedules and/or provides the training, (2) revises and updates training material as needed, and (3) maintains training documentation. The TSD unit training organization maintains individual training records for TSD unit employees.

H-1a. Job Tasks [IDAPA 58.01.05.008; 40 CFR §§ 264.16(d)(1) and 264.16(d)(2)]

The job tasks for personnel involved with hazardous waste management at INTEC TSD units are included in Table H-1 "Minimum Training Matrix for TSD unit Personnel." Personnel are trained to those sections of the permit, which are pertinent to their specific job assignments.

Security Guards – The Security personnel are not stationed at the permitted units nor are they involved in the management or handling of the waste. Security personnel receive training from the security organization relative to their positions and the facilities they serve. Therefore, training of security personnel is not discussed further in this section.

Incident Commander – is the INL Fire Department Chief. The INL Firefighters serve the INL Site in fighting fires and containing major spills, including spills of waste from waste management units. The INL Fire Department conducts a self-contained training program for their personnel, which includes procedures for handling fires and spill emergencies involving hazardous materials and hazardous mixed waste at the INL Site. Therefore, training of fire fighters is not discussed further in this section.

Emergency Director (ED) – is trained on the INL (Site-wide) Emergency Plan/RCRA Contingency Plan or Industrial Safety and Hygiene Program as part of his/her duties. The ED will be informed by the EAM or facility personnel at INTEC. Therefore, training of the ED is not discussed further in this section.

H-1b. Training Content, Frequency, and Techniques [IDAPA 58.01.05.008; 40 CFR § 264.16]

The TSD unit training program consists of a combination of classroom instruction and OJT. Additionally, TSD unit employees receive new employee orientation and training. [All employees working at or assigned as part-time/frequent visitor to Site facilities are required to complete annual facility access training and general employee radiological training (GERT) unless they are currently trained as radiation workers.]

The initial training includes a general orientation of INL Site and TSD unit procedures including evacuation and alert procedures, training requirements, and emergency equipment locations. The initial training provides TSD unit personnel with training commensurate with their job assignments in the following areas:

- General description of the INTEC
- Job-related procedures, policies, and instructions
- Radiological health and safety program
- Fire protection program
- Hazards associated with the TSD unit.

Resource Conservation and Recovery Act (RCRA) training is conducted annually for INTEC TSD unit employees to address changes that have occurred which include such topics as permit status, permit requirements, contingency and inspection plan implementation, and hazardous waste management procedures for the TSD unit(s) to which they are assigned.

The following major knowledge areas are included and evaluated based on job position and formal criteria identified in the job analysis:

- RCRA requirements as they relate to INTEC unit operations
- Hazardous materials

- INTEC TSD unit systems and components (including waste treatment processes and operations)
- Normal operating procedures and shutdown procedures
- Emergency or off-normal operating procedures
- Inspections and equipment maintenance
- Occupational Safety and Health Administration (OSHA) and related health and safety requirements, as required
- INTEC TSD unit and operational/administrative procedures.

TSD unit work and maintenance is performed by appropriate personnel whose qualifications have been verified before beginning work.

Employees may be given written and/or oral examinations, operational evaluations, and reviews to ensure that they are adequately trained relative to their job tasks. Results of examinations, written or oral evaluations, and reviews are documented. All completed qualification standards, checklists, examinations, written evaluations, and documented oral evaluations are maintained in each individual's training record.

Table H-1 shows the task training requirements for TSD unit personnel involved in hazardous/mixed waste operations at INTEC TSD units addressed in this permit. TSD unit personnel may receive additional training beyond that shown in Table H-1. This training is documented and included in employee training records.

Occasionally, TSD unit personnel attend training classes conducted external to the INL or conducted at the INL Site by non-INL subcontract personnel. In order to verify an employee's attendance at these training courses, a copy of the class certification or other documentation is maintained in the individual’s training record.

H-1c. Training Director [IDAPA 58.01.05.008; 40 CFR § 264.16(a)(2)]

For all TSD units, the facility manager (training director) functions in conjunction with his/her designee(s) to ensure that all segments and responsibilities associated with the training program are accomplished. The training director provides overall leadership and management direction to the TSD unit training organization. The director's duties include the following:

- Provide direction to the TSD unit training organization
- Ensure that performance of training personnel is evaluated
- Approve TSD unit training program
- Ensure that all program objectives and requirements are satisfied and that the training program meets the requirements of IDAPA 58.01.05.008 (40 CFR 264.16) and 29 CFR 1910.120.

The training director or his/her designee(s) is responsible for ensuring that TSD unit personnel are trained in waste management and contingency plan implementation, including emergency procedures, and for ensuring that TSD unit personnel receive training appropriate to their tasks. The TSD unit training content is updated for any facility changes.

H-1d. Relevance of Training to Job Tasks [IDAPA 58.01.05.008; 40 CFR § 264.16(a)(2)]

Individual training program profiles are prepared for each TSD unit position that requires a formal training program.

At a minimum, each individual training program profile identifies the following:

- Job description
- Qualifications
- Training requirements.

Profiles typically identify qualification requirements. Occasionally, a position may require specialized training. Special-case training is documented in individual training records. Profiles include requirements for hazardous/mixed waste management or handling and emergency response training.

Supervisors have the responsibility for evaluating training requirements for TSD employees. These supervisors receive additional training in how to conduct and evaluate OJT.

Individuals who demonstrate an equivalency for specific requirements or prerequisites identified in the training profile may be exempted from requirements in accordance with established procedures. Exemptions/equivalencies must be approved by the training director. Each exemption/equivalency is granted in writing and documented in the individual's training record.

Table H-1. Training Matrix for TSD Unit Personnel

Task	**Audience**	**Initial Employee Training**	**Rad Training** [1]	**24 hour OSHA** [1]	**Annual RCRA Training**	**Applicable Sections of RCRA Permit** [2]
INTEC operations personnel that perform TSDF operations and inspections, or supervise those operations and inspections, and are exposed to the hazards of the TSDF. These employees have duties that may bring them into contact with hazardous/mixed waste. These employees are required to obtain 24-hr HAZWOPER TSDF Qualification.	INTEC RCRA Worker	X	X	X	X	C, D, F, G
Personnel who enter TSDF areas unescorted and provide support functions that may require them to interface with systems, structures, or components referenced within the facility RCRA Permit , or that may bring them into contact with hazards of the facility to include the potential for exposure to hazardous/mixed waste at the TSDF. These employees are required to obtain 24-hr HAZWOPER TSDF Qualification. Examples of work activities include radiological surveys, assessments, waste characterization, performing waste shipments or waste movement, repairing or replacing facility emergency/monitoring equipment, life safety systems support, equipment calibrations, and surveillance. Examples of workers that may be included are Quality Inspectors, Quality Engineers, System Engineers (assigned to TSDFs), Life Safety System Engineers, Environmental Engineers, Industrial Hygienists, Safety Engineers, Fire Protection Engineers, Packaging and Transportation representatives, Waste Technical Specialists, Crafts (instrument technician, pipefitter, mechanic, welder, painter, etc.) and Radiological Control Technicians.	INTEC RCRA Technical Support Worker - HAZWOPER	X	X	X	X	F, G

Task	Audience	Initial Employee Training	Rad Training [1]	24 hour OSHA [1]	Annual RCRA Training	Applicable Sections of RCRA Permit [2]
Personnel who enter TSDF areas unescorted and provide support functions that may require the individual to interface with systems, structures, or components referenced with the facility RCRA Permit . Personnel in this category generally do not have the potential for exposure to the hazardous or mixed waste (for instance, these employees are not required to wear PPE and are not required to complete 24-hr HAZWOPER training). Examples of workers that may be included are System Engineers (not assigned to TSDFs), and other personnel who perform the activities listed above.	INTEC RCRA Technical Support Worker	X	X		X	F, G
Personnel who enter TSDF areas unescorted and provide only incidental support to facility operations. These individuals are not directly exposed to the hazards of the TSDF but must be cognizant of the RCRA-related requirements for access. Examples of work activities include engineering evaluations, equipments repair certifications, walk-downs, and general interface with facility personnel. Additionally, these personnel are not required to complete 24-hour HAZWOPER training. Examples of positions within this level include: Maintenance Planners, Radiological Engineers, RCT Supervision, personnel assigned as Senior Supervisory Watch, Training Specialists, Waste Disposition Specialists, D&D Workers, and administrative support personnel.	INTEC RCRA General Employee	X			X	F, G
INTEC EAM conducts operations-related response; Coordinates protective actions or protective action recommendations; authorizes response resources; satisfies federal, state, and local requirements and declares the INTEC Emergency Control Center operational.	INTEC Emergency Action Managers	X	X	X	X	G

1. Personnel who are not exposed to the hazards of the regulated units may not require this training
2. Personnel receive training related to the permit section as appropriate to their job function.

Section C- Waste Characterization
Section D – Process Information
Section F – Procedures to Prevent Hazards
Section G – Preparedness, Prevention, and Contingency Plan

H-1e. Training for Emergency Response [IDAPA 58.01.05.008; 40 CFR 264.16(a)(3)]

Emergency response training is provided to all personnel assigned to or associated with TSD units, including specialized training for employees with specific emergency action responsibilities, such as the Emergency Action Manager (EAM) and Emergency Response Organization (ERO) personnel. The following presents an overview of the emergency response training.

General emergency response training of TSD unit ERO personnel includes the following:

- Spill Control Plan
- Evacuation/accountability
- Emergency drill/exercise
- RCRA
- Emergency Plan Implementing Procedures
- Emergency preparedness
- Incident command system
- Inspection and repair of facility emergency monitoring equipment.

ERO members respond to emergency events. ERO members receive initial training and annual requalification training, in addition to training provided to general employees. Training of ERO members is outlined by position in company procedures. All INTEC employees receive general employee emergency response action training.

H-2. Implementation of Training Program [IDAPA 58.01.05.008; 40 CFR §§ 264.16(b), 264.16(d)(4), 264.16(e)]

After completion of new employee orientation, designated employees enter a training program specific to their job assignment. Persons holding qualifications are retrained and reevaluated as mandated by procedures. Job assignments, which are required for the completion of a training program, have time and performance limitations that must be satisfied to meet program qualification criteria.

RCRA training is completed within the first six months of the individual's employment or assignment, and at least annually thereafter, for positions involving TSD unit operations. Throughout the training program and until completion, employees do not perform their job duties unsupervised.

H-3. Training Records [IDAPA 58.01.05.008; 40 CFR §§ 264.16(d)(4) and (e)]

Individual training records are maintained for personnel assigned to TSD units. Training records include documentation of completed training, such as class rosters, signed checklists, completed exams, database printouts from additional training classes attended, and other documents verifying training. The original training records are maintained by the presenting organizations, which enter course completion information into a database. A hard copy of this information is also entered into the individual's training record.

The training records include the names of employees filling each TSD unit position. Job tasks and associated training requirements for each TSD unit are found in Table H-1.

Individual training records include, as a minimum, the following:

- Initial training and retraining programs
- Attendance records of training received
- Results of exams, walk through, and job performance assessments related to certification.

Training records for current employees at each TSD unit are maintained until closure of the unit or the employee terminates or transfers to a non-TSD unit position. The training records of terminating employees are maintained at the TSD unit for a minimum of three years from the date the employee last worked at a TSD unit. The training records for TSD unit employees who transfer to a non-TSD unit position within the company are forwarded to the employee's new organization where they continue to be available for at least three years.

ATTACHMENT 6 - SECTIONS F-3, F-4, F-5 - HAZARD PREVENTION

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 6, Sections F-3, F-4, and F-5
Procedures to Prevent Hazards

Revision Date: November 30, 2015

CONTENTS

ACRONYMS

CFA	Central Facilities Area
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
DCS	Distributed Control System
DOE	Department of Energy
DOE-ID	Department of Energy, Idaho Operations Office
EP/RCRA CP	Emergency Plan/Resource Conservation and Recovery Act Contingency Plan
HEPA	high-efficiency particulate air
IDAPA	Idaho Administrative Procedures Act
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTU	Integrated Waste Treatment Unit
LET&D	Liquid Effluent Treatment and Disposal
PEWE	Process Equipment Waste Evaporator
RCRA	Resource Conservation and Recovery Act
TFT	Tank Farm Tank
TSDF	treatment, storage, or disposal facility
WAC	waste acceptance criteria

F-3 WAIVER OR DOCUMENTATION OF EMERGENCY PREPAREDNESS AND PREVENTION REQUIREMENTS

F-3a Equipment Requirements [IDAPA 58.01.05.012 and 58.01.05.008; 40 CFR §§ 270.14(b) and 264.32]

F-3a(1) Internal Communications [IDAPA 58.01.05.008; 40 CFR § 264.32(a)]

The ILWMS buildings are equipped with communication devices (e.g., two way radios, alarm systems, etc.) capable of summoning emergency assistance. The personnel involved in the operation have immediate access to emergency communication devices.

F-3a(2) External Communications [IDAPA 58.01.05.008; 40 CFR § 264.32(b)]

The INTEC communication devices provide access to external emergency response agencies.

F-3a(3) Emergency Equipment [IDAPA 58.01.05.008; 40 CFR § 264.32(c)]

The contingency plan, located in Section G of this permit, identifies evacuation routes and locations of RCRA emergency equipment for the PEWE system, the LET&D facility, CPP-659, and the IWTU.

CPP-604 PEWE System and TFT

Safety and emergency equipment located at CPP-604 is listed below:

- Fire sprinkler system
- Portable fire extinguishers
- Safety showers and eyewashes
- Spill control cabinet
- Plant voice paging and evacuation alarm system
- Communication devices.

For building fire protection, CPP-604 has a fire sprinkler system, which is a heat-activated detection system. This system is connected to alarms at the INL Fire Department located at the Central Facilities Area (CFA). Portable fire extinguishers located throughout the building are inspected monthly.

A seal is placed on the door of the spill cabinet. Monthly inspections check the seal. If the seal has not been altered, it is noted on the checklist and no inventory is performed. If the seal has been altered, an inventory of the cabinet is performed. If equipment is missing or out of date it is replaced immediately. Inspections are recorded on appropriate forms. At least annually the spill cabinets are opened, inventoried, and restocked, as necessary, to ensure shelf life of contents.

CPP-1618

Safety and emergency equipment located at CPP-1618 is listed below:

- Fire sprinkler system
- Portable fire extinguishers
- Safety showers and eyewashes
- Spill control cabinets
- Plant voice paging and evacuation alarm system
- Communication devices.

For building fire protection, CPP-1618 has a fire sprinkler system, which is a heat-activated detection system. This system is connected to alarms at the INL Fire Department located at the CFA. Portable fire extinguishers located throughout the building are inspected monthly.

A seal is placed on the door of the spill cabinet. Monthly inspections check the seal. If the seal has not been altered, it is noted on the checklist and no inventory is performed. If the seal has been altered, an inventory of the cabinet is performed. If equipment is missing or out of date it is replaced immediately. Inspections are recorded on appropriate forms. At least annually the spill cabinets are opened, inventoried, and restocked, as necessary, to ensure shelf life of contents.

CPP-659

Safety and emergency equipment located at CPP-659 are listed below:

- Fire sprinkler system
- Portable fire extinguishers
- Safety showers and eyewashes
- Spill control cabinets

- Plant voice paging and evacuation alarm system
- Communication devices.

CPP-659 has a fire sprinkler system, which is a heat-activated detection system. This system is connected to alarms at the INL Fire Department located at the CFA. Portable fire extinguishers located throughout the building are inspected monthly.

A seal is placed on the door of the spill cabinet. Monthly inspections check the seal. If the seal has not been altered, it is noted on the checklist and no inventory is performed. If the seal has been altered, an inventory of the cabinet is performed. If equipment is missing or out of date it is replaced immediately. Inspections are recorded on appropriate forms. At least annually the spill cabinets are opened, inventoried, and restocked, as necessary, to ensure shelf life of contents.

CPP-1696

Safety and emergency equipment located at CPP-1696 are listed below:

- Fire sprinkler system, except the shielded process cells
- Portable fire extinguishers
- Safety showers and eyewashes
- Spill control cabinet
- Facility specific IWTU intercom system (inside CPP-1696)/Plant voice paging and INTEC evacuation alarm system (IWTU facility grounds)
- Communication devices.

For building fire protection, CPP-1696 has a fire sprinkler system (except in the shielded process cells), which is a heat-activated detection system. This system is connected to alarms at the INL Fire Department located at the CFA. Portable fire extinguishers located throughout the building are inspected monthly.

A seal is placed on the door of the spill cabinet. Monthly inspections check the seal. If the seal has not been altered, it is noted on the checklist and no inventory is performed. If the seal has been altered, an inventory of the cabinet is performed. If equipment is missing or out of date it is replaced immediately. Inspections are recorded on appropriate forms. At least annually the spill cabinets are opened, inventoried, and restocked, as necessary, to ensure shelf life of contents.

F-3a(4) Water For Fire Control [IDAPA 58.01.05.008; 40 CFR § 264.32(d)]

Two insulated fire water supply tanks with maximum capacities of 800,000 gal each supply the INTEC fire water system. These tanks are maintained between 400,000 and 600,000 gallons of water for fire suppression. Diesel powered pumps move water from wells to maintain these levels. Electric jockey pumps are located on the outlet lines that keep the fire water lines pressurized. Electric pumps are located on the outlets of these tanks to supply water for hose streams and automatic sprinklers at adequate volume and pressure.

F-3b Aisle Space Requirement [IDAPA 58.01.05.008; 40 CFR § 264.35]

Due to the hazardous characteristics and radioactive nature of the waste processed by the IWTU, techniques such as the use of cameras for inspections and the ability to perform remote maintenance have been engineered into the process. In those instances where hazards are reduced and controlled personnel movements are permitted, adequate aisle space will be maintained to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment.

In IWTU container storage areas, the Vault Loading Area and the Vault Storage Area, personnel movement will be administratively controlled to specified locations to prevent personnel from entering areas where emergency response capabilities may be limited. For instance, in the Vault Loading Area, inspections will be conducted from the cell entrance. Inspections from this area will be adequate to view three sides of the vault; however, there will not be sufficient room for personnel to circumnavigate the vault during an inspection. This would pose unacceptable risks to personnel due to the limited space around the vault and the potential for exposure to highly radioactive fields. The only waste stored in this area will be dry treatment product. In the event of a spill of the treatment product from a canister, any waste would be contained within the vault. Due to the dry nature of the waste, no runoff of waste is possible.

The vaults in the Vault Storage Area are configured so as to maintain a minimum 3-ft aisle space in the east/west direction. However, since two aisles are partially obstructed by 18-in. support beams, personnel will be restricted from accessing these aisleways and will only use the aisles that align with the access doors on the west side of the Vault Storage Area for inspection. Within each aisle the vaults will be stored in close proximity to one another. A minimum of 6 inches will be maintained between consecutive vault walls. This will allow inspection between vaults in the north/south direction; however, these aisleways will not be used for personnel movement. Like the Vault Loading Area, the only waste stored in the Vault Storage Area will be dry treatment product. In the event of a spill of the treatment product from a canister, any waste would be contained within the vault. Due to the dry nature of the waste, no runoff of waste is possible. Spill clean-up and decontamination would take place by relocating vaults, as necessary, to access the leaking container and removing any spilled material within the vault.

Due to the lack of combustibles and the non-ignitable and non-reactive nature of the treatment product, there is no foreseeable emergency situation that would require vaults to be moved to resolve the emergency.

F-4. PREVENTIVE PROCEDURES, STRUCTURES, AND EQUIPMENT

F-4a. Unloading Operations [IDAPA 58.01.05.012; 40 CFR § 270.14(b)(8)(i)]

Transfers of hazardous waste to and from ILWMS are conducted through piping systems. Wastes generated at other INL Site facilities may be introduced to the ILWMS. Unloading operations are controlled by standard operating procedures. During unloading operations, appropriate actions are taken to contain particulate and radioactive emissions (e.g., use of a portable HEPA air mover). A stainless-steel drip pan is used to collect possible leaks during unloading. Personnel will inspect for evidence of improper connections before beginning the transfer or acceptance of waste. Waste staging areas will be inspected for leaks or spills when waste is being received.

Containers are moved at CPP-1696 using equipment such as cranes, forklifts, and/or air jacks. One canister per shipment will be loaded into an RH-72B transportation cask on a flatbed semi-trailer for shipment to the ultimate disposal facility. These shipments must comply with applicable U.S. Department of Energy, Department of Transportation, U.S. Environmental Protection Agency, U.S. Nuclear Regulatory Commission, and disposal facility requirements.

Hazards in unloading and staging operations will be minimized through the following:

Waste handling areas are controlled to provide adequate space to allow unobstructed movement of waste transfer equipment and personnel.

Operations personnel will be present at all times during unloading or staging operations; therefore, any spilled or leaked material will be immediately detected and contained. Spill response will be in accordance with the INL Emergency Plan Resource Conservation and Recovery Act Contingency Plan (EP/RCRA CP), except for incidental spills, which would be immediately cleaned up.

Personnel will be trained as noted in Section H of this permit.

F-4b. Run-off [IDAPA 58.01.05.012; 40 CFR § 270.14(b)(8)(ii)]

Buildings CPP-604, CPP-649, CPP-659, CPP-1618, and CPP-1696 are fully enclosed buildings that prevent run-off from hazardous waste handling areas to other areas or the environment. Building CPP-1618 is inside the 100-year flood plain boundary and CPP-604, CPP-649, CPP-659, and CPP-1696 are outside of the 100-year flood plain boundary as postulated in the Big Lost River Flood Hazard Study, November 2005 (see Volume 3 of the INL permit application). The INL emergency plan provides for establishing plans for the protection of buildings and equipment as necessary during flooding conditions. This could include sand bagging or building berms, dikes, or trenches.

F-4c. Water Supplies [IDAPA 58.01.05.012; 40 CFR § 270.14(b)(8)(iii)]

Contamination of water supplies by spills of mixed waste is prevented by building features such as high-density concrete base, stainless-steel lining, epoxy-coated walls, sloped floors, trenches, drains, double-encased piping, and liquid collection tanks, as well as various means of leak detection. See Section B, Facility Description, for typical building construction details.

F-4d. Equipment and Power Failure [IDAPA 58.01.05.012; 40 CFR § 270.14(b)(8)(iv)]

Some components of the ILWMS are supplied with redundant equipment. If equipment should fail on these systems, it would have minimal effect on the operating unit, since the redundant equipment would be started and the operation stabilized. The failed equipment would then be investigated to determine the cause of the failure, and repairs would be initiated. If a system that did not have redundant equipment were to fail, the operating unit would be secured.

Upon total loss of electrical power, ILWMS equipment that manages hazardous and mixed wastes is designed to shut down in a manner that protects employees, equipment, human health, and the environment.

Cranes and hoists are considered non-critical equipment and are not supplied with emergency standby power. This type of equipment is designed to fail in place. Movement will be suspended until power is restored.

The DCS is designed with battery backup to maintain operability and to ensure safe shutdown.

CPP-604 PEWE System and TFT

The Evaporator Feed Collection Tank (VES-WL-133), the Process Condensate Surge Tank (VES-WL-131) and the Process Condensate Collection Tanks (VES-WL-106, VES-WL-107, and VES-WL-163) are all equipped with two redundant transfer pumps.

The PEW evaporators (EVAP-WL-129 and EVAP-WL-161) and associated heat exchangers are identical and may be operated independently or in parallel.

PEW evaporator bottoms can be stored/treated in either VES-WL-101 or VES-WL-111.

CPP-1618 LET&D Facility

The LET&D fractionators (FRAC-WLL-170 and FRAC-WLK-171) and associated heat exchangers are identical.

The Acid Fractionator Bottoms Tank (VES-WLL-195) is equipped with two redundant transfer pumps.

CPP-659 ETS

There are no redundant systems on the ETS. Upon loss of electrical power the operator would initiate the Rapid Shutdown System (RSS). The RSS would secure the ETS in a configuration that is protective of human health, the environment, and equipment.

CPP-1696 IWTU

The IWTU has a Rapid Shutdown System (RSS) which would secure the IWTU in a configuration that is protective of human health, the environment, and equipment. The IWTU has redundant equipment to allow safe operation of the steam reformers. In the event of a power failure, these redundant systems enable the IWTU processes to be maintained in a stable configuration that is protective of human health, the environment, and equipment until power is restored.

Both the Denitration and Mineralization Reformer and the Carbon Reduction Reformer are equipped with multiple redundant thermocouples in the fluidized bed region.

There is a redundant hydrogen monitor on the process gas outlet of the Denitration and Mineralization Reformer.

There is a redundant oxygen monitor on the offgas outlet of the Carbon Reduction Reformer.

There is a redundant offgas blower for the IWTU.

There is a redundant process exhaust blower for the IWTU.

There is a redundant building ventilation exhaust blower for the IWTU.

F-4e. Personnel Protection Equipment [IDAPA 58.01.05.012; 40 CFR § 270.14(b)(8)(v)]

Operations are conducted according to written procedures. Eyewash stations, safety showers, respirators and protective clothing are available as necessary to mitigate personnel exposure to hazardous waste.

F-4f. Releases to the Atmosphere [IDAPA 58.01.05.012; 40 CFR § 270.14(b)(8)(vi)]

CPP-604 PEWE System and TFT

In the event of a release to the vault from VES-WM-100, -101, or -102, the offgas would be contained in the vault until the hatch covers located in the sample corridor in CPP-604 were removed. Any release would then be removed by the offgas system that maintains a slight vacuum on the sample corridor to a high-efficiency particulate air (HEPA) filter system before being released to the atmosphere through the INTEC Main Stack.

In the event of a release to the rest of the vaults and cells associated with the PEWE system, the offgas would be removed by the offgas system that maintains a slight vacuum on the vaults and cells. The offgas would then be routed to a HEPA filter system before being released to the atmosphere through the INTEC Main Stack.

