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Department of Energy

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DEC 04 1997
DOE-0184-98

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U.S. Environmental Protection Agency
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Mr. Tom Schneider, Project Manager
Ohio Environmental Protection Agency
401 East 5th Street
Dayton, Ohio 45402-2911

Dear Mr. Saric and Mr. Schneider:

REMOVAL ACTION NUMBER 9 THORIUM STABILIZATION PROJECT TECHNOLOGY SPECIFIC WORK PLAN

The purpose of this letter is to transmit for approval, the Fernald Environmental Management Project (FEMP) Mixed Waste Chemical Treatment Project, Thorium Stabilization Project Technology Specific Work Plan. This project will be implemented under the scope of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Removal Action Number 9 - Removal of Waste Inventories, the Director's Final Findings and Orders (DF&O), dated October 4, 1995, and the General CERCLA Work Plan for the Chemical Treatment Project.

The DF&O approved the FEMP Site Treatment Plan (STP) as developed to comply with the Federal Facility Compliance Act (FFCA). Under the approved STP, the Department of Energy, Fernald Environmental Management Project (DOE-FEMP) committed to submitting technology specific work plans to the U.S. Environmental Protection Agency (U.S. EPA) and Ohio Environmental Protection Agency (OEPA) for Mixed Waste Chemical Treatment. The General CERCLA Work Plan for the Mixed Waste Chemical Treatment Project requires DOE-FEMP to submit technology specific work plans for each specific treatment process to be conducted under the scope of the Chemical Treatment Project. This Technology Specific Work Plan is submitted to comply with commitments in the General CERCLA Work Plan for the Mixed Waste Chemical Treatment Project and the DF&O.

This Technology Specific Work Plan describes the thorium stabilization process that will be used to treat the thorium waste material currently stored at the FEMP site. The waste categories will be treated for land disposal at the Nevada Test Site. A contract was awarded to OHM Remediation Services Corporation on August 7, 1997, for treatment of these mixed waste streams.

If you have any questions or would like to discuss any aspect of this project, please contact Bob Danner at (513) 648-3167.

Sincerely,

Jack R. Craig
Director

FEMP:Danner

Enclosure: As Stated

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1119

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THORIUM LEGACY WASTE PROJECT

MIXED WASTE TREATMENT

TECHNOLOGY SPECIFIC WORK PLAN

November 1997

Prepared by:

Fluor Daniel Fernald
And
OHM Remediation Services Corp.

For

U.S. DEPARTMENT OF ENERGY

2 1/2

FINAL
TECHNOLOGY-SPECIFIC WORK PLAN (TSWP) FOR MOBILE COMMERCIAL SUPPORT SERVICES FOR THE THORIUM LEGACY WASTE PROJECT AT THE FLUOR DANIEL FERNALD SITE IN FERNALD, OHIO

Submitted to:

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November 20, 1997
Project 20078.2

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LIST OF ACRONYMS

ACA	Amended Consent Agreement
AEDO	Assistant Emergency Duty Officer
ALARA	As low as reasonably achievable
ARAR	Applicable or relevant and appropriate requirements
ASLs	Analytical Support Levels
BAT	Best Available Technology
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	Cubic feet per minute
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DQO	Data Quality Objective
FAT&LC	Fernald Atomic Trades and Labor Council
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
GCBCTC	Greater Cincinnati Building and Construction Trades Council
gpm	Gallons per minute
HAZWAT	Hazardous Waste Technician
HEPA	High efficiency particulate air
hp	Horsepower
LDR	Land Disposal Restrictions
MSDSs	Material Safety Data Sheets
NEMA	National Electric Manufacturer's Association
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NPL	National Priorities List
NTS	Nevada Test Site
OHM	OHM Remediation Services Corp.
OSHA	Occupational Safety and Health Administration
PID	Photoionization detector
PPE	Personal protective equipment
QA	Quality assurance
QAPP	Quality Assurance Program Plan
RCRA	Resource Conservation and Recovery Act
RWP	Radiation Work Permit
TCLP	Toxicity Characteristic Leachate Procedure
TLD	Thermo Luminescent Dosimeter
tph	Tons per hour
TSWP	Technology-Specific Work Plan
USEPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria
WBS	Work breakdown structure
WMB	White metal box

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FEMP MIXED WASTE CHEMICAL TREATMENT PROJECT
Thorium Legacy Waste Project