CPP-1618

In the event a release to the cells associated with the LET&D, the offgas would be removed by the building ventilation system that maintains a slight vacuum on the cells. The building ventilation is then routed to the ventilation APS HEPA filter system before being released to the atmosphere.

CPP-659

In the event of a release to the cells associated with the ETS, the air would be removed by the cell ventilation system that maintains a slight vacuum on the cells. The air would then be routed to a HEPA filter system before being released to the atmosphere through the CPP-659 stack.

CPP-1696

In the event of a release to the cells associated with the IWTU, the air would be removed by the cell ventilation system that maintains a slight vacuum on the cells. The air would then be routed to a HEPA filter system before being released to the atmosphere through the CPP-1696 stack.

F-5. PREVENTION OF REACTION OF IGNITABLE, REACTIVE, AND INCOMPATIBLE WASTES [IDAPA 58.01.05.008 AND 58.01.05.012; 40 CFR §§ 264.17(a) AND 270.14(b)(9)]

Waste acceptance criteria (WAC) have been established for wastes that are to be transferred to the ILWMS to prevent reaction of potentially incompatible wastes, see Section C-2f of this permit.

Waste must be characterized per procedure, to ensure waste compatibility before it can be transferred to CPP-604 TFT system.

ATTACHMENT 7 -
SECTION G -
CONTINGENCY PLAN

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 7, Section G
Preparedness, Prevention, and Contingency Plan

Revision Date: September 5, 2019

CONTENTS

TABLES

EXHIBITS

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
G-1. General Information 40 CFR § 264.51 Purpose and implementation of Contingency Plan (a) Each owner or operator must have a Contingency Plan for his facility. The Contingency Plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water. (b) The provisions of the plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment. 40 CFR § 264.53 Copies of Contingency Plan A copy of the Contingency Plan and all revisions to the Contingency Plan must be: (a) Maintained at the facility; and (b) Submitted to all local police departments, fire departments, hospitals, and State and local emergency response teams that may be called upon to provide emergency services. 40 CFR § 264.54 Amendment of the Contingency Plan. The Contingency Plan must be reviewed, and immediately amended, if necessary, whenever: (a) The facility permit is revised; (b) The plan fails in an emergency; (c) The facility changes-in its design, construction, operation, maintenance, or other circumstances-in a way that materially increases the potential for	**G-1. General Information** The Idaho Nuclear Technology and Engineering Center (INTEC) facility is designed, constructed, and operated to exclude or isolate hazardous incidents such as fires, explosions and/or unplanned sudden or nonsudden releases of mixed or hazardous waste or hazardous waste constituents to air, soil, or surface water. The INTEC location, operation, site plan and descriptions/information are presented in detail in Attachment 1, Section B, Facility Description, of this permit. This Resource Conservation and Recovery Act (RCRA) contingency plan matrix discusses emergency response at INTEC. This matrix addresses emergency actions to protect human health, the environment, and INTEC facilities and equipment in an event originating from or affecting CPP-604, -605, -649, -659, -1618, or -1696. The Idaho Cleanup Project (ICP) Emergency Plan/RCRA Contingency Plan (ICP EP/RCRA CP) is the implementing document for emergency response across the INL Site and is written to comply with requirements that are in addition to those of the Idaho Hazardous Waste Management Act (HWMA)/RCRA. This matrix provides the HWMA/RCRA contingency plan requirements that are being implemented through the ICP EP/RCRA CP. The contingency plan is designed to provide the proper preparation and necessary response planning to prevent or minimize hazards to human health and the environment from fires, explosions, or any release of hazardous waste or hazardous waste constituents. The provisions of the contingency plan are carried out immediately whenever a fire, explosion, spill, or release of hazardous waste or hazardous waste constituents that could threaten human health or the environment occurs. Minor incidents (those that can be controlled with on-Site resources and do not threaten human health or the environment) are managed by trained facility personnel according to the provisions of this plan. Such responses are not considered activation of the contingency plan. Copies of the contingency plan are maintained on-Site, with copies provided as necessary (specific to the response action needed) to the following through Memoranda of Understanding (MOUs) and Memoranda of Agreement (MOAs) with the DOE Idaho Operations Office (DOE-ID):

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency; (d) The list of emergency coordinators changes ; or (e) The list of emergency equipment changes.	- Bingham, Bonneville, Butte, Clark, and Jefferson County Sheriffs' Departments and City of Idaho Falls Police Department - Madison County, City of Ammon, City of Chubbuck, and City of Idaho Falls Fire Departments, South Custer Rural, Shelley/Firth Fire Districts, and Central Fire District, and Teton County Protection District - Portneuf Medical Center, Eastern Idaho Regional Medical Center, Bingham Memorial Hospital - Bingham County Emergency Management Services, Bonneville County Emergency Management Services, Butte County Emergency Services, Clark County Civil Defense, and Jefferson County Emergency Management - Shoshone-Bannock Tribes - Bureau of Land Management and Department of Interior - State of Idaho and Idaho Transportation Department
This space was intentionally left blank	The contingency plan is reviewed and immediately amended, if necessary, whenever: • The RCRA Permit is modified • The plan fails in an emergency • It is determined/known that changes in the permitted units', design, construction, operation, maintenance, or other circumstances have taken place in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency • The list of INTEC emergency action managers (EAMs) changes (refer to Section G-2, Emergency Coordinators) • The list of emergency equipment changes (refer to Section G-5, Emergency Equipment). A permit modification request will be submitted to the Director in compliance with 40 CFR § 270.42 to amend the permit as necessary.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
G-2. Emergency Coordinators 40 CFR §§ 264.52(d) and 264.55 40 CFR § 264.52(d) The plan must list names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator (see 264.55), and this list must be kept up to date. Where more than one person is listed, one must be named as primary emergency coordinator and the others must be listed in the order in which they will assume responsibility as alternates. For new facilities, this information must be supplied to the Regional Administrator at the time of certification, rather than the time of permit application.	**G-2. Emergency Coordinators** The Emergency Action Managers (EAMs), listed below, are the emergency coordinators (ECs) for purposes of HWMA/RCRA compliance with respect to the contingency plan. Due to the shift-work structure and remoteness of the INTEC, it is not possible or practical for one individual to assume “primary” responsibilities, rather, responsibility is best assigned through “redundant primary” EAMs, without alternates. For the IWTU facility, if an operational event occurs, the IWTU Operations Shift Supervisor will complete the initial categorization, classification, and notification activities and initial protective actions and will then hand off to the INTEC EAM for continued response. Names, home addresses, and home phone numbers of the INTEC EAMs are as follows: • Baker, Chris – 1668 Satterfield Drive, Pocatello, ID 83201 – 208-241-8672 (home/cell); 208-526-3100 (work) • Chaney, J. H. – 2810 Caribou Way, Pocatello, ID 83201 – 208-244-2418 (home/cell); 208-526-7273 (work) • Clancy, Nicholas, 545 N. Lincoln Avenue, Pocatello, ID 83204 – 208-533-0292 (work) • Doffing, Gregory P. – 3916 Orchard Circle, Ammon, ID 83406 – 360-286-4690 (home/cell); 208-533-3668 (work) • Dyroff, Frederick C. – 2519 Harold Drive, Idaho Falls, ID 83402 – 208-794-9609 (home/cell); 208-533-0451 (work) • Henderson, Christopher W. – 81 S. 1200 W., Blackfoot, ID 83221 – 208-680-1485 (home/cell/work) • Klukis, Charles R. – 1194 Pendlebury, Blackfoot, ID 83221 – 208-390-9389 (home/cell); 208-526-3100 (work) • Newsome, Eugene C. – 281 E. 400 N., Blackfoot, ID 83221 – 208-785-1658 (home); 208-526-3100 (work); 208-569-0596 (cell) • Nowak, Joel T. – 4095 E. 356 N., Rigby, ID 83442 – 208-569-5522 (home/cell/work) • Stanley, Victor B. – 4455 Nottingham Lane, Idaho Falls, ID 83402 – 208-716-5289 (home); 208-521-0883 (cell); 208-526-3100 (work) • Wiebe, Jeff K. – 212 N. 12th Avenue, Pocatello, ID 83201 – 208-244-4107 (home/cell/work) The business address (1580 Sawtelle Street, Idaho Falls, Idaho 83402), is the same for all the INTEC EAMs. The EAM list above is subject to change due to changes in personnel. The current list of EAMs is maintained in Appendix I of the INTEC addendum of the ICP EP/RCRA CP.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	An INTEC EAM is at the INTEC at all times or on call. All of the INTEC EAMs are thoroughly familiar with all aspects of the contingency plan, all INTEC operations/activities (including these units), the location and characteristics of waste handled, volumes of waste, the location of all records within the INTEC and layout. All of the INTEC EAMs have the authority to commit the necessary resources to carry out the contingency plan.
	The INTEC EAMS are responsible for: • Ensuring that the emergency procedures are implemented and completed when responding to any incident involving the units permitted herein to mitigate or eliminate any immediate or potential hazard to personnel, the public, or the environment

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• Serving as the primary lead in coordinating with the INL Fire Department, INL Emergency Operations Center (EOC), and the INL Warning Communications Center (WCC) for the proper support from these organizations • Delegating authority to the INTEC Emergency Response Organization (ERO), as well as the Incident Commander (IC), as appropriate. If an incident overlaps more than one shift, the active INTEC EAM shall maintain the command until responsibility is officially passed to the incoming INTEC EAM.
G-3. Implementation 40 CFR §§ 264.52(a) and 264.56(d) 40 CFR § 264.52(a) The Contingency Plan must describe the actions facility personnel must take to comply with 264.51 and 264.56 in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility. 40 CFR § 264.51 *[The text of 40 CFR § 264.51 is located in Section G-1, General Information.]* 40 CFR § 264.56 Emergency procedures. (a) *[The text of 40 CFR § 264.56(a) is located in Section G-4a, Notification.]* (b) *[The text of 40 CFR § 264.56(b) is located in Section G-4b, Identification of Hazardous Materials.]* (c) *[The text of 40 CFR § 264.56(c) is located in Section G-4c, Assessment.]* (d) If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, he must report his findings as follows:	**G-3. Implementation** The provisions of the contingency plan will be carried out immediately (activation of the contingency plan) whenever there is a fire, explosion, or unplanned release of hazardous or mixed waste or hazardous waste constituents that threaten human health or the environment. Such an occurrence (incident) requires classification, as described below, to aid in expediting the appropriate emergency response. Classification of an occurrence is done in accordance with DOE Orders. Through these orders, the DOE has established definitions for occurrence categories and emergency classes. Occurrences are categorized by severity, in order of increasing severity. An operational emergency at the INTEC may require response from the INTEC ERO, or support agencies, because the occurrence involves either an actual or potential fire or explosion involving mixed waste, or an uncontrolled release or threat of an uncontrolled release of mixed waste or constituents. Operational emergencies are defined as an unplanned significant event or condition that requires time-urgent response from outside the immediate/affected area of the incident. An operational emergency shall be declared when events have seriously degraded, or have the potential to degrade, the safety or security of the INTEC. Operational emergencies are classified by severity for specifying the appropriate emergency response actions and notifications, which are commensurate with the degree of hazard for the emergency. Classification aids in the rapid communication of critical information and the initiation of appropriate time-urgent emergency response action. The three classes of operational emergencies, in order of increasing severity, are: **ALERT.** Alert shall be declared when events are predicted, are in progress, or have occurred that result in either: • An actual or potential substantial degradation in the level of control over hazardous materials (radiological and nonradiological) OR

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
(1) If his assessment indicates that evacuation of local areas may be advisable, he must immediately notify appropriate local authorities. He must be available to help appropriate officials decide whether local areas should be evacuated; and (2) He must immediately notify either the government official designated as the on-scene coordinator for that geographical area, (in the applicable regional contingency plan under part 1510 of this title) or the National Response Center (using their 24-hour toll free number 800/424-8802). The report must include: (i) Name and telephone number of reporter; (ii) Name and address of facility; (iii) Time and type of incident (e.g., release, fire); (iv) Name and quantity of material(s) involved, to the extent known; (v) The extent of injuries, if any; and (vi) The possible hazards to human health, or the environment, outside the facility. **This space was intentionally left blank**	• An actual or potential substantial degradation in the level of safety or security of a facility or process that could, with further degradation, produce a site area emergency or a general emergency. If an actual or potential substantial degradation in the level of control over hazardous materials (radiological and nonradiological) occurs, the radiation dose from any release to the environment of radioactive material or a concentration in air of other hazardous material is expected to exceed either: • The applicable Protective Action Guide (PAG) or Emergency Response Planning Guideline (ERPG) at or beyond 30 m from the point of release to the environment OR • Ten percent of the applicable PAG or 10% of the ERPG-2 (TEEL-2) value at 100 m AND • It is not expected that the applicable PAG or ERPG will be exceeded at or beyond the facility boundary or exclusion zone boundary. **SITE AREA EMERGENCY.** A site area emergency shall be declared when events are predicted, are in progress, or have occurred that result in either: • An actual or potential major failure of functions necessary for the protection of worker or the public OR • An actual or potential major degradation in the level of safety or security of a facility or process that could, with further degradation, produce a general emergency AND The radiation dose from any release of radioactive material or concentration in air from any release of other hazardous material is not expected to exceed the applicable PAG or ERPG at or beyond the site boundary. **GENERAL EMERGENCY.** A general site emergency shall be declared when events are predicted, are in progress or have occurred that result in either: • Catastrophic reduction of facility safety or security systems with a potential for the release of large quantities of hazardous materials (radiological or nonradiological) to the environment actually occurring or imminent OR

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• The radiation dose from any release of radioactive material or a concentration in air from any release of other hazardous material is expected to exceed the applicable PAG or ERPG at or beyond the site boundary. The following is a list of personnel and organization with a general description of their actions/responsibilities in response to fires, explosions, or unplanned sudden or nonsudden releases of hazardous waste or hazardous waste constituents to air, soil, or surface water: • Operations Personnel – Ensure personal safety, inform plant shift supervisor of situation/emergency (type of emergency, location, size, material(s) involved, status of other waste materials, equipment, etc.), and, if possible and properly trained, stop waste movements, secure area, and initiate efforts to stabilize the situation • Plant Shift Supervisor/EAM – Sound appropriate alarms, gather information/documents, and is responsible for conducting emergency response within the INTEC and the immediate activation of the contingency plan • INL Fire Department – Primary responders to all fires and hazardous incidents, providing fire fighting, hazardous materials (HAZMAT) response, and emergency medical services • INTEC Emergency Response Organization – Trained facility personnel including the INTEC EAM • Incident Commander – With the assistance of the INTEC EAM, assesses situation from the standpoint of tactical deployment of the INL Fire Department and overall effort to address the situation/emergency • INL Emergency Operations Center (EOC) – Provides support to the INTEC ERO, including dose assessment, off-Site notifications, public information, and other technical/tactical functions that aid in the assessment, control, and return to operations • Emergency Director (ED) – Manages the INL EOC and has jurisdiction over all INL operational emergency response activities • INL Warning Communications Center (WCC) – Serves as the central organization for coordinating efforts between INL EROs and off-Site agencies/support services • Industrial Hygienist – Assists in the assessment of hazards/risk (e.g., monitor areas with known/suspected high concentrations of hazardous vapors/gases) and appropriate response actions

<table>
<tr><th>AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION</th><th>COMPLIANCE METHODOLOGY</th></tr>
<tr><td>This space was intentionally left blank</td><td>• Waste Technical Specialist – Assists in the identification of waste/materials, proper adsorbent/absorbent, and post-emergency collection, storage, treatment and/or disposal

• Central Facilities Area (CFA) EAM – Assists INTEC EAM where required/requested to assess possible effects beyond the perimeter of the INTEC, in which case he would assume a responsibility role.

Specific actions, which further address 40 CFR §§ 264.52(a) and 264.56(d), are described in Section G-4, Emergency Response Procedures.</td></tr>
<tr><td>G-4. Emergency Response Procedures

G-4a. Notification 40 CFR § 264.56(a)
40 CFR § 264.56(a) Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) must immediately:
(1) Activate internal facility alarms or communications systems, where applicable, to notify all facility personnel; and

(2) Notify appropriate State or local agencies with designated response roles if their help is needed.

This space was intentionally left blank</td><td>G-4. Emergency Response Procedures

G-4a. Notification
In the event of a fire or explosion, fire detection equipment (smoke detectors, heat detectors, water flow alarms or water sprinkler alarms) will automatically notify:

• The INTEC voice paging system, which will (through exterior and interior building speakers) alert, notify and instruct the INTEC facility personnel and INTEC ERO.
• At the IWTU facility building there is an internal intercom system in place of the INTEC voice paging system. This intercom system will alert, notify, and instruct IWTU facility personnel. Additionally outside the IWTU facility, INTEC voice paging system and emergency alarms can be heard to alert, notify and instruct the IWTU personnel.
• The Fire Alarm Center, (FAC) which will involve the INL Fire Department.

• The INL WCC, which will alert other INL EROs.

In any event (fire, explosion or release), the person involved/ discovering can activate the nearest manual alarms and use communication devices (e.g., radios, cell phones), to summon assistance, and make notifications to the plant shift supervisor/EAM and/or the INL Fire Department. The INTEC EAM will ensure that all facility personnel are being, or have been, notified of the imminent or actual emergency situation, including a confirmation call to the WCC, to verify the INL Fire Department is responding. All notifications shall include the following information, as appropriate:

• Name and telephone number of the caller
• Location of the incident and the caller
• Time and type of incident
• Severity of the incident
• Description of the incident</td></tr>
</table>

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• Cause of the incident, if known • Assistance needed to deal with or control the incident • Name and address of the facility • Name and quantity of material(s) involved, to the extent known • Extent of injuries, if any • Possible hazards to human health, or the environment, outside the facility. Once the EAM is notified of a fire, explosion, or uncontrolled release at the INTEC (by either an eyewitness or an alarm), the EAM will activate the contingency plan. If necessary, the EAM will also request assistance from the INL Fire Department. The INL Fire Department is contacted by dialing 777 or 526-7777 [if using a Voice Over Internet Protocol (VOIP) phone with the prefix 533]. In case of fire, the INL Fire Department will respond to the alarms. The nature of any incident potentially involving hazardous waste or hazardous materials will undergo assessment, as described in Section G-4c. The contingency plan will not be activated if the incident is considered minor and does not constitute an emergency requiring notification of regulatory agencies (e.g., a fire, explosion, or natural occurrence that does not involve or threaten hazardous or mixed wastes; a release that does not constitute a potential threat to human health or the environment; a spill contained in secondary containment; and/or a spill or release that is less than a reportable quantity specified in 40 CFR § 302.4). Reportable quantities under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Emergency Planning and Community Right-to-Know Act (EPCRA) apply to the release of any substance listed in Table 302.4 of 40 CFR Part 302. The INTEC maintains its own emergency response capabilities through the ERO. There are adequate supplies, equipment, and trained personnel available at the INTEC to mitigate expected emergencies. The INL Fire Department and security personnel operate separately, but their activities are coordinated through the EAM. DOE-ID maintains coordination and mutual aid agreements with local outside agencies who make additional emergency personnel and equipment available if outside assistance is required. In addition, as a DOE facility, the staff at the INTEC can call upon the resources of the INL EOC for additional assistance, including, but not limited to, MOU agreements with local agencies (such as outside medical facilities or state and local law enforcement agencies) and other federal agencies (See Section G-1). **Communication of Emergency Conditions to Facility Employees** The procedures for notifying facility personnel depend on the type and severity of emergency and may include the following: • Local Fire Alarms - In the event of a fire, these may be activated automatically or manually.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• Evacuation - The evacuation signal is an alternating, siren tone, manually activated by the contract security force, or the INTEC Emergency Control Center, at the direction of the EAM. If the primary warning system consisting of alarms and signals fails to operate when activated (as in a total power outage and failure of the backup power systems), security will be directed by the EAM to use voice amplifiers to alert personnel to evacuate the area. • INTEC Voice Paging System - The INTEC voice paging system provides personnel with general and emergency information. • IWTU Intercom System - Inside the IWTU facility (Building CPP-1696) there is an internal intercom system in place of the INTEC voice paging system which will alert, notify, and instruct IWTU facility personnel. Additionally, INTEC Alerts and emergency alarms can be heard outside the IWTU facility building. **Notification of Local, State, and Federal Authorities** If it is determined that the permitted units have had a fire, explosion, spill, or release of hazardous waste or hazardous waste constituents, or an emergency resulting in a release of a hazardous substance included in 40 CFR § 302.4, that could threaten human health or the environment inside or outside the INTEC, the contingency plan will be activated. The EAM will ensure that local authorities are notified by telephone and/or facsimile. These notifications are made by the INL WCC, based on the initial information provided by the EAM or the ED. The agencies to be contacted include, as appropriate: County Dispatch Centers: Butte County (208) 527-3585 Fax Number (208) 527-3916 Bonneville County (208) 522-1644 or (208) 529-1200 Fax Number (208) 529-1153 Bingham County (208) 785-1234 Fax Number (208) 785-8067 Clark County (208) 374-5669 Fax Number (208) 374-5614 Fort Hall Police Dispatch (208) 478-4000 or 238-4000 Public Safety (208) 237-0137 Fax Number (208) 478-4005 Jefferson County (208) 745-9207 Fax Number (208) 745-9212

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	DOE-HQ Emergency Operations Center (202) 586-8100 Fax Number (202) 586-8485 State of Idaho Communications Center (800) 632-8000 or (208) 855-9670 Fax Number (208) 846-7620 National Response Center 1-800-424-8802 The first notification of regulatory agencies will include, as appropriate: • Name and address of the facility and the name and phone number of the reporter • Type of incident: fire, explosion, release, etc. • Date and time of the incident • Type and quantity of hazardous material(s) involved • Exact location of the incident • Injuries, if any • Possible hazards to human health and the environment (air, soil, water, wildlife, etc.) outside the facility • Name, address, and telephone number of the party in charge of or responsible for the facility or activity associated with the incident • Steps being taken or proposed to contain and clean up the material involved in the incident. The ED and EAM will also be available to help the appropriate local, state, or federal officials decide whether local areas should be evacuated. **Notification of the General Public** Notification of the general public through the public safety and emergency agencies listed above will be made by the INL Emergency Director or the EAM. DOE policy is to provide accurate and timely information to the public, by the most expeditious means possible, concerning emergency situations that may affect employees, off-Site personnel, public health and safety, and/or the environment.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
G-4b. Identification of Hazardous Materials 40 CFR § 264.56(b) 40 CFR § 264.56(b) Whenever there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and areal extent of any released materials. He may do this by observation or review of facility records or manifests, and, if necessary, by chemical analysis. **This space was intentionally left blank**	**G-4b. Identification of Hazardous Materials** The identification of hazardous wastes or hazardous waste constituents involved in a fire, explosion, or release to the environment is a necessary part of the assessment of an incident. RCRA-regulated hazardous waste and hazardous substances and materials listed in 40 CFR § 302.4 involved in any release at the permitted units will be identified. The wastes normally stored at the permitted units present no unique hazards to the waste operations personnel. The permitted units present common industrial hazards for exposures or injuries. The INTEC EAM will determine the identity, exact source, amount, and extent of any released materials. Sources of information include, but may not be limited to: • Observations of personnel involved in or discovering the situation • Permitted units operating records • Material Safety Data Sheets (MSDSs) • Monitoring performed by an Industrial Hygienist • The INL Fire Department's findings/reports. Released or residual materials (residuals from a fire or explosion) that cannot be identified by labels, records, logbooks, identification numbers, or electronic databases will be sampled in accordance with a waste analysis plan (WAP), and analyzed to determine the chemical properties of the waste. The analytical results will determine the proper disposition of unidentifiable waste materials.
G-4c. Assessment 40 CFR §§ 264.56(c) and 264.56(d) 40 CFR § 264.56(c) Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water run-off from water or chemical agents used to control fire and heat-induced explosions).	**G-4c. Assessment** Once the required notifications have been made, the EAM will ensure the identity, exact source, amount, and extent of released materials spreading from the event location can be determined. Individuals entering the affected area to gather information for the assessment will wear appropriate PPE. The EAM will determine the identity of materials released, based on knowledge of the area and access to the waste identification/characterization information described in Section G-4b. After the materials involved in an emergency are identified, the specific information on the associated hazards, appropriate PPE, decontamination method, etc., will be obtained from MSDSs or other appropriate chemical reference materials.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
40 CFR § 264.56(d) *[The text of 40 CFR § 264.56(d) is located in Section G-3, Implementation.]* **This space was intentionally left blank**	Based on default conservative estimates of potential source terms, emergency action levels (EALs) have been developed for fires, explosions, radiological releases and other emergency events. EALs are specific, predetermined, observable criteria used to determine the emergency classification and initial protective actions for operational emergencies. These EALs provide guidance for activating the INL EROs at the appropriate level in response to the incident. These EALs specify the initial protective actions (i.e., evacuation or take cover) to be taken in response to the event. The emergency assessment requires determination of hazards involving evaluation of several criteria, including the following: • Nature of the accident - Known or probable cause; current/projected status of the affected area; facility conditions; status of containment boundaries/systems; type(s) and quantities of hazardous waste/material (nonradiological and radiological) involved in the incident • Weather conditions, present and expected - Wind speed and direction; precipitation; time of day; stability class; weather forecast; anticipated dispersion pattern; direction of travel and width of plume; locations affected • Exposure - Magnitude of actual or potential exposure to employees, the general public, and the environment; duration of human and environmental exposure; pathways of exposure • Toxicity - Types of adverse health or environmental effects associated with exposures; the relationship between the magnitude of exposure and adverse effects • Reactivity (if applicable) - Hazardous materials or wastes involved in an incident will be assessed, through accessing the MSDSs for the affected material to determine its reactivity and the recommended method(s) for managing such waste • Effects - Direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating or asphyxiating gases that are generated, or the effects of any hazardous surface water run-off from water or chemical agents used to control fire or explosions) • Uncertainties - Considerations for undeterminable or future exposures; uncertain or unknown health effects including future health effects. If the assessment indicates no real or potential threat to human health or the environment, the occurrence will be considered a minor incident. Minor incidents do not require further activation of the contingency plan.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	If the assessment indicates that a potential threat exists to off-Site human health or the environment due to airborne contaminants, the EAM or INL ED will advise the appropriate off-Site response personnel of the nature of the potential threat. Wind data for the INTEC and the nature of the wastes normally stored at the permitted units do not indicate that an airborne release is likely to occur outside the TSDF.
G-4d. Control Procedures 40 CFR § 264.52(a) 40 CFR § 264.52(a) The Contingency Plan must describe the actions facility personnel must take to comply with 264.51 and 264.56 in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility. **This space was intentionally left blank**	**G-4d. Control Procedures** **Spills that Occur While Working With a Hazardous Waste** Employees in the permitted units will evacuate the immediate area and notify the EAM. The EAM will notify the spill control team, appropriate facility personnel, and/or the INL Fire Department who will perform the following steps: (1) After donning appropriate PPE (if necessary), secure the source of the release. (2) Transfer the spill to a tank or drum, using a pump, jet, or airlift. (3) After pumping or if the spill is small, spread absorbent over the area of the spill and dispose of the contaminated absorbent to an appropriate container. (4) Stabilize flammable solvent spills using an absorbent. (5) Stabilize other chemical spills by using a neutralizing agent or by adding absorbent. (6) Handle the stabilized material as a hazardous or mixed waste. Sweep, shovel, or pump it into an appropriate container. (7) Remove any contamination from floors and walls with a decontaminant appropriate to the spilled material, and transfer decontaminant and cleaning materials to an appropriate container. (8) Properly label the container. (9) Dispose of container appropriately. (10) Decontaminate all reusable spill cleanup equipment. After cleanup is complete, trained facility personnel will complete a weekly inspection log entry and include the details of the spill and cleanup in the log. **Unattended Spills that are Discovered** Employees in the permitted units will leave the immediate area of the spill and notify the EAM. The EAM will notify the INL Fire Department who will perform the following: (1) Attempt to determine the source of the spill.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	(2) If the spilled material can be identified from the source, handle the spill as in the procedure for "Spills that Occur While Working With a Hazardous Waste," above. (3) If the spilled material cannot be identified, a sample will be collected. (4) Obtain a rush analysis from a laboratory. (5) The spilled material will be containerized per the Analytical Data provided. (6) After the waste has been fully characterized, it will be managed appropriately. **Natural Phenomena Emergencies** After any natural emergency (earthquake, flood, lightning strike, etc.) that may have affected the permitted units, the EAM shall ensure the following actions are performed: (1) Inspect tanks and containment for signs of leakage or damage. (2) Check to ensure all automatic and manual alarms in the permitted units are working if feasible. (3) Conduct a general survey of the permitted units looking for potential problems. (4) Take any necessary corrective measures, however temporary, to rectify potential or real problems. (5) Record all inspection results. **Personnel Contamination** In the event of chemical material in the eye or on the skin, personnel will use the following procedure: (1) Wash the eye(s) or skin using a shower/eyewash station for an appropriate time (2) Hold the eyelids open during washing. (3) Notify the EAM. The EAM will notify the appropriate facility personnel, and or the INL Fire Department who will, if possible, ascertain what chemical material was involved in the injury. (4) Report to the appropriate INL medical facility.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	In the event of irritation of the eyes, breathing passages, or skin, difficulty in breathing, and/or nausea, light-headedness, vertigo, or blurred vision, personnel will notify the INL Fire Department. The EAM will evacuate and barricade the area to prevent unauthorized entry and notify the appropriate facility personnel and or the INL Fire Department, who will attempt to determine what, if any, chemical exposure occurred and what corrective measures are appropriate. **Power Failure** The permitted units are equipped with a standby power source in the event of utility failure. Should total power failure occur, battery-operated lights would automatically illuminate. In the event of a power failure, personnel will secure any work in progress and leave the area until power is restored. The utilities have power replacements as shown: • Lights - Fixed battery-operated lights will operate • Alarms - Emergency communication and fire alarm systems have battery backup • Communication Device - Radio networks and/or pagers will be used • Fire sprinklers - Portable extinguishers and external hose streams.
G-4e. Prevention of Recurrence or Spread of Fires, Explosions, or Releases **40 CFR §§ 265.56(e) and (f)** 40 CFR § 264.56(e) During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include where applicable, stopping processes and operations, collecting and containing release waste, and removing or isolating containers. 40 CFR § 264.56(f) If the facility stops operations in response to a fire, explosion, or release, the emergency coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, whenever this is appropriate.	**G-4e. Prevention of Recurrence or Spread of Fires, Explosions, or Releases Equipment Failure** There will be no impact to the permitted units from an equipment failure. Mechanical failures not resulting in spills will be repaired by maintenance personnel. During an emergency, the EAM will ensure that reasonable measures are taken so that fires, explosions, and releases do not occur, recur, or spread to mixed waste or other hazardous materials at the facility. These measures include the following: • Stopping processes and operations • Collecting and containing released wastes and materials • Removing or isolating containers of waste or hazardous materials • Ensuring wastes managed during an emergency are handled, stored, or treated with due consideration for compatibility with other wastes and materials onsite and with any containers utilized (see Section G-4g) • Restricting personnel not needed for response activities from the area of the incident

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• Evacuating the area if necessary • Curtailing nonessential activities in the area • Conducting preliminary inspections of adjacent facilities and equipment to assess damage • Repairing damaged equipment and facilities, as appropriate • Constructing, monitoring, and reinforcing temporary dikes, as needed • Maintaining the INL Fire Department and equipment on standby at the incident site in cases where ignitable liquids have been or may be released and ensuring that all ignition sources are kept out of the area • If applicable, ensuring ignitable liquids are segregated, contained, confined, diluted, or otherwise controlled to preclude inadvertent explosion or detonation.
This space was intentionally left blank	As described in Section G-4a above, once the EAM is notified (by either an eyewitness or alarm) of a fire, explosion, or release, the EAM will immediately report the situation to the WCC and take action to notify the INL Fire Department and ERO, as necessary. If necessary, the EAM may request other INL support. All personnel not involved in combating the emergency shall evacuate the affected area and assemble in designated locations away from the affected area as informed by the EAM by appropriate means. Emergencies originating at the permitted units will be addressed by activation of the contingency plan under the direction of the EAM. The contingency plan may be activated at any time, at the discretion of the EAM. **Fires** Fires that involve or threaten hazardous or mixed wastes are considered emergencies for the purposes of the contingency plan. Planned actions include: • The INL Fire Department will be contacted by pulling the fire-alarm call box or by dialing 777 or 526-7777 if using a Voice Over Internet Protocol (VOIP) phone with the prefix 533. • Fire fighting personnel will don appropriate PPE. • If the fire is small and the fuel source is small, portable fire extinguishers may be used to put out the fire. • Whenever possible, flammable material will be removed from the area of the fire.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• If the fire spreads or increases in intensity, all personnel will be evacuated to an upwind location. • The EAM will remain in contact with responding personnel to advise them of the known hazards. • As necessary, actions will be taken to ensure storm drains do not receive potentially hazardous run-off. Dikes will be built around storm drains and any valves controlling discharge will be closed. The EAM is responsible for all emergency response actions conducted within the facility, supporting and coordinating with the Incident Commander and for the overall mitigation of the event until the emergency event is terminated. Selection of methods and tactics of fire fighting is the responsibility of the INL Fire Department. An absorbent will be poured over all chemical residues resulting from a hazardous waste fire. Once the liquid is absorbed, the waste will be swept or shoveled back into labeled compatible containers, and the surface will be cleaned using appropriate cleaners for the identified chemicals. Fire fighting waters will be collected and analyzed, whenever possible, to determine an appropriate disposal method. The Integrated Waste Treatment Unit contains mercury adsorbers with activated carbon beds, Process HEPA Filters, and Building Ventilation HEPA Filters. Thermocouples are provided upstream and downstream of the Mercury Adsorbers, as well as within each bed. The Mercury Adsorbers, Process HEPA Filters, and Building Ventilation HEPA Filters are equipped with a manually initiated water deluge fire suppression system, which floods the adsorbers or filters with water in response to elevated carbon monoxide. Response to this event does not result in clean up of fire fighting materials as the water is contained within the adsorber and/or filter vessel/housing. The water is drained to a Fire Water Collection Tank. Appropriate response following the event would involve inspecting the unit to ensure the vessels' integrity has not been compromised and replacing the granular activated carbon media or HEPA filters. If the water deluge fire suppression system is activated the DEQ must be verbally notified within 24 hours. **Explosions** The following procedure will be carried out, in the event that an explosion that involves or threatens hazardous or mixed waste occurs, or in the event that an explosion is imminent: • The area will be immediately evacuated. • Any injured personnel will be immediately transported to the appropriate medical facility for treatment.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	• The EAM will immediately notify the appropriate emergency response personnel and the WCC about the explosion. • The EAM will remain in contact with responding personnel to advise them of the known hazards involved and the degree and location of the explosion and associated fires. • The EAM is responsible for all emergency response actions conducted within the facility, supporting and coordinating with the Incident Commander and for the overall mitigation of the event until the emergency event is terminated. Selections of methods and tactics of responding to an explosion are the responsibility of the Incident Commander. • Ensure that appropriate and trained personnel collect and contain released wastes by stabilizing or neutralizing the spilled material, as appropriate, pouring an absorbent over the spilled material, and sweeping or shoveling the absorbed material into drums or other appropriate containers. Once the waste has been collected the surface is cleaned using appropriate cleaners for the identified chemicals. • The EAM will ensure operational units (e.g., process and ventilation equipment) that may be affected directly or indirectly by the explosion be secured once the areas are determined safe for reentry. **Releases** The EAM will complete the following procedures in the event that: (a) a hazardous or mixed waste or hazardous material spill causes an immediate health hazard; (b) a hazardous or mixed waste or hazardous material spill cannot be contained with secondary containment or application of absorbents; or (c) a threat exists for spilled material to move out of the permitted units: (1) Evacuate the immediate area. (2) Review facility records to determine the identity and chemical nature of released material. (3) Ensure personnel don appropriate PPE to prevent exposure to the material. (4) Ensure that the source of the release is secured, if possible. (5) Ensure that a dike is built to contain runoff. (6) Ensure storm drains do not receive potentially hazardous run-off or spill material. Build dikes around storm drains or close any valves controlling discharge.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	(7) Ensure that appropriate and trained personnel collect and contain released wastes by stabilizing or neutralizing the spilled material, as appropriate, pouring an absorbent over the spilled material, and sweeping or shoveling the absorbed material into drums or other appropriate containers. (8) Ensure that waste that may be incompatible with the released material will be managed in the affected area until cleanup procedures are complete. After collection of a released material, the incident location will be sampled and evaluated. If contamination is found to exist, contaminated materials may be collected, drummed (if appropriate), and removed from the area for disposal at a permitted disposal facility. Depending on the specific conditions, however, INTEC personnel may choose to implement an alternative decontamination method, such as surface cleaning or in-situ neutralization or stabilization. Any such alternative will be discussed with the Director of the Idaho Department of Environmental Quality, before implementation.
G-4f. Storage and Treatment of Released Materials 40 CFR § 264.56(g) 40 CFR § 264.56(g) Immediately after an emergency, the emergency coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility. **This space was intentionally left blank**	**G-4f. Storage and Treatment of Released Materials** Once initial spill containment has been completed, the EAM will ensure that recovered hazardous materials and waste are properly stored, treated, and/or disposed, as required by IDAPA 58.01.05.006; 58.01.05.007; and 58.01.05.008 (40 CFR 262, 263, and 264). If applicable, spills of liquid that escaped secondary containment, the perimeter of the spill will be diked with an absorbent material, such as absorbent pillows, that is compatible with the material(s) released. Freestanding liquid will be transferred to a labeled compatible container. The remaining liquid will be absorbed with an absorbent material and swept or scooped into a labeled compatible container. Spill residue will be removed. Spills of dry material will be swept or shoveled into a labeled compatible recovery container. Material recovered from the spill will be transferred to a new or clean-washed container that held a compatible material. All containers will meet Department of Transportation (DOT) specifications for shipping the recovered wastes and materials. Hazardous waste resulting from the cleanup of a fire, explosion, or release will be contained and managed as a hazardous waste until such time that it can be determined that the waste is not hazardous, as defined in IDAPA 58.01.05.005 (40 CFR 261, Subparts C and D). When necessary, however, samples of the waste will be collected and analyzed to determine the presence of any hazardous characteristics and/or hazardous waste constituents; this information is needed to evaluate disposal options. Approved sampling and analytical methods will be used.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	The contaminated area will be decontaminated. If the release results in contamination to a permeable surface, such as soil, asphalt, or other surface, the material will be removed and placed in DOT-approved shipping containers. Contaminated surface materials, as well as materials used in the cleanup (e.g., rags and absorbent material), will be containerized and placed into storage, pending transfer to an on- or off-Site treatment or disposal facility, in accordance with applicable regulations.
G-4g. Incompatible Waste 40 CFR § 264.56(h)(1) 40 CFR § 264.56(h) The emergency coordinator must ensure that, in the affected area(s) of the facility: (1) No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and **This space was intentionally left blank**	**G-4g. Incompatible Waste** In the event of a hazardous material or hazardous waste release, the EAM will ensure that no wastes will be received, treated, or stored in the affected areas until cleanup operations have been completed. This will ensure that incompatible waste will not be present in the vicinity of the release. If waste is generated as the result of a spill or release of hazardous materials or hazardous waste, the waste generated as a result of abatement and cleanup will be evaluated to determine its compatibility with other wastes being managed in temporary storage areas. The evaluation will identify the material or waste that was spilled or released and determine its characteristics (e.g., ignitable, reactive, corrosive, and toxic). The waste generated by the abatement and cleanup activities will be stored in that part of the temporary storage area of the permitted units that has been established to manage wastes with which it is compatible. Administrative controls, such as installing barriers and/or a cordon around the temporary storage area(s), will be implemented to ensure segregation of wastes. The EAM will not allow hazardous or mixed waste operations to resume in a building or area in which incompatible materials have been released before ensuring that necessary post-emergency cleanup operations to remove potentially incompatible materials have been completed.
G-4h. Post-Emergency Equipment Maintenance 40 CFR § 264.56(h)(2) 40 CFR § 264.56(h) The emergency coordinator must ensure that, in the affected area(s) of the facility: (2) All emergency equipment listed in the CP is cleaned and fit for its intended use before operations are resumed.	**G-4h. Post-emergency Equipment Maintenance** The EAM will ensure that emergency equipment is cleaned and ready for its intended use before operations are resumed. Any equipment that cannot be decontaminated may be discarded as waste (i.e., hazardous, mixed, solid, as appropriate). Equipment or supplies that cannot be reused following an emergency will be replaced. After the equipment has been cleaned, repaired, or replaced, a post-emergency facility and equipment inspection will be performed, and the results will be recorded.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	Cleaning and decontaminating equipment may be accomplished using nonhazardous materials whenever possible, by physically removing gross or solid residue, rinsing with water or another nonhazardous liquid, and/or washing with detergent and water. Decontamination and cleaning will be conducted in a confined area, such as a wash pad or building equipped with a floor drain and sump isolated from the environment. Care will be taken to prevent wind dispersion of particles and spray. Liquid or particulate resulting from cleaning and decontamination of equipment will be placed in clean, compatible containers. Waste resulting from decontamination operations will be analyzed for hazardous waste constituents and/or hazardous waste characteristics to determine proper management. When INTEC facility personnel has completed any post-emergency cleanup of waste and hazardous residues from areas where waste management operations are ready to resume, and the EAM has ensured that all emergency equipment used in managing the emergency has been cleaned or replaced and is fit for service, the following notifications will be made, the Director of the Department of Environmental Quality, and any relevant local authorities. This post-emergency notification complies with IDAPA 58.01.05.008 [40 CFR § 264.56(i)].
G-4i. Container Spills and Leakage 40 CFR 264.52, 264.171, and 264.175(c)	**G-4i. Container Spills and Leakage**
40 CFR 264.52 Content of contingency plan. (a) Regulation text is located in Section G-3, Implementation	40 CFR 264.52(a) is addressed in Sections G-3 (Implementation), G-4d (Control Procedures), and G-4e (Prevention of Recurrence or Spread of Fires, Explosions, or Releases)
(b) If the owner or operator has already prepared a Spill Prevention, Control, and Countermeasures (SPCC) Plan in accordance with part 112 of this chapter, or part 1510 of chapter V, or some other emergency or CP, he need only amend that plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this part	Hazardous waste management provisions are included in the contingency plan.
(c) The plan must describe arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services pursuant to 264.37.	40 CFR 264.52(c) is addressed in Sections G-1 (General Information) and G-6 (Coordination Agreements).
(d) Regulation text is located in Section G-2, Emergency Coordinators.	40 CFR 264.52(d) and 40 CFR 264.55 are addressed in Section G-2, Emergency Coordinator.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
(e) The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), where this equipment is required. This list must be kept up to date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.	40 CFR 264.52(e) is addressed in Section G-5, Emergency Equipment.
(f) The plan must include an evacuation plan for facility personnel where there is a possibility that an evacuation could be necessary. This plan must describe signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).	40 CFR 264.52(f) is addressed in Section G-7, Evacuation Plan.
40 CFR 264.51 *[The text of 40 CFR 264.51 is located in Section G-1, General Information.]*	
40 CFR 264.171 Condition of containers. If a container holding hazardous waste is not in good condition (e.g., severe rusting, apparent structural defects) or if it begins to leak, the owner or operator must transfer the hazardous waste from this container to a container that is in good condition or manage the waste in some other way that complies with the requirements of this part.	Any/all containers, used for storage or treatment, found through inspection or use, not to be in good condition, will either be over-packed or the waste will be removed and the "empty container" disposed of accordingly. 40 CFR 264.171 is further addressed in Section D-1, Process Information – Containers.
40 CFR 264.175 Containment (c) Storage areas that store containers holding only wastes that do not contain free liquids need not have a containment system defined by paragraph (b) of this section, except as provided by paragraph (d) of this section or provided that: (1) The storage area is sloped or is other wise designed and operated to drain and remove liquid resulting from precipitation, or (2) The containers are elevated or are otherwise protected from contact with accumulated liquid.	The containers are protected from contact with accumulated liquid by being placed in cement storage vaults with lids. The vaults are placed in a fully contained building.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
G-4j. Tank Spills and Leakage 40 CFR § 264.194 (c)(1)	**G-4j. Tank Spills and Leakage**
40 CFR § 264.194(c) The owner or operator must comply with 264.196 if a leak or a spill occurs in the tank system.	In addressing this section, it is important to realize that the INTEC buildings are designed, constructed and remotely operated to exclude or isolate hazardous incidents. In the case of the permitted tank systems (tanks, ancillary equipment, and secondary containment), all are contained within a completely enclosed, self-supporting structure that is designed and constructed of man-made materials of sufficient strength and thickness to support themselves, the waste contents, and personnel and heavy equipment that may operate within the building(s).
40 CFR § 264.196 Response to leaks or spills and disposition of leaking or unfit-for-use tank systems. A tank system or secondary containment system from which there has been a leak or spill, or which is unfit for use, must be removed from service immediately, and the owner or operator must satisfy the following requirements:	Tank system leaks or spills can be detected by tank level measurement equipment, sump high level, and radiation alarms, as well as through inspection or operation. Upon detection of a leak or spill from a tank system, or if through inspection or use a tank system is determined to be unfit for use, the following steps will be taken, as deemed necessary.
(a) Cessation of use; prevent flow or addition of wastes. The owner or operator must immediately stop the flow of hazardous waste into the tank system or secondary containment system and inspect the system to determine the cause of the release.	When a spill or leak from a tank system is encountered, the plant shift supervisor/EAM will have the situation assessed, and determine the proper and safe action(s) through consultation with the appropriate Subject Matter Expert(s) (SME), if any, necessary to best stop the spill or leak (e.g., stop the flow of waste into or out of the tank). Additional waste will not be added to the tank. All of the subject tanks are mixed waste tanks and radiological considerations will in most cases impede efforts to remove the waste from the tank or secondary containment system within 24 hours. However, the waste will be addressed in as timely a manner as is possible to prevent harm to human health and the environment while ensuring the safety of the facility personnel responding to the spill/leak.
(b) Removal of waste from tank system or secondary containment system. (1) If the release was from the tank system, the owner/operator must, within 24 hours after detection of the leak or, if the owner/operator demonstrates that it is not possible, at the earliest practicable time, remove as much of the waste as is necessary to prevent further release of hazardous waste to the environment and to allow inspection and repair of the tank system to be performed. (2) If the material released was to a secondary containment system, all released materials must be removed within 24 hours or in as timely a manner as is possible to prevent harm to human health and the environment.	After ensuring personnel safety, the most important task is to identify the source of the spill/leak and the actual and potential extent of the leak/spill, for example: • A minor leak from ancillary equipment (i.e., a pump or valve, that can be easily stopped/controlled). • A minor tank leak/spill that can be easily stopped. • A minor leak or spill to a secondary containment system or portion of INTEC that can be easily stopped. • A major tank leak from which total loss of contents could be realized. Once the source of the leak/spill is identified and controlled within the cell, trained INTEC facility personnel assess the extent of the spill/leak and initiate corrective actions and cleanup activities

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
	In the most extreme case of tank failure, the INTEC EAM will be notified and the contingency plan activated.
(c) Containment of visible releases to the environment. The owner/operator must immediately conduct a visual inspection of the release and, based upon that inspection: (1) Prevent further migration of the leak or spill to soils or surface water; and (2) Remove, and properly dispose of, any visible contamination of the soil or surface water.	Since all tanks and ancillary equipment are contained within permanent structures, release to soils or surface water is extremely unlikely. In the event a release to the environment is detected, a visual inspection will be conducted immediately. Migration of the leak or spill toward soils or surface water will be prevented as practicable and any contaminated materials will be removed, characterized, and properly disposed.
(d) Notifications, reports. (1) Any release to the environment, except as provided in paragraph (d)(2) of this section, must be reported to the Regional Administrator within 24 hours of its detection. If the release has been reported pursuant to 40 CFR Part 302, that report will satisfy this requirement. (2) A leak or spill of hazardous waste is exempted from the requirements of this paragraph if it is: (i) Less than or equal to a quantity of one (1) pound, and (ii) Immediately contained and cleaned up. (3) Within 30 days of detection of a release to the environment, a report containing the following information must be submitted to the Regional Administrator (i) Likely route of migration; (ii) Characteristics of the surrounding soil (composition, geology, hydrogeology, climate); (iii) Results of any monitoring or sampling conducted in connection with the release (if available). If sampling or monitoring data relating to the release are not available within 30 days, these data must be submitted to the Regional Administrator as soon as they become available. (iv) Proximity to downgradient drinking water, surface water, and populated areas; and (v) Description of response actions taken or planned.	Any release from the tank system to the soil, groundwater, or surface water will be reported to the Director of DEQ within 24 hours of detection, unless: • The release has already been reported pursuant to 40 CFR Part 302, or • It is a spill of hazardous waste totaling less than or equal to one pound that was immediately contained and cleaned up. Within 30 days of detection of a release from the tank system to the soil, groundwater, or surface water, a report detailing the release will be submitted to the Director of DEQ. This report will, at a minimum, contain the following: • The likely route of migration. • Characteristics of the surrounding soil. • The results of any monitoring or sampling conducted in connection with the release, if available. • Proximity to downgradient drinking water, surface water, and populated areas. • A description of response actions taken or planned. In all cases the proper reports will be filed in accordance with Section G-8, the incident will be documented in the unit's operating record, and the PPE/equipment used in the response will be decontaminated or disposed of and replaced. All tanks and ancillary equipment are secondarily contained and/or may be visually inspected. Once a release has been contained and cleaned up, the affected unit(s) will be inspected and returned to service, provided that: • The cause of the release has been identified.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
(e) Provision of secondary containment, repair, or closure. (1) Unless the owner/operator satisfies the requirements of paragraphs (e)(2) through (4) of this section, the tank system must be closed in accordance with Sec. 264.197. (2) If the cause of the release was a spill that has not damaged the integrity of the system, the owner/operator may return the system to service as soon as the released waste is removed and repairs, if necessary, are made. (3) If the cause of the release was a leak from the primary tank system into the secondary containment system, the system must be repaired prior to returning the tank system to service. (4) If the source of the release was a leak to the environment from a component of a tank system without secondary containment, the owner/operator must provide the component of the system from which the leak occurred with secondary containment that satisfies the requirements of Sec. 264.193 before it can be returned to service, unless the source of the leak is an aboveground portion of a tank system that can be inspected visually. If the source is an aboveground component that can be inspected visually, the component must be repaired and may be returned to service without secondary containment as long as the requirements of paragraph (f) of this section are satisfied. If a component is replaced to comply with the requirements of this subparagraph, that component must satisfy the requirements for new tank systems or components in Sections 264.192 and 264.193. Additionally, if a leak has occurred in any portion of a tank system component that is not readily accessible for visual inspection (e.g., the bottom of an inground or onground tank), the entire component must be provided with secondary containment in accordance with Sec. 264.193 prior to being returned to use.	• The integrity of the tank and/or ancillary equipment has not been compromised. • The source of the release has been repaired, as necessary. • The affected area has been decontaminated. • Spill response equipment has been replenished or decontaminated and returned to service. **This space was intentionally left blank**

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
(f) Certification of major repairs. If the owner/operator has repaired a tank system in accordance with paragraph (e) of this section, and the repair has been extensive (e.g., installation of an internal liner; repair of a ruptured primary containment or secondary containment vessel), the tank system must not be returned to service unless the owner/operator has obtained a certification by a qualified, registered, professional engineer in accordance with Sec. 270.11(d) that the repaired system is capable of handling hazardous wastes without release for the intended life of the system. This certification must be submitted to the Regional Administrator within seven days after returning the tank system to use.	When a tank system repair has been extensive (e.g., repair of a ruptured primary containment or secondary containment), the tank system will not be returned to service until a certification by a qualified, registered, professional engineer in accordance with 40 CFR § 270.11(d) has been obtained. The certification will reflect that the repaired system is capable of handling hazardous wastes without release for the intended life of the system. This certification will be submitted to the DEQ within seven days after returning the tank system to use. **This space was intentionally left blank**
G-5. Emergency Equipment 40 CFR § 264.52(e) 40 CFR § 264.52(e) The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), where this equipment is required. This list must be kept up to date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.	**G-5. Emergency Equipment** A variety of equipment is available at the INTEC for emergency response, containment, and cleanup operations. This includes equipment for spill control, fire control, personnel protection, monitoring and medical attention, communications, and alarms. This equipment is immediately available to emergency response personnel. A listing of typical emergency equipment is shown in Tables G-1 through G-4. In the event a spill cannot be mitigated with the supplies kept at the permitted units, additional response supplies are available throughout the INTEC, and throughout the INL.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	Safety and emergency equipment located at CPP-604 includes: • Portable fire extinguishers • Safety showers/eye wash stations • Spill control cabinet • Communication devices • Plant voice paging and evacuation alarm system. Safety and emergency equipment located at CPP-1618 includes: • Portable fire extinguishers • Safety showers/eye wash stations • Communication devices • Spill control cabinets. Safety and emergency equipment located at CPP-659 includes: • Portable fire extinguishers • Safety showers/eye wash stations • Communication devices • Spill control cabinets. Safety and emergency equipment located at CPP-1696 includes: • Portable fire extinguishers • Safety showers/eye wash stations • Spill control cabinets • Communication devices • IWTU Facility intercom system inside the facility building and the INTEC voice paging and evacuation alarm system outside the facility building. The following are examples of the safety equipment available for spill control in the permitted units: • Acid suits (disposable and reusable) and acid gloves (neoprene) • Spill control pillows • Hazardous waste bags

<table>
<tr><th>AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION</th><th>COMPLIANCE METHODOLOGY</th></tr>
<tr><td>This space was intentionally left blank</td><td>• Plastic buckets
• Hazardous material pigs
• Safety rope and signs
• Radiation rope/ribbon and radiological tags/signs
• Duct tape
• pH paper
• Shovel (flat head)
• Smear paper and envelopes
• Grease/standard pencils
• Mops
• Absorbent
• Acid/caustic neutralizers
• Splash goggles.

Safety and emergency equipment provide adequate capabilities for trained personnel to respond to and control leaks, spills, and emergency situations until assistance arrives. The INL Fire Department has other emergency equipment including, but not limited to, self-contained breathing apparatus (SCBAs), stretchers, and first-aid kits.</td></tr>
<tr><td>G-6. Coordination Agreements 40 CFR §§ 264.52(c) and 264.37

40 CFR § 264.52(c) The plan must describe arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services pursuant to 264.37.

40 CFR § 264.37 Arrangements with local authorities.

(a) The owner or operator must attempt to make the following arrangements, as appropriate for the type of waste handled at his facility and the potential need for the services of these organizations:</td><td>G-6. Coordination Agreements

The INTEC EAM will ensure initial responders are dispatched to an emergency event originating at the INTEC. However, the level of response depends on the nature and extent of the incident. If warranted, additional INL resources are obtained, such as on-Site security, medical, and fire assistance, which are available on a 24-hour basis.

Section G-1, General Information [40 CFR § 264.53(b)], contains the list of off-Site state, local and tribal agencies that are familiar with the contingency plan and may be called upon through agreements with the DOE-ID.</td></tr>
</table>

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
(1) Arrangements to familiarize police, fire departments, and emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel would normally be working, entrances to and roads inside the facility, and possible evacuation routes. (2) Where more than one police and fire department might respond to an emergency, agreements designating primary emergency authority to a specific police and a specific fire department, and agreements with any others to provide support to the primary emergency authority; (3) Agreements with State emergency response teams, emergency response contractors, and equipment suppliers; and (4) Arrangements to familiarize local hospitals with the properties of hazardous waste handled at the facility and the types of injuries or illnesses which could result from fires, explosions, or releases at the facility. (b) Where State or local authorities decline to enter into such arrangements, the owner or operator must document the refusal in the operating record.	**This space was intentionally left blank**
G-7. Evacuation Plan 40 CFR § 264.52(f) 40 CFR § 264.52(f) The plan must include an evacuation plan for facility personnel where there is a possibility that an evacuation could be necessary. This plan must describe signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).	**G-7. Evacuation Plan** The normal actions to protect non-emergency personnel are to minimize their exposure to radiation, airborne radioactivity, hazardous chemicals, and airborne hazardous chemicals, by seeking shelter, avoiding the accident area, or evacuating selected buildings or areas. In the event of an emergency, which results in high radiation, hazardous chemical levels, or a continuing release to the environment, it may become necessary to evacuate the entire INTEC area. Building and Emergency Plan Maps depicting evacuation routes are located throughout the INTEC buildings. Upon exiting a building, personnel proceed to a designated staging area not affected by the emergency, or in accordance with direction given by the PSS/EAM.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
This space was intentionally left blank	The INTEC evacuation system alerts personnel in case of an evacuation. This system is on backup power; should power fail, it will automatically switch to a battery. Evacuation sirens are strategically located throughout the INTEC to provide coverage for all occupied areas. If the evacuation alarm is out of service or fails to operate, the evacuation will be communicated over the voice paging system, by word of mouth, or by security personnel using sirens or the voice amplifiers in their vehicles. Inside the IWTU facility, the building intercom system alerts personnel in case of an evacuation. The intercom system is on backup power; should power fail, it will automatically switch to a battery. Outside the IWTU facility building, the INTEC evacuation system alerts personnel in case of an evacuation. Designated personnel, known as area wardens, are assigned responsibility for ensuring that personnel are evacuated from the area warden's assigned area or building or accounted for during evacuations. The following procedure will allow for a safe, coordinated evacuation: (1) When an evacuation is announced, stop work. (2) Follow the voice-paging instruction or proceed to the closest building exit, unless blocked by hazards. (3) Do not remain in the affected area. Assist injured personnel in evacuating the facility. (4) Exit the facility through the security access points to the designated assembly area. (5) Report to designated assembly area for roll call. (6) Be continually cognizant of wind direction (stay upwind) and emergency equipment. (7) Do not reenter the fenced area of the INTEC, until the EAM authorizes reentry. During an evacuation, all personnel will remain in the designated assembly area, until given further instructions. The primary evacuation routes for the permitted units are depicted in the Exhibits located at the end of this section. Alternative evacuation routes are through the nearest unobstructed emergency exit. **Evacuation Alarm** signal is an alternating tone-generated siren. Inside the IWTU facility, the evacuation alarm is announced over the building intercom system. Outside the IWTU facility, the INTEC evacuation alarm signal notifies IWTU personnel of an evacuation event. **Fire Alarm** is announced over the INTEC voice paging system. Inside the IWTU facility, the fire alarm is announced over the building intercom system. Outside the IWTU facility, IWTU personnel are notified of a fire alarm by announcement over the INTEC voice paging system. **Take-Cover Alarm** is a steady tone-generated siren. This signal provides an emergency option to total INTEC evacuation. Inside the IWTU facility, the take cover alarm is announced over the building intercom system. Outside the IWTU facility, IWTU personnel are notified of a take cover event by the INTEC take cover alarm.

AT KEARNEY FORMAT SECTION REGULATORY REFERENCE/CITATION	COMPLIANCE METHODOLOGY
G-8. Required Reports 40 CFR § 264.56(j) and 40 CFR § 264.56(i).	**G-8. Required Reports**
40 CFR § 264.56(j) The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the CP. Within 15 days after the incident, he must submit a written report on the incident to the Regional Administrator. The report must include:	Any fire, explosion, or unplanned release of hazardous or mixed waste or hazardous constituent requiring activation of the contingency plan will be reported by the permittee in writing within 15 days to the Director of the Department of Environmental Quality. Such reports will include, as a minimum, the following:
(1) Name, address, and telephone number of the owner or operator;	• Name, address, and telephone number of the facility owner/operator
(2) Name, address, and telephone number of the facility;	• Name, address, and telephone number of the facility
(3) Date, time, and type of incident (e.g., fire, explosion);	• Date, time, and type of incident (e.g., fire, explosion, release)
(4) Name and quantity of material(s) involved;	• Name and quantity of the material(s) involved
(5) The extent of injuries, if any;	• Extent of any injuries to personnel at the facility
(6) An assessment of actual or potential hazards to human health or the environment, where this is applicable; and	• An assessment of any actual or potential hazards to human health or the environment, as applicable
(7) Estimated quantity and disposition of recovered material that resulted from the incident.	• Estimated quantity and disposition of material recovered from the incident (includes fire fighting materials, such as water, foam, adsorbents/absorbents, etc.). In accordance with IDAPA58.01.05.008 [40 CFR § 264.56(i)], the permittee will notify the Director of the Department of Environmental Quality:
40 CFR § 264.56(i) The owner or operator must notify the Regional Administrator, and appropriate State and local authorities, that the facility is in compliance with paragraph (h) of this section before operations are resumed in the affected area(s) of the facility.	• The permitted units are in compliance with requirements for the cleanup of areas affected by the emergency and that the emergency equipment used in the emergency response has been cleaned or replaced and is fit for the intended use, before the resumption of waste management activities. • The permitted units have experienced a fire, explosion, spill, or release of hazardous waste or hazardous waste constituents or an emergency resulting in a release of a hazardous substance included in 40 CFR § 302.4 that could threaten human health or the environment outside the INTEC. The contingency plan will be activated, and the EAM will ensure that local authorities are notified in writing.

Table G-1. Emergency response equipment available at CPP-604

Emergency Equipment	Location	Capabilities
Fire control		
Wet-pipe fire sprinkler system	Throughout CPP-604	Fire control / suppression
Portable fire extinguisher (ABC or CO_2)	See Exhibits G-1 through G-4	Use during incipient stage of fire (10 to 60 second discharge time)
Emergency Communication/Alarm System		
Manual fire alarm boxes	Located on each level throughout CPP-604	Summon INL Fire Department
Communication Devices	Located on each level throughout CPP-604	On-Site / Off-Site communications
Site-wide evacuation alarm	Alarm may be sounded throughout INTEC	Provides immediate notice of evacuation
Internal voice paging system	Located on each level throughout CPP-604	Provides general and emergency information
Personal Protection		
Acid suits	See Exhibits G-1 through G-4 (located in WO area)	Protection during spill response
Acid boots	See Exhibits G-1 through G-4 (located in WO area)	Protection during spill response
Acid gloves	See Exhibits G-1 through G-4 (located in WO area)	Protection during spill response
Face shields and/or safety glasses	See Exhibits G-1 through G-4 (located in WO area)	Protection against liquid splash
Spill Control, Containment, Cleanup		
Plastic buckets	Located in WO area	Clean up small spills
Spill control pillows	Located in WO area	Contain / absorb small spills
Hazardous material pigs	Located in WO area	Contain / absorb small spills
Hazardous material bags	Located in WO area	Clean up small spills
Safety rope	Located in WO area	Isolate affected area
Acid / Chemical spill warning signs	Located in WO area	Warn others
pH paper	Located in WO area	Characterize spilled material
Acid spill supplies	Located in WO area	Clean up small acid spills
Safety Equipment		
Safety showers	See Exhibits G-1 through G-4	Remove contamination
Eye wash stations	See Exhibits G-1 through G-4	Flush eyes for chemical and particulate contamination

Table G-2. Emergency response equipment available at CPP-1618

Emergency Equipment	Location	Capabilities
Fire control		
Wet-pipe fire sprinkler system	Throughout CPP-1618	Fire control / suppression
Portable fire extinguisher (ABC or CO_2)	See Exhibits G-5 through G-7	Use during incipient stage of fire (10 to 60 second discharge time)
Emergency Communication/Alarm System		
Manual fire alarm boxes	Located on each level throughout CPP-1618	Summon INL Fire Department
Communication Devices	Located on each level throughout CPP-1618	On-Site / Off-Site communications
Site-wide evacuation alarm	Alarm may be sounded throughout INTEC	Provides immediate notice of evacuation
Internal voice paging system	Located on each level throughout CPP-1618	Provides general and emergency information
Personal Protection		
Acid suits	See Exhibits G-5 through G-7 (located in spill cabinets)	Protection during spill response
Acid boots	See Exhibits G-5 through G-7 (located in spill cabinets)	Protection during spill response
Acid gloves	See Exhibits G-5 through G-7 (located in spill cabinets)	Protection during spill response
Face shields and/or safety glasses	See Exhibits G-5 through G-7 (located in spill cabinets)	Protection against liquid splash
Spill Control, Containment, Cleanup		
Plastic buckets	See Exhibits G-5 through G-7 (located in spill cabinets)	Clean up small spills
Spill control pillows	See Exhibits G-5 through G-7 (located in spill cabinets)	Contain / absorb small spills
Hazardous material pigs	See Exhibits G-5 through G-7 (located in spill cabinets)	Contain / absorb small spills
Hazardous material bags	See Exhibits G-5 through G-7 (located in spill cabinets)	Clean up small spills
Safety rope	See Exhibits G-5 through G-7 (located in spill cabinets)	Isolate affected area
Acid / Chemical spill warning signs	See Exhibits G-5 through G-7 (located in spill cabinets)	Warn others
pH paper	See Exhibits G-5 through G-7 (located in spill cabinets)	Characterize spilled material
Acid spill supplies	See Exhibits G-5 through G-7 (located in spill cabinets)	Clean up small acid spills
Safety Equipment		
Safety showers	See Exhibits G-5 through G-7	Remove contamination
Eye wash stations	See Exhibits G-5 through G-7	Flush eyes for chemical and particulate contamination

Table G-3. Emergency response equipment available at CPP-659.

Emergency Equipment	Location	Capabilities
Fire control		
Wet-pipe fire sprinkler system	Throughout CPP-659	Fire control / suppression
Portable fire extinguisher (ABC or CO_2)	See Exhibit G-8 through G-10	Use during incipient stage of fire (10 to 60 second discharge time)
Emergency Communication/Alarm System		
Manual fire alarm boxes	Located on each level throughout CPP-659	Summon INL Fire Department
Communication Devices	Located on each level throughout CPP-659	On-Site / Off-Site communications
Site-wide evacuation alarm	Alarm may be sounded throughout INTEC	Provides immediate notice of evacuation
Internal voice paging system	Located on each level throughout CPP-659	Provides general and emergency information
Personal Protection		
Acid suits	See Exhibits G-8 through G-10 (located in spill cabinets)	Protection during spill response
Acid boots	See Exhibits G-8 through G-10 (located in spill cabinets)	Protection during spill response
Acid gloves	See Exhibits G-8 through G-10 (located in spill cabinets)	Protection during spill response
Face shields and/or safety glasses	See Exhibits G-8 through G-10 (located in spill cabinets)	Protection against liquid splash
Spill Control, Containment, Cleanup		
Plastic buckets	See Exhibits G-8 through G-10 (located in spill cabinets)	Clean up small spills
Spill control pillows	See Exhibits G-8 through G-10 (located in spill cabinets)	Contain / absorb small spills
Hazardous material pigs	See Exhibits G-8 through G-10 (located in spill cabinets)	Contain / absorb small spills
Hazardous material bags	See Exhibits G-8 through G-10 (located in spill cabinets)	Clean up small spills
Safety rope	See Exhibits G-8 through G-10 (located in spill cabinets)	Isolate affected area
Acid / Chemical spill warning signs	See Exhibits G-8 through G-10 (located in spill cabinets)	Warn others
pH paper	See Exhibits G-9 through G-10 (located in spill cabinets)	Characterize spilled material
Acid spill supplies	See Exhibits G-8 through G-10 (located in spill cabinets)	Clean up small acid spills
Safety Equipment		
Safety showers	See Exhibits G-8 through G-10	Remove contamination
Eye wash stations	See Exhibits G-8 through G-10	Flush eyes for chemical and particulate contamination

Table G-4. Emergency response equipment available at CPP-1696

Emergency Equipment	Location	Capabilities
Fire control		
Wet/Dry-pipe fire sprinkler system	Throughout CPP-1696 except shielded process cells*	Fire control / suppression
Portable fire extinguisher (ABC or CO_2)	See Exhibit G-11	Use during incipient stage of fire (10 to 60 second discharge time)
Emergency Communication/Alarm System		
Manual fire alarm boxes	Located throughout CPP-1696	Summon INL Fire Department
Communication Devices	Located throughout CPP-1696	On-Site / Off-Site communications
Site-wide evacuation alarm	Alarm may be sounded throughout INTEC	Provides immediate notice of evacuation
Internal voice paging/intercom system	Located throughout CPP-1696	Provides general and emergency information
Personal Protection		
Acid suits	See Exhibit G-11 (located in spill cabinets)	Protection during spill response
Acid boots	See Exhibit G-11 (located in spill cabinets)	Protection during spill response
Acid gloves	See Exhibit G-11 (located in spill cabinets)	Protection during spill response
Face shields and/or safety glasses	See Exhibit G-11 (located in spill cabinets)	Protection against liquid splash
Spill Control, Containment, Cleanup		
Plastic buckets	See Exhibit G-11 (located in spill cabinets)	Clean up small spills
Spill control pillows	See Exhibit G-11 (located in spill cabinets)	Contain / absorb small spills
Hazardous material pigs	See Exhibit G-11 (located in spill cabinets)	Contain / absorb small spills
Hazardous material bags	See Exhibit G-11 (located in spill cabinets)	Clean up small spills
Safety rope	See Exhibit G-11 (located in spill cabinets)	Isolate affected area
Acid / Chemical spill warning signs	See Exhibit G-11 (located in spill cabinets)	Warn others
pH paper	See Exhibit G-11 (located in spill cabinets)	Characterize spilled material
Acid spill supplies	See Exhibit G-11 (located in spill cabinets)	Clean up small acid spills
Safety Equipment		
Safety showers	See Exhibit G-11	Remove contamination
Eye wash stations	See Exhibit G-11	Flush eyes for chemical and particulate contamination

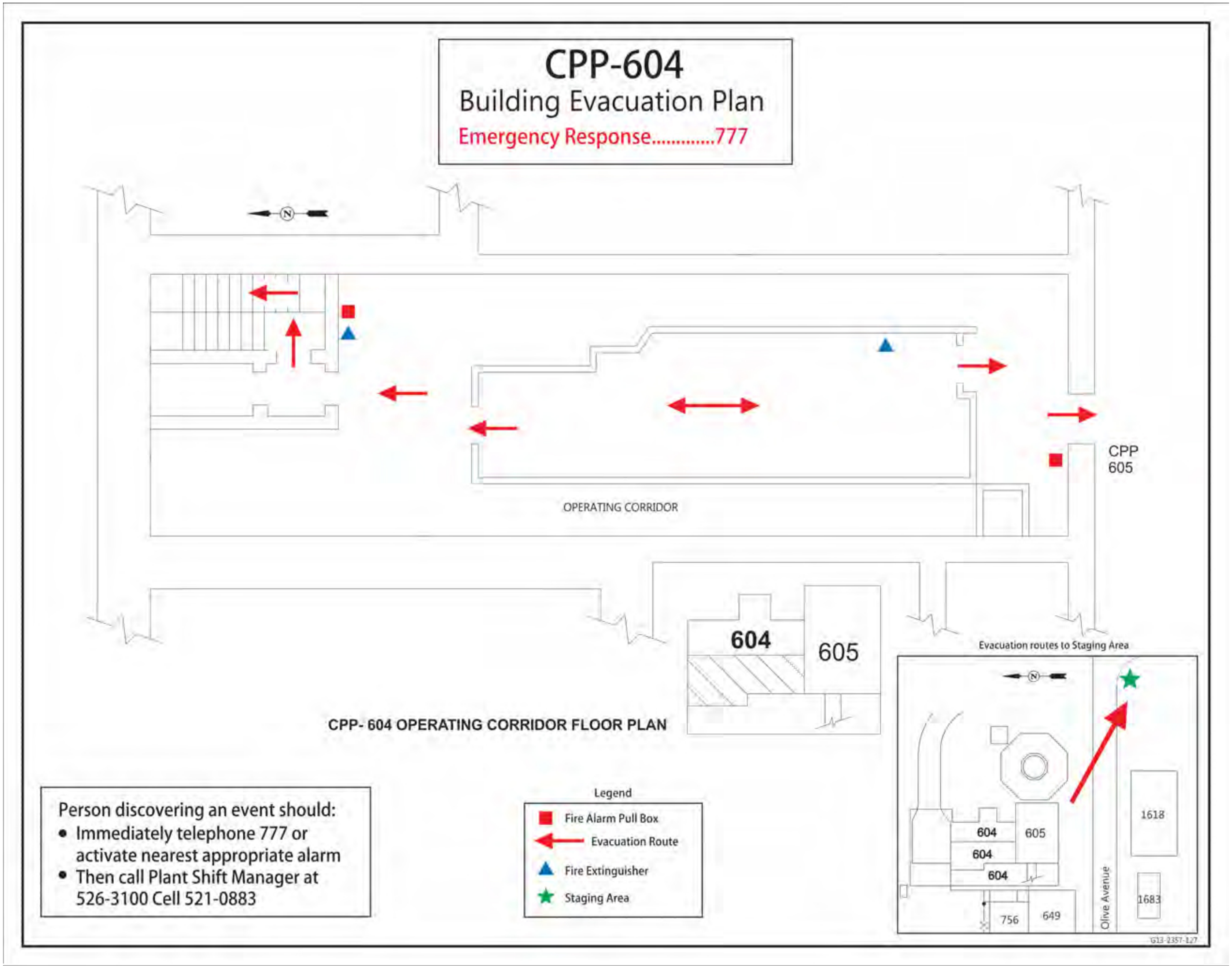


Exhibit G-1. Evacuation Routes and Emergency Equipment, Operating Corridor CPP-604

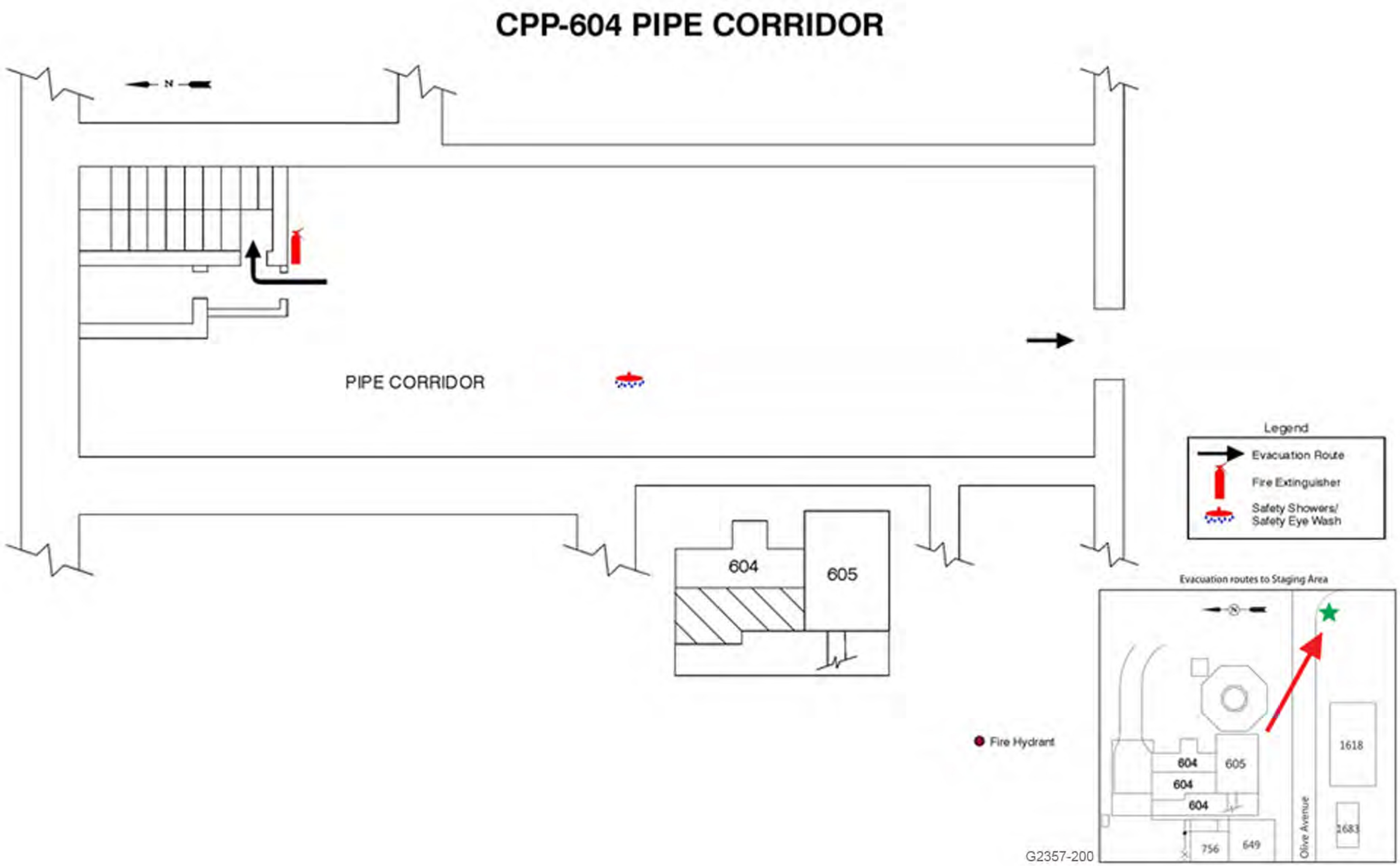


Exhibit G-2. Evacuation Routes and Emergency Equipment, Pipe Corridor CPP-604

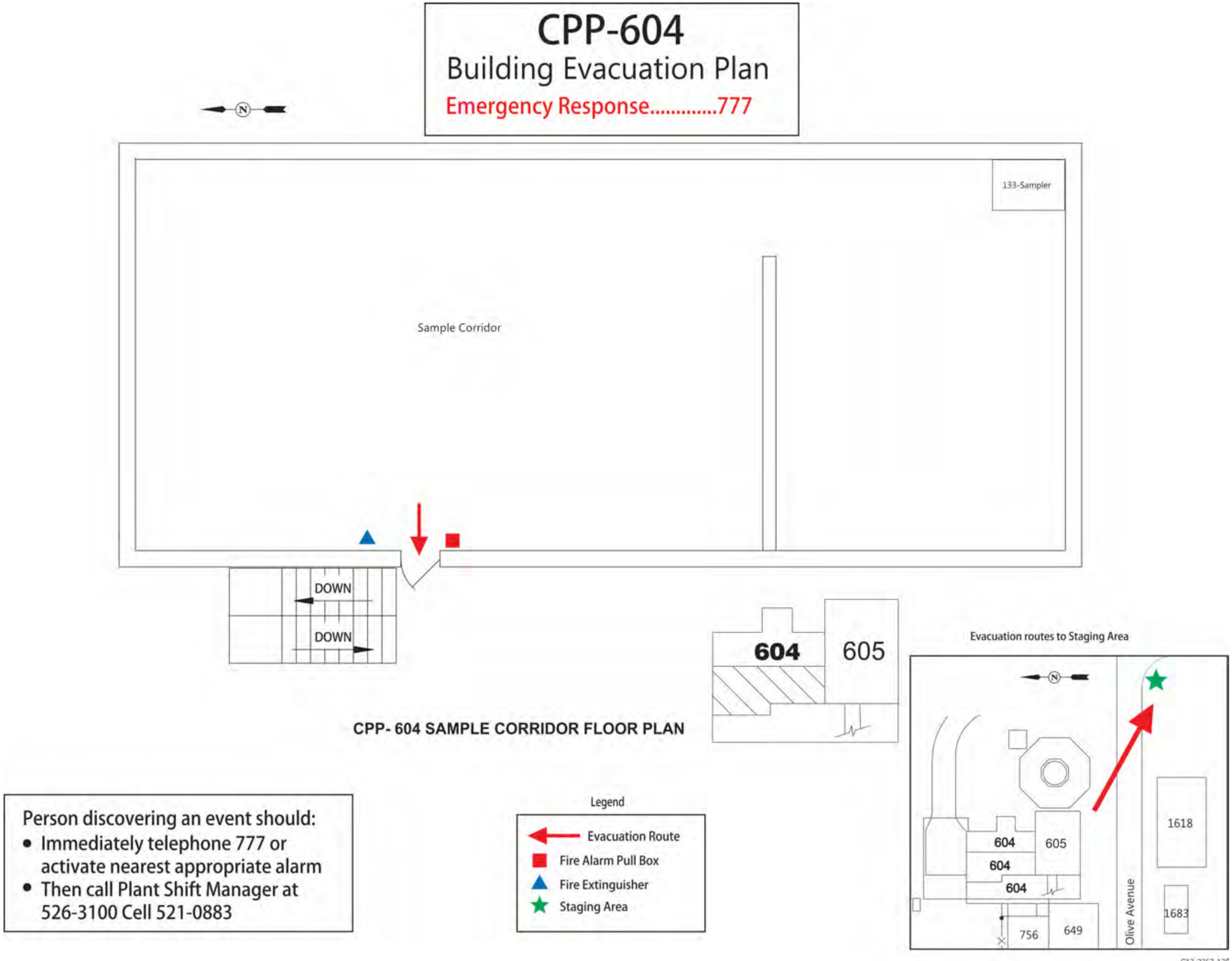


Exhibit G-3. Evacuation Routes and Emergency Equipment, Sample Corridor CPP-604

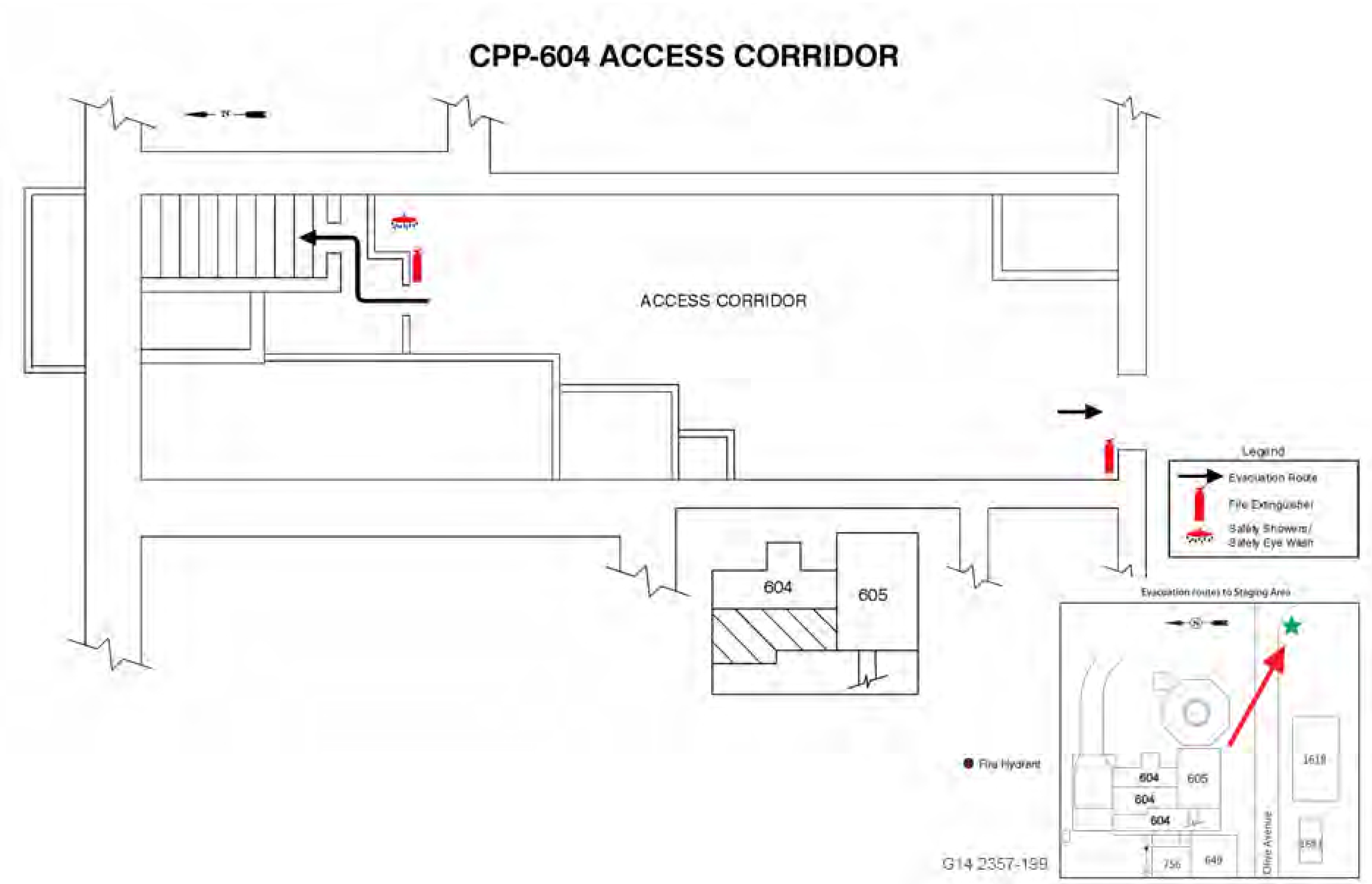


Exhibit G-4. Evacuation Routes and Emergency Equipment, Access Corridor CPP-604

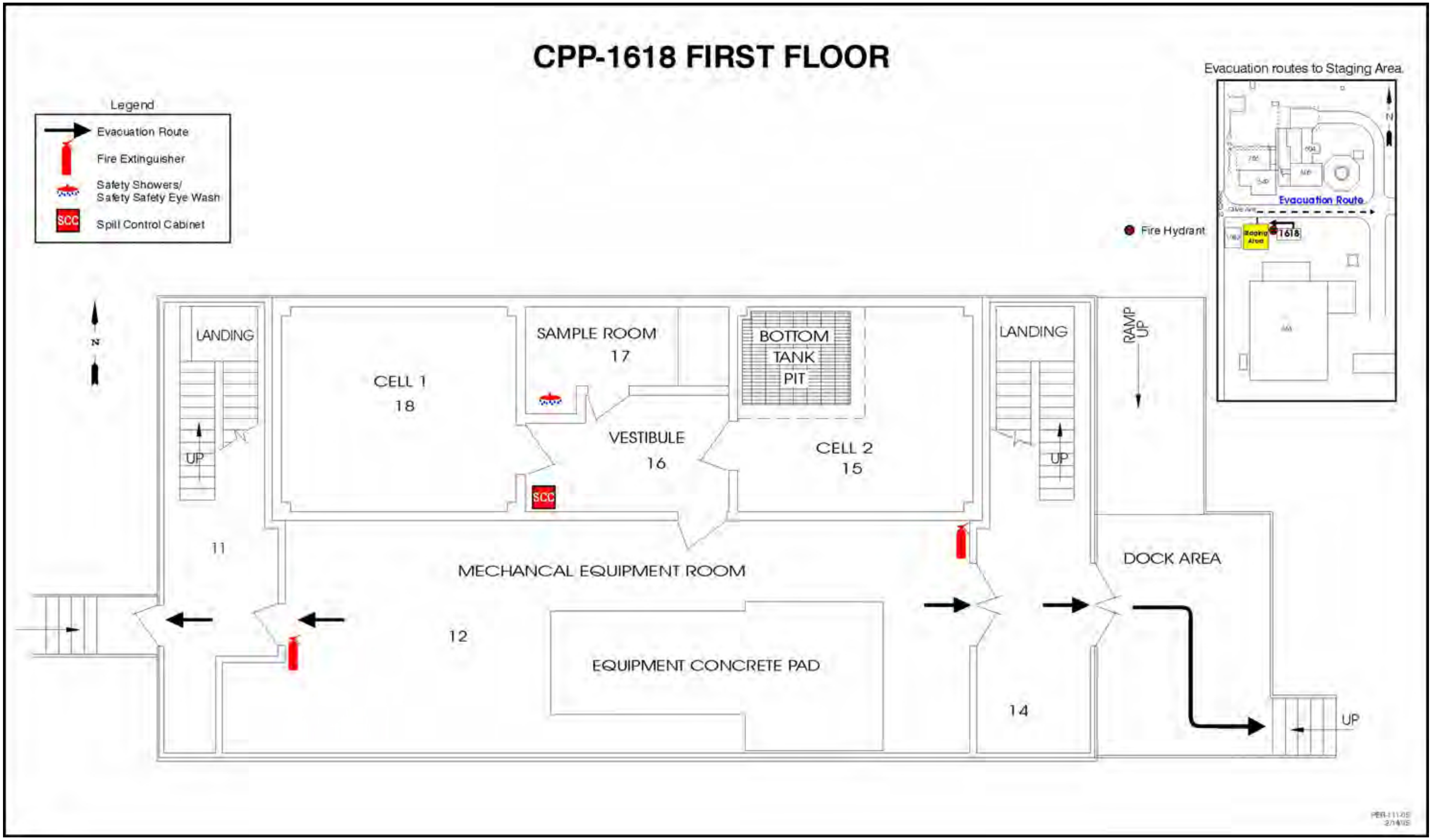


Exhibit G-5. Evacuation Routes and Emergency Equipment, First Floor CPP-1618

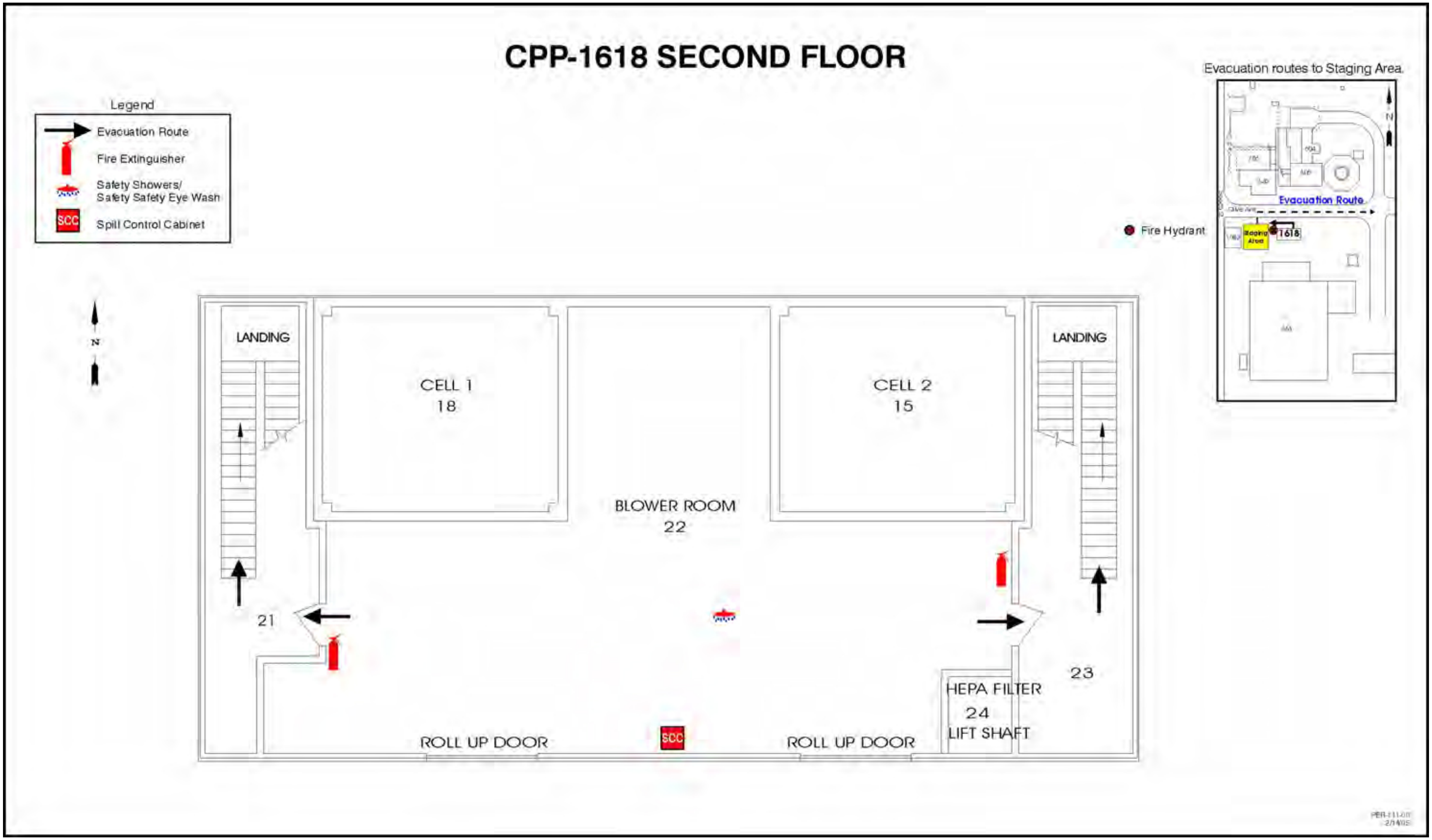


Exhibit G-6. Evacuation Routes and Emergency Equipment, Second Floor CPP-1618

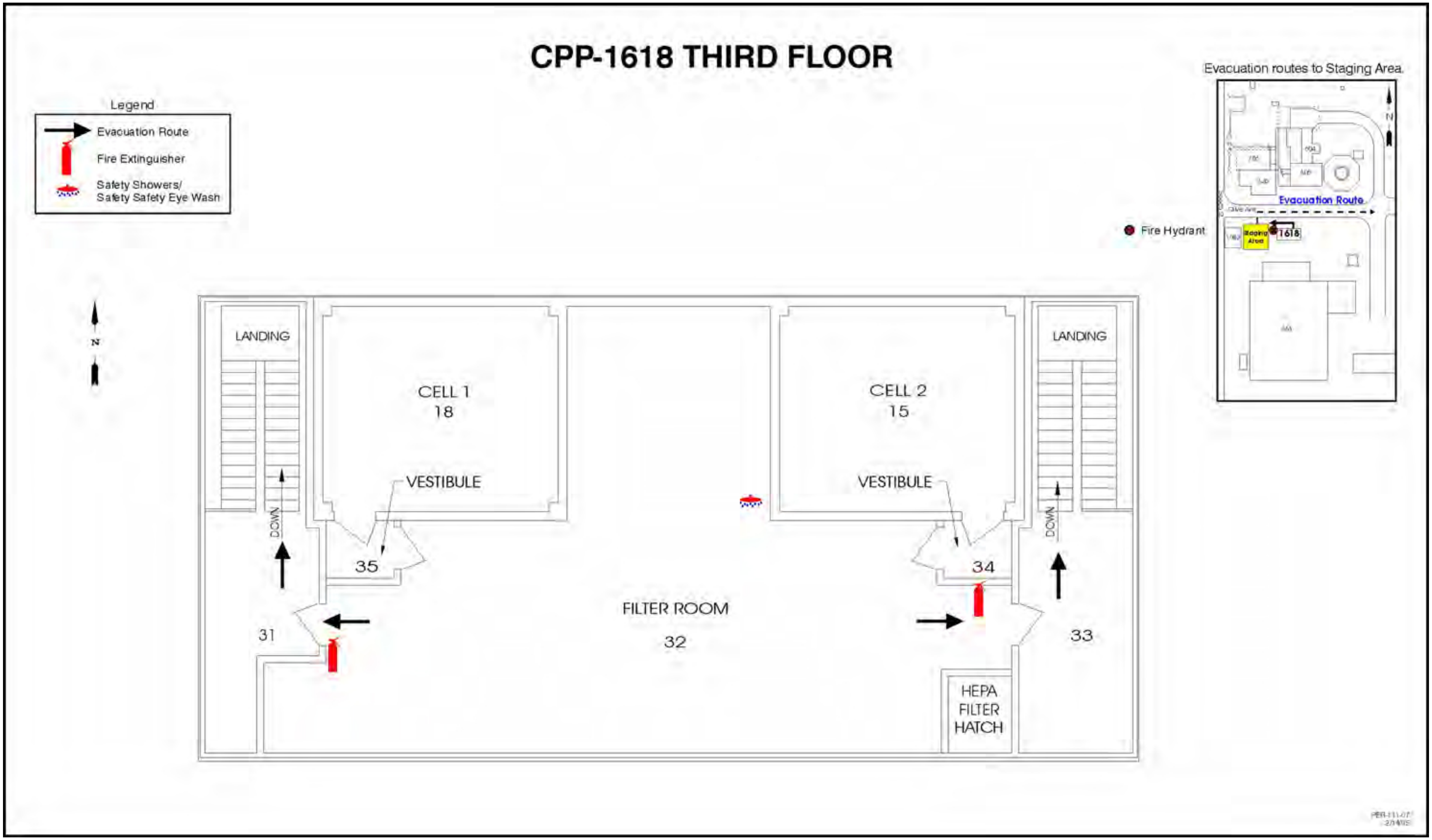


Exhibit G-7. Evacuation Routes and Emergency Equipment, Third Floor CPP-1618

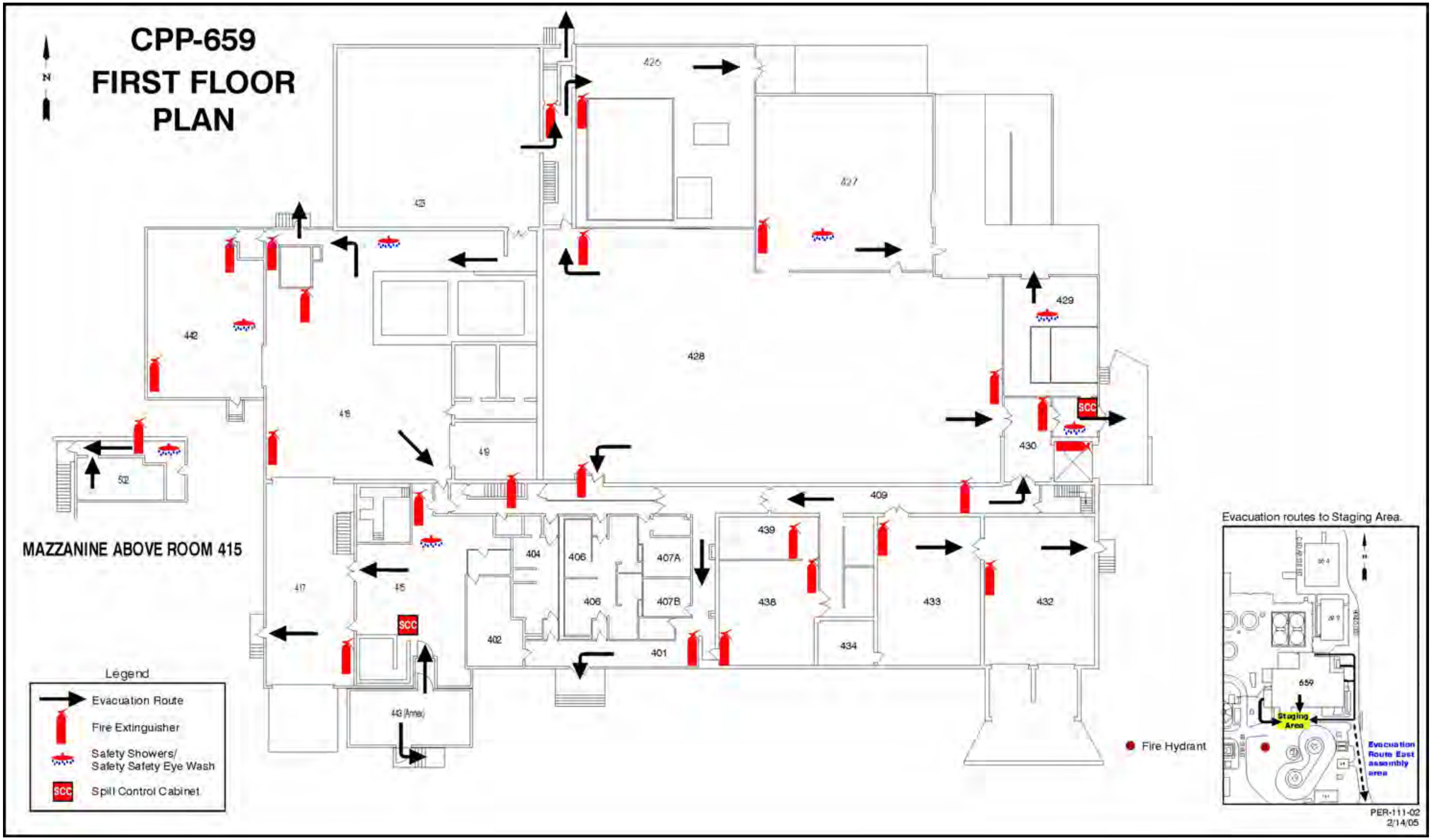


Exhibit G-8. Evacuation Routes and Emergency Equipment, CPP-659 First Floor

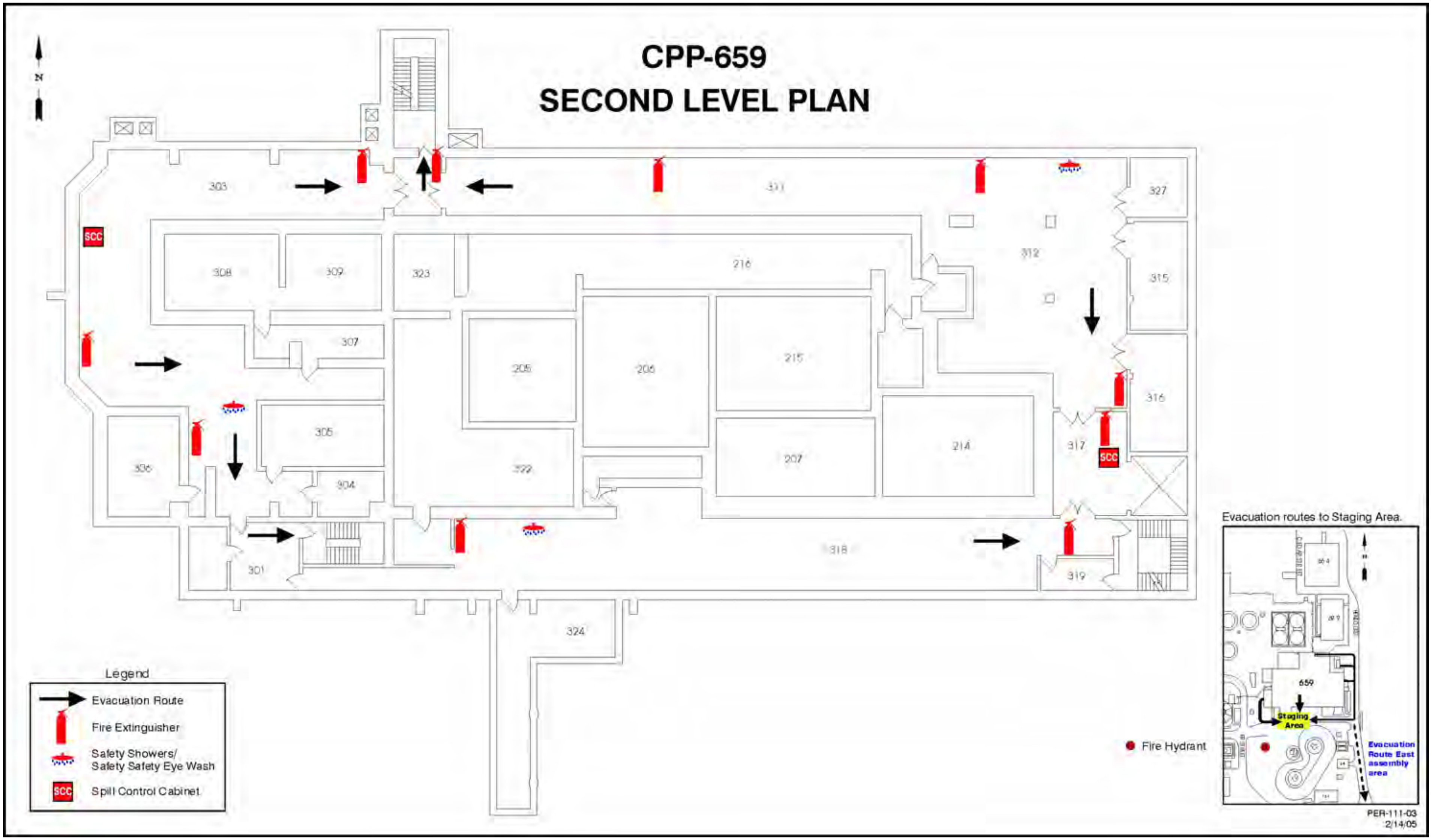


Exhibit G-9. Evacuation Routes and Emergency Equipment, CPP-659 Second Floor

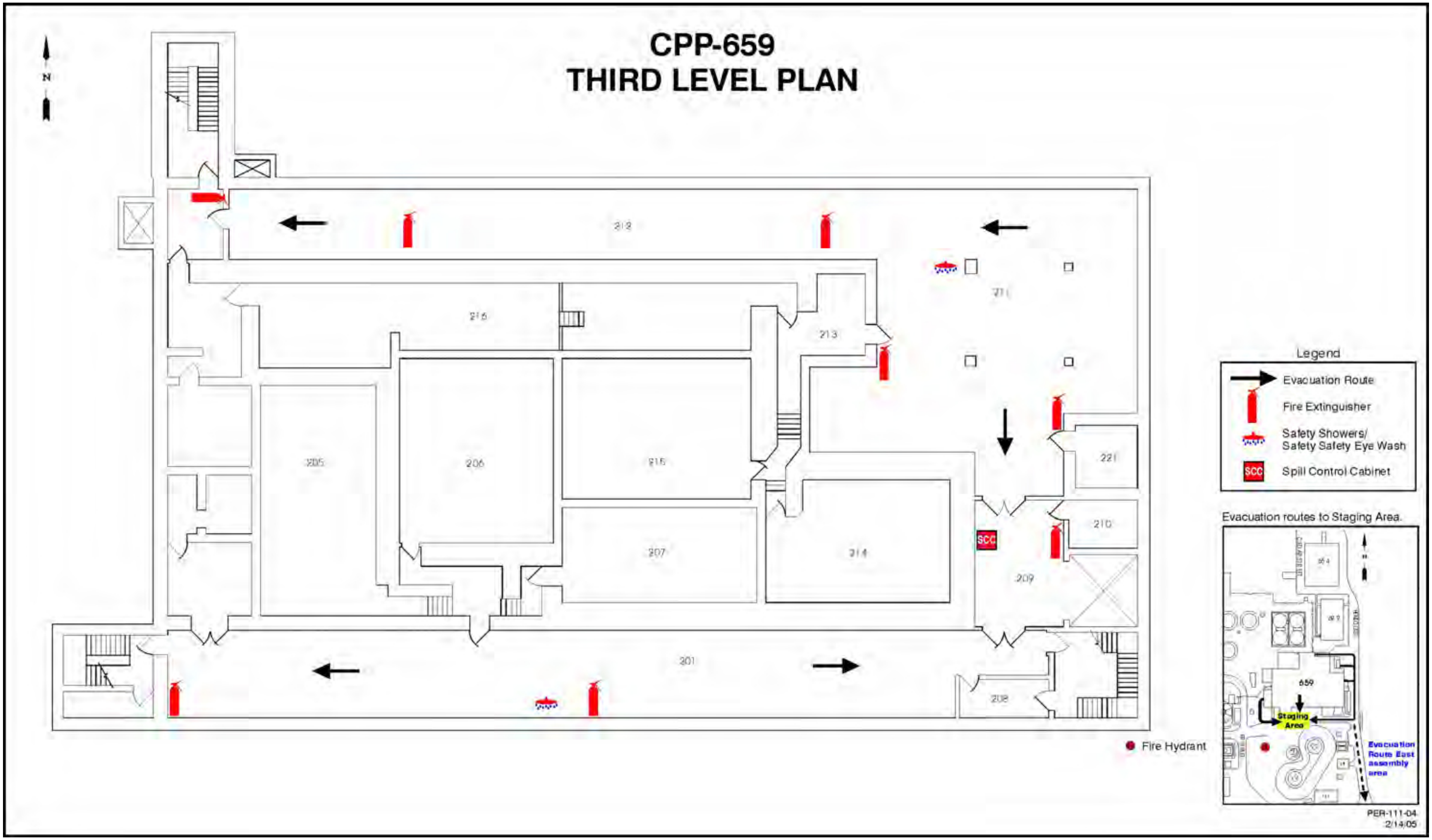


Exhibit G-10. Evacuation Routes and Emergency Equipment, CPP-659 Third Floor

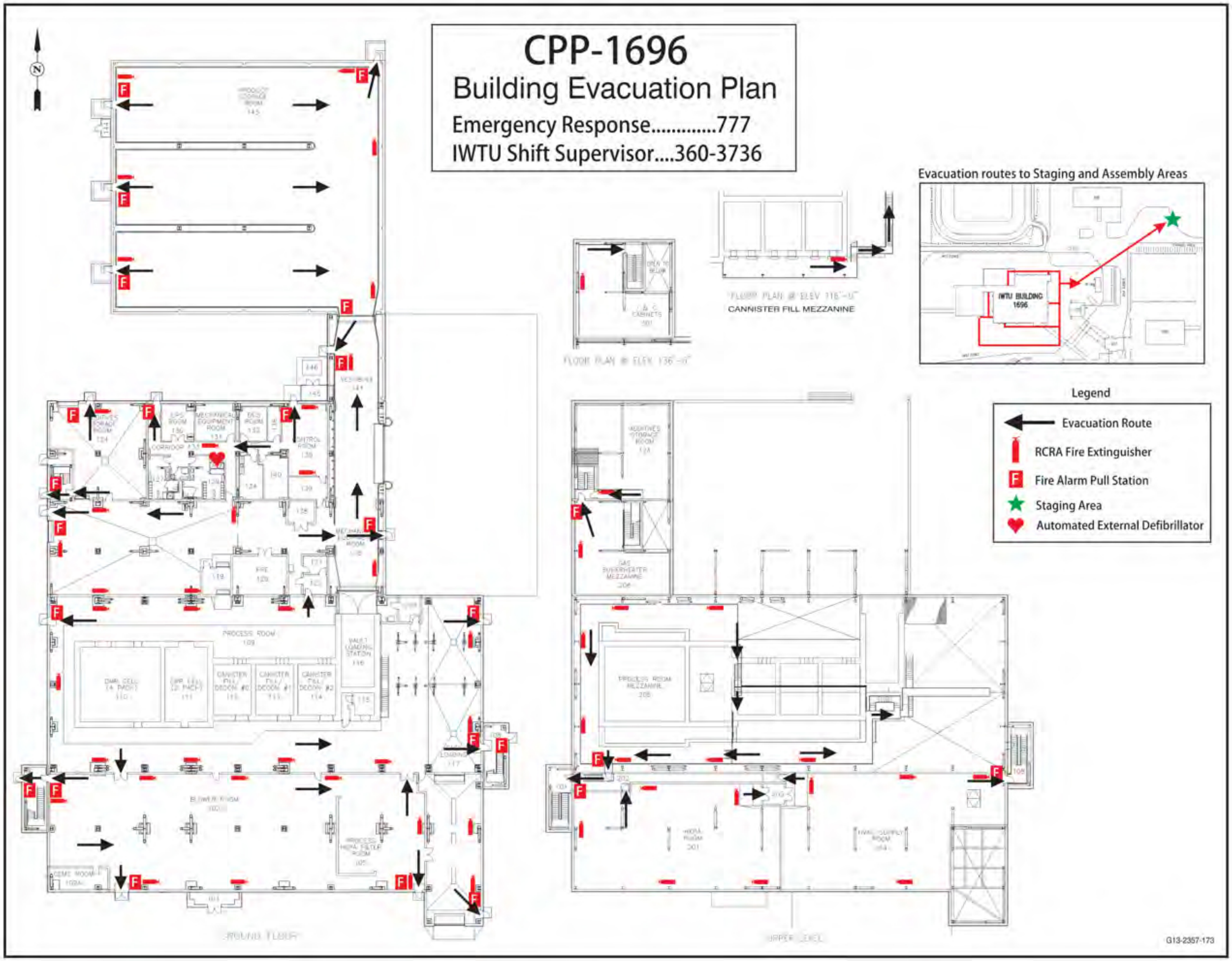


Exhibit G-11. Evacuation Routes and Emergency Equipment, CPP-1696

ATTACHMENT 8 -
SECTION I - CLOSURE
PLAN

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 8, Section I
Closure Plan

Revision Date: November 27, 2017

CONTENTS

ACRONYMS

CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
CRR	Carbon Reduction Reformer
DMR	Denitration and Mineralization Reformer
EPA	Environmental Protection Agency
ETS	Evaporator Tank System
HVAC	heating, ventilating, and air conditioning
HWMA	Hazardous Waste Management Act
IDAPA	Idaho Administrative Procedures Act
ILWMS	INTEC Liquid Waste Management System
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IWTU	Integrated Waste Treatment Unit
LET&D	Liquid Effluent Treatment and Disposal
P.E.	professional engineer
PEWE	Process Equipment Waste Evaporator
RCRA	Resource Conservation and Recovery Act
TFF	Tank Farm Facility
TFT	Tank Farm Tank

I. FACILITY DESCRIPTION

The Idaho National Laboratory (INL) Site encompasses approximately 2,276 km^2 (890 mi^2) on the Eastern Snake River Plain in southeastern Idaho, west of Idaho Falls. Within the laboratory complex are eight major applied engineering, interim storage, and research and development facilities.

The Idaho Nuclear Technology and Engineering Center (INTEC) is situated on the south-central portion of the INL site. INTEC occupies an enclosed and secured area of approximately one km^2 (250 acres). INTEC was initially constructed in the 1950s to reprocess spent fuel from naval ship reactors and has undergone continuous additions and improvements since that time. Current work at INTEC includes receiving and storing spent nuclear fuel, environmental restoration, decontamination and decommissioning activities, and technology development.

Process Equipment Waste Evaporator (PEWE) System

The PEWE system includes tanks and ancillary equipment in Building Numbers CPP-604, CPP-649, and CPP 659. The regulated tanks and ancillary equipment specific to the PEWE system are listed below:

- VES-WL-132, Evaporator Feed Sediment Tank [regulated under the Idaho Administrative Procedures Act (IDAPA) as a storage/treatment tank]
- VES-WL-133, Evaporator Feed Collection Tank (regulated under IDAPA as a storage/treatment tank)
- VES-WL-102, Surge Tank for VES-WL-133 (regulated under IDAPA as a storage/treatment tank)
- VES-WL-109, Evaporator Head Tank (regulated under IDAPA as a storage tank)
- EVAP-WL-129, CPP-604 Evaporator Unit, including VES-WL-129, VES-WL-130, HE-WL-307, and HE-WL-308 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)
- VES-WL-134, Process Condensate Surge Tank (regulated under IDAPA as a storage tank, ancillary to both evaporators)
- EVAP-WL-161, CPP-604 Evaporator Unit, including VES-WL-161, VES-WL-162, HE-WL-300, and HE-WL-301 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)
- VES-WL-131, Process Condensate Surge Tank (regulated under IDAPA as a storage tank)

- VES-WL-108, Process Condensate Knock Out Pot (regulated under IDAPA as a storage tank)
- VES-WL-111, Bottoms Collection Tank (regulated under IDAPA as a storage/treatment tank)
- VES-WL-101, Bottoms Collection Tank (regulated under IDAPA as a storage/treatment tank)
- VES-WL-106, VES-WL-107, and VES-WL-163, CPP-604 Process Condensate Collection Tanks (regulated under IDAPA as storage/treatment tanks)
- VES-WM-100, VES-WM-101, and VES-WM-102, CPP-604 Tank Farm Tanks (regulated under IDAPA as storage/treatment tanks)
- VES-WL-135, -136, -137, -138, -139, -142, -144, and -150 (regulated under IDAPA as storage tanks).

The PEWE system receives mixed wastes from the INTEC and non-INTEC facilities. INTEC wastes are received at the PEWE system through underground piping and are accumulated in the feed collection tank, VES-WL-133, prior to being fed to the evaporators.

The evaporation process reduces the volume of the wastes sent to the INTEC Tank Farm Facility (TFF) for storage. Two waste streams are produced as a result of the evaporation process; overhead condensates and concentrated bottoms. The overhead condensates are further treated at the Liquid Effluent Treatment and Disposal (LET&D) facility. The concentrated bottoms are accumulated in the Bottoms Collection Tank (VES-WL-101 or VES-WL-111). The bottoms are transferred to either VES-WL-101 or VES-WL-111, or are recycled back to VES-WL-133 for further processing. From VES-WL-101 or VES-WL-111, the bottoms can be sent to the CPP-604 Tank Farm Tanks (TFT), (VES-WM-100, VES-WM-101, and VES-WM-102), to the TFF, or to the CPP-659 Blend and Hold Tanks (VES-NCC-101, -102, -103).

Closure Strategy

The strategy is to clean close (decontamination and removal of equipment) the tank systems and miscellaneous units associated with the PEWE system. In the future, as the actual closure of the PEWE system is considered, this closure plan will be modified to reflect any information or condition that has changed or occurred and may precipitate different closure options such as risk based closure or possibly landfill.

Liquid Effluent Treatment and Disposal (LET&D) system

The LET&D system includes fractionators, tanks, and ancillary equipment in Building Numbers CPP-1618 and CPP-659 Annex at the INTEC. The regulated fractionators, tanks, and ancillary equipment specific to the LET&D system are listed below:

- VES-WLK-197, Feed Head Tank (regulated under IDAPA as a storage tank)
- FRAC-WLK-171, CPP-1618 Acid Fractionator, including FRAC-WLK-171, HE-WLK-392, HE-WLK-397, HE-WLK-399, and VES-WLK-199 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)
- FRAC-WLL-170, CPP-1618 Acid Fractionator, including FRAC-WLL-170, HE-WLL-391, HE-WLL-396, HE-WLL-398, and VES-WLL-198 (regulated under IDAPA as a miscellaneous unit with treatment/storage tanks)
- VES-WLL-195, Bottoms Tank (regulated under IDAPA as a storage tank)
- VES-NCR-171, CPP-659 Annex LET&D Nitric Acid Recycle Tank (regulated under IDAPA as a storage tank)
- VES-NCR-173, CPP-659 Annex LET&D Nitric Acid Head Tank (regulated under IDAPA as a storage tank).

The LET&D system receives mixed wastes from the PEWE system as overhead condensates. The overhead condensates are received at the LET&D system through overhead piping and are accumulated in the feed collection tank, VES-WLK-197, prior to being fed to the fractionators.

The fractionation process significantly reduces the volume of waste transferred to the TFF. Two streams are produced as a result of the evaporation process; overhead condensates and concentrated nitric acid bottoms. The overhead condensates are heated, filtered and sent to the INTEC main stack. The concentrated nitric acid bottoms are accumulated in the bottoms collection tank. The concentrated bottoms are transferred to the Nitric Acid Recycle Tank at the CPP-659 Annex for reuse at the INTEC.

Closure Strategy

The strategy is to clean close (decontamination and removal of equipment) the tank systems and miscellaneous units associated with the LET&D system. In the future, as the actual closure of the LET&D system is considered, this closure plan will be modified to reflect any information or condition that has changed or occurred and may precipitate different closure options.

CPP-659 Annex Nitric Acid Recycle System

The CPP-659 Annex Nitric Acid Recycle Tank includes VES-NCR-171, VES-NCR-173, and ancillary equipment at the INTEC.

The concentrated nitric acid bottoms from LET&D are stored in the Nitric Acid Recycle Tank for reuse at the INTEC.

Closure Strategy

The strategy is to clean close (decontamination and removal of equipment) the tank systems associated with the Nitric Acid Recycle system. In the future, as the actual closure of the LET&D system is considered, this closure plan will be modified to reflect any information or condition that has changed or occurred and may precipitate different closure options such as risk based closure or possibly landfill.

CPP-659 Evaporator Tank System

The ETS includes tanks and ancillary equipment in Building Number CPP-659 at the INTEC. The regulated tanks and ancillary equipment specific to the ETS are listed below:

- VES-NCC-152, CPP-659 Constant Head Feed Tank (regulated under the IDAPA as a storage tank)
- EVAP-NCC-150, CPP-659 (which includes HE-NCC-350, HE-NCC-351), (regulated under the IDAPA as a miscellaneous treatment (evaporation) unit and tank storage)
- VES-NCC-101, CPP-659 Blend Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-102, CPP-659 Hold Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-103, CPP-659 Hold Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-119, CPP-659 Fluoride Hot Sump Tank (regulated under the IDAPA as a storage/treatment tank)

- VES-NCC-122, CPP-659 Non-Fluoride Hot Sump Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-108, CPP-659 Scrub Hold Tank (regulated under the IDAPA as a storage/treatment tank)
- VES-NCC-136, CPP-659 Vent Condenser Knockout Drum (regulated under the IDAPA as a storage tank)
- VES-NCC-116, CPP-659 Mist Collector (regulated under the IDAPA as a storage tank)

The function of the ETS is to concentrate liquid waste stored in the TFF. The overheads are condensed and transferred to the PEWE System for further treatment of the liquid waste. The ETS bottoms are concentrated and transferred back to the TFF, which reduces the overall volume of storage in the TFF.

Closure Strategy

The strategy is to clean close (decontamination and removal of equipment) the tank systems and miscellaneous units associated with the ETS. In the future, as the actual closure of the ETS is considered, this closure plan will be modified to reflect any information or condition that has changed or occurred and may precipitate different closure options.

CPP-1696 Integrated Waste Treatment Unit

The IWTU includes tanks, ancillary equipment, waste piles, and container storage in Building Number CPP-1696 at the INTEC. The regulated tanks specific to the IWTU facility are listed below:

- VES-SRC-131, Waste Feed Tank (regulated under IDAPA as a storage/treatment tank)
- VES-SRC-133, Sump Tank (regulated under IDAPA as a storage/treatment tank)
- VES-SRC-134, Clarifier Tank (regulated under IDAPA as a storage/treatment tank)
- VES-SRC-190 and -191, Product Receiver/Coolers (regulated under IDAPA as a storage tanks)
- TK-SRE-196, Firewater Collection Tank (regulated under IDAPA as a storage tank)
- TK-SRH-141, Condensate Collection Tank (regulated under IDAPA as a storage tank)
- Integrated Waste Treatment Unit (regulated under IDAPA as a miscellaneous treatment unit), which can be divided into the following two subsystems; 1) Sodium Bearing Waste (SBW) Treatment System, which manages the liquid and offgas phases of the process; and 2) Product Transfer and Loadout System, which deals with solids management. The components of each of these subsystems are identified below:

- SBW Treatment System, includes VES-SRC-140 [Denitration and Mineralization Reformer (DMR)], F-SRC-153 (Process Gas Filter), VES-SRC-160 [Carbon Reduction Reformer (CRR)], COL-SRC-160 (Offgas Cooler), F-SRC-160 (Offgas Filter), BLO-SRH-260 A and B (Offgas Blowers), F-SRH-140 A, B, C, and D (Process HEPA Pre-filters and Process HEPA Filters), F-SRH-141 A and B (Mercury Adsorbers), and BLO-SRH-240 A and B (Process Exhaust Blowers);

- Product Transfer and Loadout System, which includes AUG-SRC-440 (DMR Auger/Grinder), BLO-SRC-291 (Product Receiver/Cooler Blower), F-SRC-191 (Product Receiver Filter), VES-SRC-180 (Product Receiver Filter Product Pump), F-SRC-190 (Product Handling Vacuum Filter), BLO-SRC-286 (Product Handling Vent Blower), and the Canister Filling Stations (2).

The purpose of the IWTU is to process sodium bearing wastes currently located in the TFF and newly generated liquid waste (NGLW) and produce a solid waste form suitable for disposal at the ultimate disposal facility.

The container storage areas of CPP-1696 are located in the filling/capping area (Vault Loading Area) and the north end of CPP-1696 (Vault Storage Area). The waste pile storage areas are located in the Product Load-Out Cell (Rooms 112 and 113) of CPP-1696

Closure Strategy

The strategy is to clean close (decontamination and removal of equipment) the tank systems, miscellaneous units, waste piles, and container storage areas associated with the IWTU. In the future, as the actual closure of the IWTU is considered, this closure plan will be modified to reflect any information or condition that has changed or occurred and may precipitate different closure options.

Inactive Lines and Equipment

Although not part of the active system, there are several inactive transfer lines and ancillary equipment that will require closure. These transfer lines and ancillary equipment potentially managed RCRA/HWMA regulated waste after the effective date of RCRA, but are not currently storing or managing a waste; thus, are inactive. Any ILWMS transfer lines and ancillary equipment that are determined to have managed RCRA/HWMA waste will be specifically identified and included in this closure plan as the actual closure of the system is being considered.

1. REGULATORY REQUIREMENTS MATRIX

1.1 IDAPA 58.01.05.008 (40 CFR 264 Subpart G) INTEC Liquid Waste Management System Closure and Post-Closure Plan

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.1.1 264.110 Applicability	**264.110 Applicability**
Except as § 264.1 provides otherwise: (a) §§ 264.111 through 264.115 (which concern closure) apply to the owners and operators of all hazardous waste management facilities; and	(a) IDAPA 58.01.05.008 [40 Code of Federal Regulation (CFR) §§ 264.111 through 264.115] addressing closure performance standards, the closure plan and amendments to the plan, closure time, disposal or decontamination of equipment, structures and soils, and certification of closure is applicable to the units described in Volume 14.
(b) §§ 264.116 through 264.120 (which concern post-closure care) apply to the owners and operators of: (1) All hazardous waste disposal facilities; (2) Waste piles and surface impoundments for which the owner or operator intends to remove the wastes at closure to the extent that these sections are made applicable to such facilities in § 264.228 or § 264.258; (3) Tank systems that are required under § 264.197 to meet requirements for landfills; and (4) Containment buildings that are required under § 264.1102 to meet the requirement for landfills.	(b) This closure plan is written to consider clean closure (decontaminating and removal of equipment) as practicable with risk based closure or landfill being a possibility if the clean closure standards cannot be met. If the clean closure standards cannot be met the owner/operator will comply with the post-closure care requirements of IDAPA 58.01.05.008 (40 CFR §§ 264.116 through 264.120) as necessary.
(c) The Regional Administrator may replace all or part of the requirements of this subpart (and the unit-specific standards in § 264.111(c)) applying to a regulated unit (as defined in § 264.90), with alternative requirements for closure set out in an.... NOTE: *The remainder of this regulation has not been cited and is not applicable to this closure plan.*	(c) Not applicable to this closure plan.

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.1.2 264.111 Closure performance standard	**264.111 Closure performance standard**
The owner or operator must close the facility in a manner that:	Closure of the PEWE, LET&D, ETS, or IWTU will represent a partial closure of the INL Site.
(a) Minimizes the need for further maintenance, and This space was intentionally left blank	(a) The intent of closure activities is to minimize the need for further maintenance. Closure objectives will achieve the closure performance standard of minimizing the need for further maintenance by; (1) removing waste and residue, (2) verifying the efficacy of waste removal efforts, and (3) securing the system to prevent reintroduction of waste or liquid into the units. The closure plan will be modified, in accordance with IDAPA 58.01.05.008 [40 CFR § 264.112(c)], to include the appropriate verification sampling techniques to be used to meet the closure performance standards prior to implementation of the closure plan. The specific objectives that will achieve the IDAPA 58.01.05.008 [40 CFR § 264.111(a)] closure performance standard are described below: • Waste and residue will be removed, and the units decontaminated to allow the removal and disposal of equipment. • Verification of removal to this standard will be made through visual observation, by sampling the rinsate, and a formal report written and certified by a registered professional engineer (P.E.). • After verification has been completed, the systems will be secured, by blind flanging lines, locking valves closed, or tagging valves out of service, to prevent reintroduction of waste or liquids.

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	Ancillary Equipment and Process Lines • Ancillary equipment and process lines will be decontaminated to allow removal and disposal of equipment. • After closure activities have been completed, the ancillary equipment and process lines will be secured, by blind flanging lines, locking valves closed, or tagging valves out of service, to prevent reintroduction of waste or liquids. PEWE System Cells • The PEWE system cells will be decontaminated to the extent practicable. For the PEWE system cells "to the extent practicable" means removing as much contamination as possible with flushing and hands-on decontamination. • Verification of removal to this standard will be performed by direct visual observation. Confirmation that waste removal and decontamination activities occurred will be written in a formal report and certified by a registered P.E. LET&D System Cells • The LET&D system cells will be decontaminated by removing as much contamination as possible with flushing and hands-on decontamination. • Verification of removal to this standard will be performed by direct visual observation. Confirmation that waste removal and decontamination activities occurred will be written in a formal report and certified by a registered P.E.

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	CPP-659 Annex • The CPP-659 Annex will be decontaminated by flushing and hands-on decontamination. Verification of removal to this standard will be performed by direct visual observation. Confirmation that waste removal and decontamination activities occurred will be written in a formal report and certified by a registered P.E. ETS Cells • The ETS cells will be decontaminated to the extent practicable. For the ETS cells "to the extent practicable" means removing as much contamination as possible with flushing and/or hands-on decontamination. • Verification of removal to this standard will be performed by direct visual observation. Confirmation that waste removal and decontamination activities occurred will be written in a formal report and certified by a registered PE. IWTU Cells • The IWTU cells will be decontaminated to the extent practicable. For the IWTU cells "to the extent practicable" means removing as much contamination as possible with flushing and/or hands-on decontamination. • Verification of removal to this standard will be performed by direct visual observation. Confirmation that waste removal and decontamination activities occurred will be written in a formal report and certified by a registered P.E.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(b) 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 run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere, and This space was intentionally left blank	(b) The specific closure objectives described in Section 1.2.1, 264.111(a), will achieve the IDAPA 58.01.05.008 [40 CFR § 264.111(b)] closure performance standard as described below: • The systems will be secured to prevent reintroduction of liquids. These activities will reduce the quantity of hazardous waste and residue available for escape, reduce the hazardous characteristics and mobility of the waste and residue, and eliminate the presence of liquid that could transport waste and residue. • The systems cells and equipment within the buildings, and the process lines outside the buildings, have underlying, impermeable floors and/or secondary containment. • Run-off is controlled in CPP-604, CPP-1618, CPP-659, and CPP-1696 by being fully enclosed buildings that prevent run-off from hazardous waste handling areas to other areas or the environment. CPP-1618 is inside of the floodplain boundary as postulated in the Big Lost River Flood Hazard Study, November 2005 (see Volume 3 of the INL permit application). CPP-604, CPP-659, and CPP-1696 are outside the postulated 100-year floodplain boundary. The INL emergency plan provides for the establishment of plans for the surveillance and protection of buildings and equipment, as necessary during flooding conditions to prevent run-on. This could include sand bagging, building berms, dikes, or trenches. • The existing heating, ventilating and air conditioning (HVAC) system controls releases to the atmosphere.
(c) Complies with the closure requirements of this subpart, including, but not limited to, the requirements of §§ 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.601, through 264.603, and 264.1102.	(c) The PEWE, LET&D, ETS, and IWTU are miscellaneous treatment units and subject to the closure requirements of IDAPA 58.01.05.008 (40 CFR § 264.603). The tank systems associated with the ILWMS are subject to the tank closure requirements of IDAPA 58.01.05.008 (40 CFR § 264.197).

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.1.3 264.112 Closure plan; amendment of plan	**264.112 Closure plan; amendment of plan**
(a) *Written plan.*	(a) The hazardous waste management facility is by definition the entire INL Site [IDAPA 58.01.05.004 (40 CFR § 260.10)]. However, this is a partial closure plan that, by definition, is for less than the entire facility. Therefore, for purposes of this closure plan, "facility" shall refer to the PEWE, LET&D, ETS, or IWTU.
The owner or operator of a hazardous waste management facility must have a written closure plan. In addition, certain surface impoundments and waste piles from which the owner or operator intends to remove or decontaminate the hazardous waste at partial or final closure are required by §§ 264.228(c)(1)(i) and 264.258(c)(1)(i) to have contingent closure plans. The plan must be submitted with the permit application, in accordance with § 270.14(b)(13) of this chapter, and approved by the Regional Administrator as part of the permit issuance procedures under Part 124 of this chapter. In accordance with § 270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit.	(1) A copy of the most current version of the closure plan for the facility will be maintained by the facility until closure is certified in accordance with IDAPA 58.01.05.008 (40 CFR § 264.115). The plan will be furnished to the Director, upon request, any time prior to closure certification of the facility. Until the closure plan is approved, it will be provided to a duly authorized representative of the Agency on the day of a site inspection.
The Director's approval of the plan must ensure that the approved closure plan is consistent with §§ 264.111 through 264.115 and the applicable requirements of subpart F of this part, 264.178, 264.197, 264.228, 264.258, 264.280, 264.310, 264.351, 264.601, 264.1102. Until final closure is competed and certified in accordance with § 264.115, a copy of the approved plan and all approved revisions must be furnished to the Director upon request, including requests by mail.	The plan will be furnished to the Director, upon request, any time prior to closure certification of the facility.
Content of plan. The plan must identify steps necessary to perform partial and/or final closure of the facility at any point during its active life. The closure plan must include, at least: (1) A description of how each hazardous waste management unit at the facility will be closed in accordance with § 264.111;	(b)(1) The details of how the closure will be performed are provided in Section 1.1.3, 264.112(b)(3) and (b)(4), of this plan.
(2) A description of how final closure of the facility will be	(2) Final closure of the facility shall constitute final closure in the

Regulatory Citation (Description of Requirement)	Compliance Methodology
conducted in accordance with § 264.111. The description must identify the maximum extent of the operation which will be unclosed during the active life of the facility; and	terms of this plan. The details of how this closure will be conducted are shown in Section 1.1.3, 264.112(b)(3) and (b)(4), of this plan.
(3) An estimate of the maximum inventory of hazardous wastes ever on-site over the active life of the facility and a detailed description of the methods to be used during partial and final closure, including, but not limited to, methods for removing, transporting, treating, storing or disposing of all hazardous waste, and identification of and the type(s) of off-site hazardous waste management units to be used, if applicable; and This space was intentionally left blank	(3) The maximum inventory of hazardous waste ever in the PEWE system over its active life can only be estimated based on the capacity of the miscellaneous treatment (evaporator) and the capacity of the tank systems associated with the PEWE: • Evaporator Feed Sediment Tank, VES-WL-132, has a maximum capacity of 4,700 gal • Evaporator Feed Collection Tank, VES-WL-133, has a maximum capacity of 19,000 gal • Surge Tank, VES-WL-102, has a maximum capacity of 18,400 gal • Process Condensate Knock Out Pot, VES-WL-108, has a maximum capacity of 98 gal • Evaporator Head Tank, VES-WL-109, has a maximum capacity of 270 gal • Evaporators VES-WL-129 and VES-WL-161 have maximum capacities of 1,000 gal/each • Condensate Surge Tank, VES-WL-131, has a maximum capacity of 66 gal • Condensate Surge Tank, VES-WL-134, has a maximum capacity of 500 gal • Bottoms Collection Tank, VES-WL-101, has a maximum capacity of 18,400 gal • Bottoms Collection Tank, VES-WL-111, has a maximum capacity of 1,500 gal • CPP-604 Tank Farm Tanks (TFT), VES-WM-100, VES-WM-101, and VES-WM-102 have a maximum capacity of 18,400 gal/each

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	• CPP-604 Process Condensate Collection Tanks, VES-WL-106, VES-WL-107, and VES-WL-163, have a maximum capacity of 5,000 gal/each • Tanks VES-WL-135, VES-WL-136, VES-WL-139, and VES-WL-142 have a maximum capacity of 10 gal. Tanks VES-WL-137, VES-WL-138, and VES-WL-144 have a maximum capacity of 25 gal. VES-WL-150 has a maximum capacity of 50 gal. The maximum inventory of hazardous waste ever in the LET&D system over its active life can only be estimated based on the capacity of the miscellaneous treatment (fractionator) and the capacity of the tank systems associated with the LET&D: • VES-WLK-197 has a maximum capacity of 270 gal • FRAC-WLL-170 and FRAC-WLK-170 have a maximum capacity of 460 gal/each including equipment listed in Section D of this document. • VES-WLL-195 has a maximum capacity of 270 gal The maximum inventory of hazardous waste ever in the CPP-659 Annex over its active life can only be estimated based on the capacity of the capacity of the tank system associated with the CPP-659 Annex: • VES-NCR-171 has a maximum capacity of 22,500 gal • VES-NCR-173 has a maximum capacity of 90 gal. The maximum inventory of hazardous waste ever in the ETS over its active life can only be estimated based on the capacity of the miscellaneous treatment (evaporator) and the capacity of the tank

Regulatory Citation (Description of Requirement)	Compliance Methodology
	systems associated with the ETS. • Constant Head Feed Tank VES-NCC-152, has a maximum capacity of 200 gal • Evaporator VES-NCC-150, has a maximum capacity of 2,600 gal • Blend Tank VES-NCC-101, has a maximum capacity of 5,870 gal • Hold Tanks VES-NCC-102 and VES-NCC-103, each have a maximum capacity of 4,000 gal • Fluoride Hot Sump Tank VES-NCC-119, has a maximum capacity of 6,500 gal • Non-Fluoride Hot Sump Tank VES-NCC-122, has a maximum capacity of 4,100 gal • Scrub Hold Tank VES-NCC-108, has a maximum capacity of 2,000 gal • Vent Condenser Knockout Drum VES-NCC-136, has a maximum capacity of 60 gal • Mist Collector VES-NCC-116, has a maximum capacity of 500 gal The maximum inventory of hazardous waste ever in the IWTU over its active life can only be estimated based on the capacity of the miscellaneous treatment (reformers) and the capacity of the tank systems associated with the IWTU: • Waste Feed Tank, VES-SRC-131, has a maximum capacity of 2,170 gal • Sump Tank, VES-SRC-133, has a maximum capacity of 3,390 gal • Clarifier Tank, VES-SRC-134, has a maximum capacity of 494 gal • Denitration and Mineralization Reformer, VES-SRC-140, has a maximum capacity of approximately 3,400 gal • Process Gas Filter, F-SRC-153, has a maximum capacity of 2,300 gal • Carbon Reduction Reformer, VES-SRC-160, has a maximum

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	capacity of approximately 4,300 gal • Offgas Filter, F-SRC-160, has a maximum capacity of 3,250 gal • Product Receiver/Cooler, VES-SRC-190, has a maximum capacity of 512 gal • Product Receiver/Cooler, COL-SRC-191, has a maximum capacity of 512 gal • Product Receiver Filter, F-SRC-191, has a maximum capacity of 900 gal • Product Handling Vacuum Filter, F-SRC-190, has a maximum capacity of 900 gal • Mercury Adsorber, F-SRH-141A, has a maximum capacity of approximately 11,600 gal • Mercury Adsorber, F-SRH-141B, has a maximum capacity of approximately 11,600 gal • Firewater Collection Tank, TK-SRE-196, has a maximum capacity of 15,000 gal • Offgas Condensate Collection Tank, TK-SRH-141, has a maximum capacity of 120 gal • Vault Storage Area and Vault Loading Area combined have a maximum capacity of 179,070 gal • Product Load-Out Cells Waste Piles combined have a maximum capacity of 64 cubic yards Waste will be removed by an acid and water flush. If additional removal is needed, chemicals such as oxalic acid, potassium permanganate, sodium hydroxide, and/or other chemicals may be used, alone, or in combination. The vaults and cells will be rinsed with water. If additional removal is needed, chemicals such as oxalic acid, potassium permanganate,sodium

Regulatory Citation (Description of Requirement)	Compliance Methodology
	hydroxide, and/or other chemicals may be used, alone, or in combination. Prior to rinsing the cells, miscellaneous debris will be removed. Debris will be characterized, stored, treated, and disposed, as appropriate, in accordance with IDAPA 58.01.05.005, 58.01.05.006, 58.01.05.008, and 58.01.05.011 (40 CFR §§ 261, 262, 264, and 268). *Waste Generation* - The Hazardous Waste Management Act (HWMA)/Resource Conservation and Recovery Act (RCRA) hazardous waste numbers applicable to the ILWMS wastes are based on a historical review of the listed waste processed in the system. The applicable characteristic waste numbers are those listed on the INL's Part A Permit Application. Environmental Protection Agency (EPA) Hazardous Waste Numbers applicable to the PEWE system are as follows: <u>Waste Numbers</u> — <u>Chemical Name</u> D001 — Ignitable D002 — Corrosive D004 — Arsenic D005 — Barium D006 — Cadmium D007 — Chromium D008 — Lead D009 — Mercury D010 — Selenium D011 — Silver D018 — Benzene D019 — Carbon Tetrachloride D021 — Chlorobenzene

Regulatory Citation (Description of Requirement)	Compliance Methodology	
This space was intentionally left blank	D022	Chloroform
	D026	Cresol
	D028	1,2-Dichloroethane
	D032	Hexachlorobenzene
	D034	Hexachloroethane
	D035	Methyl ethyl ketone
	D036	Nitrobenzene
	D038	Pyridine
	D039	Tetrachloroethylene
	D040	Trichloroethylene
	F001	1,1,1-Trichoroethane, Carbon tetrachloride Trichloroethylene
	F002	1,1,1-Trichloroethane, Carbon tetrachloride Trichloroethylene, Tetrachloroethylene
	F003	Acetone, Benzene, Carbon disulfide, Toluene
	F005	Benzene, Carbon disulfide, Pyridine Toluene
	U134	Hydrogen fluoride
	Environmental Protection Agency (EPA) Hazardous Waste Numbers applicable to the LET&D system are as follows:	
	Waste Numbers	Chemical Name
	D001	Ignitable
	D002	Corrosive
	D004	Arsenic

Regulatory Citation (Description of Requirement)	Compliance Methodology	
This space intentionally left blank	D005	Barium
	D006	Cadmium
	D007	Chromium
	D008	Lead
	D009	Mercury
	D010	Selenium
	D011	Silver
	D018	Benzene
	D019	Carbon Tetrachloride
	D021	Chlorobenzene
	D022	Chloroform
	D026	Cresol
	D028	1,2-Dichloroethane
	D032	Hexachlorobenzene
	D034	Hexachloroethane
	D035	Methyl ethyl ketone
	D036	Nitrobenzene
	D038	Pyridine
	D039	Tetrachloroethylene
	D040	Trichloroethylene
	F001	1,1,1-Trichoroethane, Carbon tetrachloride Trichloroethylene
	F002	1,1,1-Trichloroethane, Carbon tetrachloride Trichloroethylene, Tetrachloroethylene

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	F003 Acetone, Benzene, Carbon disulfide, Toluene F005 Benzene, Carbon disulfide, Pyridine Toluene U134 Hydrogen fluoride Environmental Protection Agency (EPA) Hazardous Waste Numbers applicable to the ETS are as follows: Waste Numbers — Chemical Name D001 Ignitable D002 Corrosive D004 Arsenic D005 Barium D006 Cadmium D007 Chromium D008 Lead D009 Mercury D010 Selenium D011 Silver D018 Benzene D019 Carbon Tetrachloride D021 Chlorobenzene D022 Chloroform D026 Cresol D028 1,2-Dichloroethane D032 Hexachlorobenzene

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	D034 Hexachloroethane D035 Methyl ethyl ketone D036 Nitrobenzene D038 Pyridine D039 Tetrachloroethylene D040 Trichloroethylene F001 1,1,1-Trichoroethane, Carbon tetrachloride Trichloroethylene F002 1,1,1-Trichloroethane, Carbon tetrachloride Trichloroethylene, Tetrachloroethylene F003 Acetone, Benzene, Carbon disulfide, Toluene F005 Benzene, Carbon disulfide, Pyridine Toluene U134 Hydrogen fluoride Environmental Protection Agency (EPA) Hazardous Waste Numbers applicable to the IWTU are as follows: Waste Numbers — Chemical/Characteristic D001 Ignitable D002 Corrosive D004 Arsenic D005 Barium D006 Cadmium D007 Chromium D008 Lead

Regulatory Citation (Description of Requirement)	Compliance Methodology	
This space was intentionally left blank	D009	Mercury
	D010	Selenium
	D011	Silver
	D018	Benzene
	D019	Carbon Tetrachloride
	D021	Chlorobenzene
	D022	Chloroform
	D026	Cresol
	D028	1,2-Dichloroethane
	D032	Hexachlorobenzene
	D034	Hexachloroethane
	D035	Methyl ethyl ketone
	D036	Nitrobenzene
	D038	Pyridine
	D039	Tetrachloroethylene
	D040	Trichloroethylene
	F001	1,1,1-Trichoroethane, Carbon tetrachloride Trichloroethylene
	F002	1,1,1-Trichloroethane, Carbon tetrachloride Trichloroethylene, Tetrachloroethylene
	F003	Acetone, Benzene, Carbon disulfide, Toluene
	F005	Benzene, Carbon disulfide, Pyridine Toluene
	U134	Hydrogen fluoride

Regulatory Citation (Description of Requirement)	Compliance Methodology
This space was intentionally left blank	
(4) A detailed description of the steps needed to remove or decontaminate all hazardous waste residues and contaminated containment system components, equipment, structures, and soils during partial and final closure including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination required to satisfy the closure performance standard; and	(4) The waste removal activities described in Section 1.1.3, 264.112(b)(3), will also serve to decontaminate the system. The closure plan will be modified, in accordance with IDAPA 58.01.05.008 [40 CFR § 264.112(c)], to include the appropriate verification sampling techniques to be used to meet the closure performance standards prior to implementation of the closure plan.
(5) A detailed description of other activities necessary during the closure period to ensure that all partial closures and final closure satisfy the closure performance standards, including, but not limited to, groundwater monitoring, leachate collection, and run-on and run-off control; and	(5) Other activities necessary during the closure will focus on securing the system to prevent reintroduction of waste and liquids into the system. • The utility lines (e.g., decontamination, water, steam lines) will be secured by blind flanging and/or locking valves closed at the decontamination header source. The header will be flushed with water prior to securing the system. • Disposition of all instrumentation will be determined during final closure.
(6) A schedule for closure of each hazardous waste management unit and for final closure of the facility. The schedule must include, at a minimum, the total time required to close each hazardous waste management unit and the time required for intervening closure activities which will allow tracking of the progress of partial and final closure. (For example, in the case of a landfill unit, estimates of the time required to treat or dispose of all hazardous waste inventory and of the time required to place a final cover must be included.)	(6) A general schedule for closure is estimated as follows: Day 0 Approval of the closure plan Day 100 Complete equipment decontamination Day 140 Complete surface decontamination Day 160 Decontaminate tools (where applicable), complete waste assessments, remove wastes Day 180 Complete all closure activities. 60 days after completion of closure – submit closure certification to the State of Idaho.

Regulatory Citation (Description of Requirement)	Compliance Methodology
	As the actual closure is anticipated the schedule above will be modified to reflect conditions and activities existing at that time. The amended closure schedule will allow adequate time to complete the closure of the systems.
(7) For facilities that use trust funds to establish financial assurance under § 264.143 or 264.145 and that are expected to close prior to the expiration of the permit, an estimate of the expected year of final closure.	(7) This requirement is not applicable.
(8) For facilities where the Regional Administrator has applied alternative requirements at a regulated unit under §§ 264.90(f), 264.110(d), and/or 264.140(d), either the alternative requirements applying to the regulated unit, or a reference to the enforceable document containing those alternative requirements.	(8) Not applicable to this closure plan.
(c) *Amendment of plan*. The owner or operator must submit a written notification of or request for a permit modification to authorize a change in operating plans, facility design, or the approved closure plan in accordance with the applicable procedures in Parts 124 and 270. The written notification or request must include a copy of the amended closure plan for review or approval by the Regional Administrator.	(c) The owner/operator may amend the approved closure plan, prior to notification of partial closure, by notifying the Director with a written request. The request will contain a copy of the amended closure plan for approval.
(1) The owner or operator may submit a written notification or request to the Regional Administrator for a permit modification to amend the closure plan at any time prior to the notification of partial or final closure of the facility.	(1) The owner or operator will submit a written notification or request to the Regional Administrator for a permit modification to amend the closure plan prior to the notification of partial or final closure of the facility, as necessary.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(2) The owner or operator must submit a written notification of or request for a permit modification to authorize a change in the approved closure plan whenever: (i) Changes in operating plans or facility design affect the closure plan, or (ii) There is a change in the expected year of closure, if applicable, or (iii) In conducting partial or final closure activities, unexpected events require a modification of the approved closure plan. (iv) The owner or operator requests the Regional Administrator to apply alternative requirements to a regulated unit under §§ 264.90(f), 264.110(c), and/or 264.140(d).	(2) The owner/operator will amend the closure plan whenever: (i) Changes in operating plans or facility design affect the closure plan (ii) Change in the closure schedule, or (iii) Unexpected events occur during partial closure requiring a modification. The owner/operator will not request alternative requirements of the Regional Administrator.
(3) The owner or operator must submit a written request for a permit modification including a copy of the amended closure plan for approval at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the closure plan. If an unexpected event occurs during the partial or final closure period, the owner or operator must request a permit modification no later than 30 days after the unexpected event. An owner or operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to prepare a contingent closure plan under § 264.228(c)(1)(i) or 264.258(c)(1)(i), must submit an amended closure plan to the Regional Administrator no later than 60 days from the date that the owner or operator or Regional Administrator determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of § 264.310, or no later than 30 days from that date if the determination is made during partial or final closure. The Regional Administrator will approve, disapprove, or modify this amended plan in accordance with the procedures in Parts 124 and 270. In accordance with § 270.32 of this chapter, the approved closure plan will become a condition of any RCRA permit issued.	(3) The owner/operator will amend the closure plan at least 60 days prior to any and all proposed changes in design or operation that could affect partial or final closure, or no later than 60 days after an unexpected event occurs that has affected the closure plan. If an unexpected event occurs during partial closure, the owner/operator will amend the closure plan no later than 30 days after the unexpected event occurs. This space was intentionally left blank

Regulatory Citation (Description of Requirement)	Compliance Methodology
(4) The Regional Administrator may request modifications to the plan under the conditions described in paragraph 264.112(c)(2). The owner or operator must submit the modified plan within 60 days of the Regional Administrator's request, or within 30 days if the change in facility conditions occurs during partial or final closure. Any modifications requested by the Regional Administrator will be approved in accordance with the procedures in Parts 124 and 270.	(4) Once this closure plan is approved, the owner/operator will submit a modified plan within 60 days of a request from the Director, or within 30 days, if an unexpected event occurs during partial or final closure.
(d) Notification of partial closure and final closure.	(d) The owner/operator will notify the Director in writing at least 45 days prior to the date on which the owner/operator expects to begin final closure.
(1) The owners or operator must notify the Regional Administrator in writing at least 60 days prior to the date on which he expects to begin closure of a surface impoundment, waste pile, land treatment or landfill unit, or final closure of a facility with such a unit. The owner or operator must notify the Regional Administrator in writing at least 45 days prior to the date on which he expects to begin final closure of a facility with only treatment or storage tanks, container storage, or incinerator units to be closed. The owner or operator must notify the Regional Administrator in writing at least 45 days prior to the date on which he expects to begin partial or final closure of a boiler or industrial furnace, whichever is earlier.	(1) The owner/operator will notify the Director in writing at least 45 days prior to the date on which the owner/operator expects to begin final closure.
(2) The date when he "expects to begin closure" must be either: (i) No later than 30 days after the date on which any hazardous waste management unit receives the known final volume of hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional hazardous wastes, no later than one year after the date on which the unit received the most recent volume of hazardous waste. If the owner or operator of a hazardous waste	(2)(i) The requirements will be applicable when the ILWMS receives its final volume of waste.

Regulatory Citation (Description of Requirement)	Compliance Methodology
management unit can demonstrate to the Regional Administrator that the hazardous waste management unit or facility has the capacity to receive additional hazardous wastes and he has taken all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Regional Administrator may approve an extension to this one-year limit; or	This space was intentionally left blank
(ii) For units meeting the requirements of § 264.113(d), no later than 30 days after the date on which the hazardous waste management unit receives the known final volume of non-hazardous wastes, or if there is a reasonable possibility that the hazardous waste management unit will receive additional non-hazardous wastes, no later than one year after the date on which the unit received the most recent volume of non-hazardous wastes. If the owner or operator can demonstrate to the Regional Administrator that the hazardous waste management unit has the capacity to receive additional non-hazardous wastes and he has taken, and will continue to take, all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, the Regional Administrator may approve an extension to this one-year limit.	(ii) The requirements will be applicable when the ILWMS receives its final volume of waste.
(3) If the facility's permit is terminated, or if the facility is otherwise ordered, by judicial decree or final order under § 3008 of RCRA, to cease receiving hazardous wastes or to close, then the requirements of this paragraph do not apply. However, the owner or operator must close the facility in accordance with the deadlines established in § 264.113.	(3) The owner/operator understands this allowance.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(e) Removal of wastes and decontamination or dismantling of equipment. Nothing in this section shall preclude the owner or operator from removing hazardous wastes and decontaminating or dismantling equipment in accordance with the approved partial or final closure plan at any time before or after notification of partial or final closure.	(e) The owner/operator understands this allowance.
1.1.4 264.113(a) Closure; time allowed for closure	**264.113 Closure; time allowed for closure**
(a) Within 90 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at a hazardous waste management unit or facility, the owner or operator must treat, remove from the unit or facility, or dispose of on-site, all hazardous wastes in accordance with the approved closure plan. The Regional Administrator may approve a longer period if the owner or operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	(a) In accordance with the provisions of IDAPA 58.01.05.008 [40 CFR 264.113(a)], the owner/operator is not requesting an extension of the closure period longer than 90 days for removing waste from the systems. However, when a decision is made to close the systems, the 90-day time-period will be reevaluated and a request for an extension may be made at that time.
(1)(i) The activities required to comply with this paragraph will, of necessity, take longer than 90 days to complete; or (ii)(A) The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner or operator complies with paragraphs (d) and (e) of this section; and (B) There is a reasonable likelihood that he or another person will recommence operation of the hazardous waste management unit or the facility within one year; and (C) Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	(1) Not applicable to this closure plan.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(2) He has taken and will continue to take all steps to prevent threats to human health and the environment, including compliance with all applicable interim status requirements.	(2) Not applicable to this closure plan.
(b) The owner or operator must complete partial and final closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of hazardous wastes, or the final volume of non-hazardous wastes if the owner or operator complies with all applicable requirements in paragraphs (d) and (e) of this section, at the hazardous waste management unit or facility. The Regional Administrator may approve an extension to the closure period if the owner or operator complies with all applicable requirements for requesting a modification to the permit and demonstrates that:	(b) The owner/operator intends to perform partial and final closure activities in accordance with the approved closure plan and the closure schedule in Section 1.1.3, 264.113(b).
(1)(i) The partial or final closure activities will, of necessity, take longer than 180 days to complete; or (ii)(A) The hazardous waste management unit or facility has the capacity to receive additional hazardous wastes, or has the capacity to receive non-hazardous wastes if the owner or operator complies with paragraphs (d) and (e) of this section; and (B) There is reasonable likelihood that he or another person will recommence operation of the hazardous waste management unit or the facility within one year; and (C) Closure of the hazardous waste management unit or facility would be incompatible with continued operation of the site; and	(1) Not applicable to this closure plan.
(2) He has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but not operating hazardous waste management unit or facility, including compliance with all applicable permit requirements.	(2) Not applicable to this closure plan.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(c) The demonstrations referred to in paragraphs (a)(1) and (b)(1) of this section must be made as follows: (1) The demonstrations in paragraph (a)(1) of this section must be made at least 30 days prior to the expiration of the 90-day period in paragraph (a) of this section; and (2) The demonstration in paragraph (b)(1) of this section must be made at least 30 days prior to the expiration of the 180-day period in paragraph (b) of this section, unless the owner or operator is otherwise subject to the deadlines in paragraph (d) of this section.	(c) Not applicable to this closure plan.
(d) The Regional Administrator may allow an owner or operator to receive non-hazardous wastes in a landfill, land treatment, or surface impoundment unit after the final receipt of hazardous wastes at that unit if: (1) The owner or operator requests a permit modification in compliance with all applicable requirements in parts 270 and 124 of this title and in the permit modification request demonstrates that... NOTE: *The remainder of this regulation has not been cited and is not applicable to this closure plan.*	(d) Not applicable to this closure plan.
1.1.5 264.114 Disposal or decontamination of equipment, structures and soils	**264.114 Disposal or decontamination of equipment, structures and soils**
During the partial and final closure periods, all contaminated equipment, structures and soils must be properly disposed of or decontaminated unless specified otherwise in §§ 264.197, 264.228, 264.258, 264.280, or 264.310. By removing all hazardous wastes or hazardous constituents during partial and final closure, the owner or operator may become a generator of hazardous waste and must handle that hazardous waste in accordance with all applicable requirements of part 262 of this chapter.	All equipment will be decontaminated, to allow removal and disposal, as detailed in Section 1.1.3, 264.112(b)(3) and (4) of this plan. All debris and waste generated during closure will be characterized, stored, treated, and disposed, as appropriate, in accordance with IDAPA 58.01.05.005, 58.01.05.006, 58.01.05.008, and 58.01.05.011 (40 CFR Parts 261, 262, 264, and 268). Final disposal/disposition of any equipment will be determined at final closure.

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.1.6 264.115 Certification of closure	**264.115 Certification of closure**
Within 60 days of completion of closure of each hazardous waste surface impoundment, waste pile, land treatment, and landfill unit, and within 60 days of completion of final closure, the owner or operator must submit to the Regional Administrator, by registered mail, a certification that the hazardous waste management unit or facility, as applicable, has been closed in accordance with the specifications in the approved closure plan. The certification must be signed by the owner or operator and by a registered professional engineer. Documentation supporting the registered professional engineer's certification must be furnished to the Regional Administrator upon request until he releases the owner or operator from the financial assurance requirements for closure under § 264.143(h).	Within 60 days after completion of the closure activities, the owner/operator will submit to the Director a certification that the systems have been closed in accordance with the approved closure plan. The certification will be signed by the owner/operator and by a registered P.E.
1.1.7 264.116 Survey plat	**264.116 Survey plat**
No later than the submission of the certification of closure of each hazardous waste disposal unit, an owner or operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Regional Administrator, a survey plat indicating the location and dimensions of landfill cells or other hazardous waste disposal units with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local zoning authority, or the authority with jurisdiction over local land use, must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the hazardous waste disposal unit in accordance with the applicable Subpart G regulations.	A survey plat meeting this requirement will be submitted to the local zoning authority or the authority with jurisdiction over local land use and the Regional Administrator.
1.1.8 264.117 Post-closure care and use of property	**264.117 Post-closure care and use of property**
(a)(1) Post-closure care for each hazardous waste management unit subject to the requirements of §§ 264.117 through 264.120 must begin after completion of closure of the unit and continue for 30 years after that date and must consist of at least the following: (i) Monitoring and reporting in accordance with the	(a) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required.

Regulatory Citation (Description of Requirement)	Compliance Methodology
requirements of Subparts F, K, L, M, N, and X of this part; and (ii) Maintenance and monitoring of waste containment systems in accordance with the requirements of Subparts F, K, L, M, N, and X of this part. (2) Any time preceding closure of a hazardous waste management unit subject to post-closure care requirements or final closure, or any time during the post-closure period for a particular unit, the Regional Administrator may, in accordance with the permit modification procedures in Parts 124 and 270: (i) Shorten the post-closure care period applicable to the hazardous waste management unit, or facility, if all disposal units have been closed, if he finds that the reduced period is sufficient to protect human health and the environment (e.g., leachate or ground-water monitoring results, characteristics of the hazardous waste, application of advanced technology, or alternative disposal, treatment, or re-use techniques indicate that the hazardous waste management unit or facility is secure); or (ii) Extend the post-closure care period applicable to the hazardous waste management unit or facility if he finds that the extended period is necessary to protect human health and the environment (e.g., leachate or groundwater monitoring results indicate a potential for migration of hazardous wastes at levels which may be harmful to human health and the environment).	This space was intentionally left blank

Regulatory Citation (Description of Requirement)	Compliance Methodology
(b) The Regional Administrator may require, at partial and final closure, continuation of any of the security requirements of § 264.14 during part or all of the post-closure period when: (1) Hazardous wastes may remain exposed after completion of partial or final closure; or (2) Access by the public or domestic livestock may pose a hazard to human health.	(b) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required.
(c) Post-closure use of property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of the containment system, or the function of the facility's monitoring systems, unless the Regional Administrator finds that the disturbance: (1) Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or (2) Is necessary to reduce a threat to human health or the environment. (d) All post-closure care activities must be in accordance with the provisions of the approved post-closure plan as specified in § 264.118.	(c) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required.

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.1.9 264.118 Post-closure plan; amendment of plan	**264.118 Post-closure plan; amendment of plan**
(a) *Written plan*. The owner or operator of a hazardous waste disposal unit must have a written post-closure plan. In addition, certain surface impoundments and waste piles from which the owner or operator intends to remove or decontaminate the hazardous wastes at partial or final closure are required by §§ 264.228(c)(1)(ii) and 264.258(c)(1)(ii) to have contingent post-closure plans. Owners or operators of surface impoundments and waste piles not otherwise required to prepare contingent post-closure plans under §§ 264.128(c)(1)(ii) and 264.258(c)(1)(ii) must submit a post-closure plan to the Regional Administrator within 90 days from the date that the owner or operator or Regional Administrator determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of §§ 264.117 through 264.120. The plan must be submittted with the permit application, in accordance with § 270.14(b)(13) of this chapter, and approved by the Regional Administrator as part of the permit issuance procedures under Part 124 of this chapter. In accordance with §270.32 of this chapter, the approved post-closure plan will become a condition of any RCRA permit issued.	(a) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required. If clean closure cannot be achieved and a "risk-based closure" or "landfill closure" is deemed necessary then a post-closure plan will be developed.
(b) For each hazardous waste management unit subject to the requirements of this section, the post-closure plan must identify the activities that will be carried on after closure of each disposal unit and the frequency of these activities, and include at least: (1) A description of the planned monitoring activities and frequencies at which they will be performed to comply with Subparts F, K, L, M, N, and X of this part during the post-closure care period; and (2) A description of the planned maintenance activities, and frequencies at which they will be performed, to ensure: (i) The integrity of the cap and final cover or other containment systems in accordance with the	(b) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required. If clean closure cannot be achieved and a "risk-based closure" or "landfill closure" is deemed necessary then a post-closure plan will be developed.

Regulatory Citation (Description of Requirement)	Compliance Methodology
requirements of subparts F, K, L, M , N, and X of this part; and (ii) The function of the monitoring equipment in accordance with the requirements of subparts F, K, L, M, N, and X of this part; and (3) The name, address, and phone number of the person or office to contact about the hazardous waste disposal unit or facility during the post-closure care period. (4) For facilities where the Regional Administrator has applied alternative requirements at a regulated unit under §§ 264.90(f), 264.110(c), and/or 264.140(d), either the alternative requirements that apply to the regulated unit, or a reference to the enforceable document containing those requirements.	This space was intentionally left blank
(c) Until final closure of the facility, a copy of the approved post-closure plan must be furnished to the Regional Administrator upon request, including request by mail. After final closure has been certified, the person or office specified in §264.118(b)(3) must keep the approved post-closure plan during the remainder of the post-closure period.	(c) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required. If clean closure cannot be achieved and a "risk-based closure" or "landfill closure" is deemed necessary then a post-closure plan will be developed.
(d) Amendment of plan. The owner or operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan in accordance with the applicable requirements in Parts 124 and 270. The written notification or request must include a copy of the amended post-closure plan for review or approval by the Regional Administrator. (1) The owner or operator may submit a written notification or request to the Regional Administrator for a permit modification to amend the post-closure plan at any time during the active life of the facility or during the post-closure care period.	(d) All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required. If clean closure cannot be achieved and a "risk-based closure" or "landfill closure" is deemed necessary then a post-closure plan will be developed

Regulatory Citation (Description of Requirement)	Compliance Methodology
(2) The owner or operator must submit a written notification of or request for a permit modification to authorize a change in the approved post-closure plan whenever: (i) Changes in operating plans or facility design affect the approved post-closure plan, or (ii) There is a change in the expected year of final closure, if applicable, or (iii) Events which occur during the active life of the facility, including partial and final closures, affect the approved post-closure plan. (iv) The owner or operator requests the Regional Administrator to apply alternative requirements to a regulated unit under §§ 264.90(f), 264.110(c), and/or 264.140(d). (3) The owner or operator must submit a written request for a permit modification at least 60 days prior to the proposed change in facility design or operation, or no later than 60 days after an unexpected event has occurred which has affected the post-closure plan. An owner or operator of a surface impoundment or waste pile that intends to remove all hazardous waste at closure and is not otherwise required to submit a contingent post-closure plan under §§ 264.228(c)(1)(ii) and 264.258(c)(1)(ii) must submit a post-closure plan to the Regional Administrator no later than 90 days after the date that the owner or operator or Regional Administrator determines that the hazardous waste management unit must be closed as a landfill, subject to the requirements of § 264.310. The Regional Administrator will approve, disapprove or modify this plan in accordance with the procedures in Parts 124 and 270. In accordance with § 270.32 of this chapter, the approved post-closure plan will become a permit condition.	This space was intentionally left blank

Regulatory Citation (Description of Requirement)	Compliance Methodology
(4) The Regional Administrator may request modifications to the plan under the conditions described in § 264.118(d)(2). The owner or operator must submit the modified plan no later than 60 days after the Regional Administrator's request, or no later than 90 days if the unit is a surface impoundment or waste pile not previously required to prepare a contingent post-closure plan. Any modifications requested by the Regional Administrator will be approved, disapproved, or modified in accordance with the procedures in Parts 124 and 270.	This space was intentionally left blank
1.1.10 264.119 Post-closure notices	**264.119 Post-closure notices**
(a) No later than 60 days after certification of closure of each hazardous waste disposal unit, the owner or operator must submit to the local zoning authority, or the authority with jurisdiction over local land use, and to the Regional Administrator, a record of the type, location, and quantity of hazardous wastes disposed of within each cell or other disposal unit of the facility. For hazardous waste disposed of before January 12, 1981, the owner or operator must identify the type, location, and quantity of the hazardous wastes to the best of his knowledge and in accordance with any records he has kept. (b) Within 60 days of certification of closure of the first hazardous waste disposal unit and within 60 days of certification of closure of the last hazardous waste disposal unit, the owner or operator must: (1) Record, in accordance with State law, a notation on the deed to the facility property – or on some other instrument which is normally examined during title search – that will in perpetuity notify any potential purchaser of the property that: (i) The land has been used to manage hazardous wastes; and	All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required. If clean closure cannot be achieved and a "risk-based closure" or "landfill closure" is deemed necessary, then a post-closure plan will be developed.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(ii) Its use is restricted under 40 CFR Subpart G regulations; and (iii) The survey plat and record of the type, location, and quantity of hazardous wastes disposed of within each cell or other hazardous waste disposal unit of the facility required by §§ 264.116 and 264.119(a) have been filed with the local zoning authority or the authority with jurisdiction over local land use and with the Regional Administrator; and	This space was intentionally left blank
(2) Submit a certification, signed by the owner or operator, that he has recorded the notation specified in paragraph (b)(1) of this section, including a copy of the document in which the notation has been placed, to the Regional Administrator. (c) If the owner or operator or any subsequent owner or operator of the land upon which a hazardous waste disposal unit is located wishes to remove hazardous wastes and hazardous waste residues, the liner, if any, or contaminated soils, he must request a modification to the post-closure permit in accordance with the applicable requirements in parts 124 and 270. The owner or operator must demonstrate that the removal of hazardous wastes will satisfy the criteria of § 264.117(c). By removing hazardous waste, the owner or operator may become a generator of hazardous waste and must manage it in accordance with all applicable requirements of this chapter. If he is granted a permit modification or otherwise granted approval to conduct such removal activities, the owner or operator may request that the Regional Administrator approve either: (1) The removal of the notation on the deed to the facility property or other instrument normally examined during title search; or (2) The addition of a notation to the deed or instrument indicating the removal of the hazardous waste.	This space was intentionally left blank

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.1.11 264.120 Certification of completion of post-closure care	**264.120 Certification of completion of post-closure care**
No later than 60 days after the completion of the established post-closure care period for each hazardous waste disposal unit, the owner or operator must submit to the Regional Administrator, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification must be signed by the owner or operator and a registered professional engineer. Documentation supporting the registered professional engineer's certification must be furnished to the Regional Administrator upon request until he releases the owner or operator from the financial assurance requirements for post-closure care under § 264.145(I).	All hazardous wastes and equipment associated with the ILWMS will be removed and disposed of appropriately. Post closure plan and care will not be required. If clean closure cannot be achieved and a "risk-based closure" or "landfill closure" is deemed necessary then a post-closure plan will be developed.

IDAPA 58.01.05.008 (40 CFR 264 Subparts I and J)
1.2 Container Storage and Tank Systems Closure and Post-Closure

Regulatory Citation (Description of Requirement)	Compliance Methodology
1.2.1 264.178 Closure	**264.178 Closure**
At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soil containing or contaminated with hazardous waste or hazardous waste residues must be decontaminated or removed.	The container storage will be closed by removing all waste residues from CPP-1696 container storage areas. All containers, liners, bases, and soil containing or contaminated with hazardous waste or hazardous waste residues will be decontaminated or removed.
1.2.2 264.197 Closure and post-closure care	**264.197 Closure and post-closure care**
(a) 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 applies. The closure plan, closure activities, cost estimates for closure, and financial responsibility for tank systems must meet all of the requirements specified in subparts G and H of this part.	(a) The tank systems will be closed by removing all waste residues; contaminated containment system components (liners, etc.); contaminated soils; and structures and equipment contaminated with waste, and manage them as hazardous waste.
(b) If the owner or operator demonstrates that not all contaminated soils can be practicably removed or decontaminated as required in paragraph (a) of this section, then the owner or operator must close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills (§ 264.310). In addition, for the purposes of closure, post-closure, and financial responsibility, such a tank system is then considered to be a landfill, and the owner or operator must meet all of the requirements for landfills specified in subparts G and H of this part.	(b) The requirements will be applicable when the ILWMS receives its final volume of waste.
(c) If an owner or operator has a tank system which does not have secondary containment that meets the requirements of § 264.193(b) through (f) and has not been granted a variance from the secondary containment requirements in accordance with § 264.193(g), then:	(c) Not applicable for this closure plan. The tank systems associated with the ILWMS have secondary containment.

Regulatory Citation (Description of Requirement)	Compliance Methodology
(1) The closure plan for the tank system must include both a plan for complying with paragraph (a) of this section and a contingent plan for complying with paragraph (b) of this section. (2) A contingent post-closure plan for complying with paragraph (b) of this section must be prepared and submitted as a part of the permit application. (3) The cost estimates calculated for closure and post-closure care must reflect the costs of complying with the contingent closure plan and the contingent post-closure plan, if those costs are greater than the costs of complying with the closure plan prepared for the expected closure under paragraph (a) of this section. (4) Financial assurance must be based on the cost estimates in paragraph (c)(3) of this section. (5) For the purpose of the contingent closure and post-closure plans, such a tank system is considered to be a landfill, and the contingent plans must meet all of the closure, post-closure, and financial responsibility requirements for landfills under Subparts G and H of this part.	This space was intentionally left blank
1.2.3 264.258 Closure and Post-Closure Care	**264.258 Closure and Post-Closure Care**
(a) At closure, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated sub-soils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste unless §261.3(d) of this chapter applies.	(a) The waste pile will be closed by removing all waste residues; contaminated containment system components (liners, etc.); contaminated soils; and structures and equipment contaminated with waste, and managing them as hazardous waste,
(b) If, after removing or decontaminating all residues and making all reasonable efforts to effect removal or decontamination of contaminated components, sub-soils structures, and equipment as required in paragraph (a) of this section, the owner or operator finds that not all contaminated sub-soils can be practicably removed or decontaminated, he must close the facility and perform post closure care in accordance with the closure and post-closure care requirements that apply to landfills (§ 264.310).	(b) Not applicable for this closure plan. The waste piles associated with the IWTU are contained within the building.

IDAPA 58.01.05.008 (40 CFR 264 Subpart X)
1.3 Miscellaneous Units

Regulatory Citation (Description of Requirement)	Compliance Methodology
(c)(1) The owner or operator of a waste pile that does not comply with the liner requirements of § 264.251(a)(1) and is not exempt from them in accordance with §264.250(c) or § 264.251(b), must: (i) Include in the closure plan for the pile under § 264.112 both a plan for complying with paragraph (a) of this section and a contingent plan for complying with paragraph (b) of this section in case not all contaminated sub-soils can be practicably removed at closure; and (ii) Prepare a contingent post-closure plan under § 264.118 for complying with paragraph (b) of this section in case not all contaminated sub-soils can be practicably removed at closure. (c)(2) The cost estimates calculated under §§ 264.142 and 264.144 for closure and post-closure care of a pile subject to this paragraph must include the cost of complying with the contingent closure plan and the contingent post-closure plan, but are not required to include the cost of expected closure under paragraph (a) of this section.	(c) Not applicable for this closure plan. The waste piles associated with the IWTU are contained within the building and are exempt in accordance with §264.250(c).
1.3.1 264.603 Post-closure care	**264.603 Post-closure care**
A miscellaneous unit that is a disposal unit must be maintained in a manner that complies with § 264.601 during the post-closure care period. In addition, if a treatment or storage unit has contaminated soils or ground water that cannot be completely removed or decontaminated during closure, then that unit must also meet the requirements of § 264.601 during post-closure care. The post-closure plan under § 264.118 must specify the procedures that will be used to satisfy this requirement.	The owner/operator understand this requirement.

ATTACHMENT 9 - PERMIT MODIFICATION TRACKING LOG

RCRA PERMIT

FOR THE

IDAHO NATIONAL LABORATORY

Volume 14
INTEC Liquid Waste Management System

Attachment 9

Permit Modification Tracking Log

Revision Date: September 5, 2019

PERMIT MODIFICATION TRACKING LOG

SUBMITTED	APPROVED	PMR CLASS	SUMMARY OF CHANGES
April 17, 2014	DEQ approved the Permit Reapplication on October 21, 2014 with an effective date of November 20, 2014	Permit Reapplication	Permit Reapplication Format Administrative/editorial changes
October 1, 2015	November 30, 2015	2	The information contained in this PMR provides for the following changes based on the results of TI-102 testing: - Addition of OGF gas cannons - Instrument changes - CRR ATG nozzle changes - DMR waste feed nozzle changes - Nitrogen purge tubing change to HV-SRC-180-014, -004 - Removal of PV-SRC-191-022B - Install flow instrument in off-gas piping - Reconfigure Oxygen supply to CRR ATG nozzles - Replace auger/grinder shear pins - Reroute/increase size of JET-SRC-581 - Addition of product sampling line - Add/replace rupture discs - Calibration frequency changes - Administrative changes to update information and correct typographical errors as necessary.
April 20, 2016	April 28, 2016	1*	Change in designated contract operator from CH2M-WG Idaho, LLC to Fluor Idaho, LLC with an effective Revision Date of June 1, 2016.

SUBMITTED	APPROVED	PMR CLASS	SUMMARY OF CHANGES
January 11, 2017	January 24, 2017	1*	The information contained in this PMR provides for the following changes based on the results of continued testing and evaluation: - Add Drain to Denitration and Mineralization Reformer (DMR) Solids Transport Line - Remove Treated Water Source from the Carbon Reduction Reformer (CRR) - Reroute PHVF and PRF Decon Drain Line - Modify Piping for PRC 0 to PRC 1 Cross Connect - Install low point drain in Process Gas Filter (PGF) gas outlet - Install low point drain in Offgas Filter (OGF) gas outlet - Install low point drain in Product Receiver Filter (PRF) gas outlet - Install low point drain in Product Handling Vacuum Filter (PHVF) gas outlet. - CRR Spectacle Blind Isolation and Fluidizing Rail Nitrogen Blow-Down - Add Strainer to Sample Line - Apply Hard-Facing Weld Overlay on DMR Fluidizing Gas Distributors - Increase PRF/PHVF Back Pulse Reservoir Capacities - Increase PRC product cooling temperature from <150°C to <204°C prior to filling canister - Other Administrative changes. Various changes (e.g., remove independent from professional engineer certification requirement) were made to the permit to update information and correct typographical errors

PERMIT MODIFICATION TRACKING LOG

SUBMITTED	APPROVED	PMR CLASS	SUMMARY OF CHANGES
June 15, 2017	Not Applicable	Class 1 Permit Modification Notification (PMN)	The information contained in this PMN provides for the following changes: – The addition of the carboy leak detection on Appendix II Diagram Package Drawing No. 176275 Rev 6. – Change to form INTEC-4004 to include the use of the carboy.
February 16, 2017 NOD response submitted April 12, 2017	Notice of Deficiency (NOD) issued by DEQ on April 12, 2017 DEQ approved Temporary Authorization on April 26, 2017 DEQ approved Class 3 PMR with changes, with a permit effective date of September 29, 2017	3 with a Request for Temporary Authorization (RTA)	Addition of a maintenance manway to the Denitration and Mineralization Reformer (DMR)component of the Integrated Waste Treatment Unit (IWTU)

SUBMITTED	APPROVED	PMR CLASS	SUMMARY OF CHANGES
September 7, 2017	November 27, 2017	2	The information contained in this PMR provides for the following changes: – The addition of the Sump Tank, VES-SRC-133, and Clarifier Tank, VES-SRC-134, in the Process Cell for collection/settling of decontamination liquids and solids – Update of Permit Conditions II.L and IV.C.8 to match language in the Volume 22 Permit – Other Administrative changes. Various changes were made to the permit to update information and correct typographical errors
January 2019	TBD	3	The information contained in this PMR provides for the following changes: 1. Replace Denitration Mineralization Reformer (DMR) Ring Header. Replace damaged ring header and fluidizing gas rails with Double Plenum design to allow better distribution of fluidizing gas. [Class 3 – 40 CFR 270.42(d)(2)(iii)] 2. Carbon Reduction Reformer (CRR) Nozzle N3 Modification. Allow the removal of damaged refractory and repair/replacement of the refractory in the CRR. [Class 2 – 40 CFR 270.42 Appendix I, G.2.] 3. CRR refractory repair/replacement. Replace damaged castable refractory with hard faced refractory brick and castable refractory suitable for continued operation. [Class 2 – 40 CFR 270.42, Appendix I, G.2] 4. Lower maximum feed. Allow better control for treatment of wastes. [Class 2 – 40 CFR 270.42, Appendix I, L.4.]

SUBMITTED	APPROVED	PMR CLASS	SUMMARY OF CHANGES
January 2019 (continued)	TBD	3	5. Modify Offgas blower over-pressurization protection. Prevent accumulation of off-gas and condensation for stand-by blower. [Class 1 – 40 CFR 270.42, Appendix I, A.3] 6. Changes to the auger/grinder. Allow for continuous product transfer and removal of cementous material. [Class 1 – 40 CFR 270.42, Appendix I, A.3] 7. Replacement of DMR bed 3-point thermocouples with 6-point thermocouples. Allows for additional temperature data monitoring in the DMR. [Class 1 – 40 CFR 270.42 Appendix I, A.3] 8. Addition of DMR nitrogen neck purge. Allow increased fluidization. [Class 2 - 40 CFR 270.42, Appendix I, L.4] 9. DMR drain line purge. Allow increased fluidization. [Class 2 – 40 CFR 270.42, Appendix I, L.4] 10. CRR Nozzle N2 drain enhancement. Allow for effective bed removal in the vessel during radiological operations. [Class 1 – 40 CFR 270.42 Appendix I, A.3]. 11. Sample System Part Modifications. Allow increased functionality of the sample system. [Class 1 – 40 CFR 270.42, Appendix I, A.3] 12. Addition of Carbon Dioxide to the Fluidizing Gas. Reduces the buildup of wall scale and cementous product deposits in the DMR. [Class 2 – 40 CFR 270.42, Appendix I, L.4.] 13. Other administrative and editorial changes. [Class 1 – 40 CFR 270.42, Appendix I, A.3]