OHIO EPA RCRA PART B PERMIT
SUBSTANTIVE COMPLIANCE DEMONSTRATION

APPLICABLE Y/N	ITEM	CROSS REFERENCE INDEX
Y	Hazardous Waste Determinations (OAC 3745-52-11), (40 CFR 262.11)	Section 1.0
Y	Preparing and Transporting Hazardous Waste Off-Site (OAC 3745-52-20-31) (OAC 3745-52-40 and OAC 3745-52-42) (40 CFR 262.20 - 262.23 and 40 CFR 263.20)	Sections 3.1.2, 3.1.3, 3.15, 6.0
Y	Interim Status: Treatment, Storage, and Disposal General Facility Standards (OAC 3745-65-13-17) (40 CFR 265.31 - 35, 265.37)	Section 3.1.5, 3.1.6, 4.0
Y	Interim Status: Treatment, Storage, and Disposal Facility Preparedness and Prevention (OAC 3745-65-31 - 35, 3745-65-37) (40 CFR 265.31 - 35, 265.37)	Sections 3.1.6, 4.0
Y	Interim Status: Treatment, Storage, and Disposal Facility Contingency Plan and Emergency Procedures (OAC 3745-65-51 through 56) (40 CFR 265.51 through 265.76)	Sections 3.1.6, 4.0, 5.0
Y	Container Storage (OAC 3745-52-34, 3745-66-70 through 77) (40 CFR 262.34, 265.170 through 265.177)	Sections 3.1.2, 3.1.3, 3.1.6, 4.0
Y	RCRA Tank Standards (OAC 3745-66-90 through OAC 3745-66-9911) (40 CFR 265.190 through 40 CFR 265.200)	Sections 3.1.6, 4.0
Y	Residue of Hazardous Waste in Empty Containers (OAC 3745-51-07) (40 CFR 261.7)	Sections 3.1.2, 3.1.3, 3.1.6, 4.0
Y	Closure Performance Standards (OAC 3745-66-11, 3745-66-14) (40 CFR 265.111 and 40 CFR 265.114)	Sections 3.4, 4.0
Y	Reusable Equipment Decontamination (OEPA Closure Plan Review Guidance for RCRA Facilities)	Sections 3.4, 4.0
Y	Land Disposal Restrictions (OAC 3745-59) (40 CFR 268)	Sections 3.1.1, 3.1.4, 4.0, 4.1

Note: Compliance with the applicable, or relevant, and appropriate requirements (ARARs) is discussed in Section 4.0 and Table 4.1.

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1.0 INTRODUCTION

This Technology-Specific Work Plan (TSWP) describes the objectives and scope of work for the mixed waste treatment of the Thorium Legacy Waste Project to be conducted at the United States Department of Energy's (DOE) Fernald Site. The Fernald Site, also known as the Fernald Environmental Management Project (FEMP), is a government-owned, former uranium processing facility located near Cincinnati, Ohio. The site was placed on the National Priorities List (NPL) in 1989 and is currently undergoing remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with the 1991 Amended Consent Agreement (ACA) between the DOE and the United States Environmental Protection Agency (USEPA).

Prior to October 1991, the FEMP was a large-scale integrated facility for the production of high purity uranium metal to support the Department of Defense (DOD) weapons program. The FEMP also processed thorium ores and residues for use in various research facilities and in breeder reactors to make U-233. When the thorium processing ceased, the FEMP became the DOE repository for thorium and has since stored this material. Thorium materials managed at numerous other facilities were also sent to the FEMP for storage. In 1992, the DOE declared all thorium material waste. The thorium waste materials that will be treated under this project are contaminated with metals above the toxicity characteristic limits of the Resource Conservation and Recovery Act (RCRA).

The objective of the mixed waste treatment of the Thorium Legacy Waste Project is to treat the thorium waste to meet the Land Disposal Restrictions (LDR) as defined in RCRA and implemented by the State of Ohio. The treated material is also required to meet Department of Transportation (DOT) requirements and the NTS WAC. The Thorium Legacy Waste Project will be implemented as a CERCLA response action under the Ohio Mobile Chemical Treatment preferred option presented in the FEMP Site Treatment Plan (STP). The STP was approved and a Director's Findings and Orders implementing the STP was issued in October, 1995.

This TSWP, including the Quality Assurance Program Plan (QAPP), demonstrates that the proposed project will be accomplished in compliance with applicable or relevant and appropriate requirements (ARAR) mandated under federal, state, and local regulatory requirements, DOE orders, and site procedures.

1.1 OBJECTIVE

The objective of the mixed waste treatment of the Thorium Legacy Waste Project is to stabilize the thorium material. The thorium waste material can be divided into five general material types. Table 1.1 lists the six general waste types and the estimated volume of each waste type.

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TABLE 1.1

SUMMARY OF THORIUM WASTE MATERIAL TYPES AND ESTIMATED VOLUMES

Waste Type	Number of Containers	Estimated Volume (55-Gallon Drum Equivalents)	RCRA Waste Codes
Thoria gel (thorium hydroxide)	429	395	D005, D010
Contaminated soil, rocks, sand, bricks, and ceramics	3	2	*
Thorium dioxide (low fluoride)	35	5	D008
Thorium dioxide (powder)	41	38	D007, D008
Scrap salts, including floor sweepings	5	5	D007
Thorium-contaminated acids and bases	23	23	D002

*Assumed RCRA hazardous for metals by process knowledge.

Thorium waste materials are generally containerized in 55-gallon drums, with some 5- and 10-gallon cans; although container size ranges from 3-gallon cans up to 110-gallon drums. All of the containers are overpacked in drums or 4-foot by 4-foot by 7-foot white metal boxes (WMBs).

1.2 CONDUCT OF THE PROJECT

The mixed waste treatment of the Thorium Legacy Waste Project will be conducted in Building 65 at the Fernald Site, to minimize risk for internal personnel exposure and environmental release. The project team will consist of OHM Remediation Services Corp. (OHM), Fluor Daniel Fernald (FDF), and DOE-FEMP personnel.

OHM and FDF propose to use an integrated material handling/treatment process to handle and treat the thorium-based mixed waste residues currently stored in drums. Figure 1.1 illustrates the logistics associated with the material handling and treatment processes.

The treatment area inside of Building 65 is divided into a Drum Handling Area, a Material Handling Area, a Stabilization Treatment Area, and a Treated Material Storage Area.

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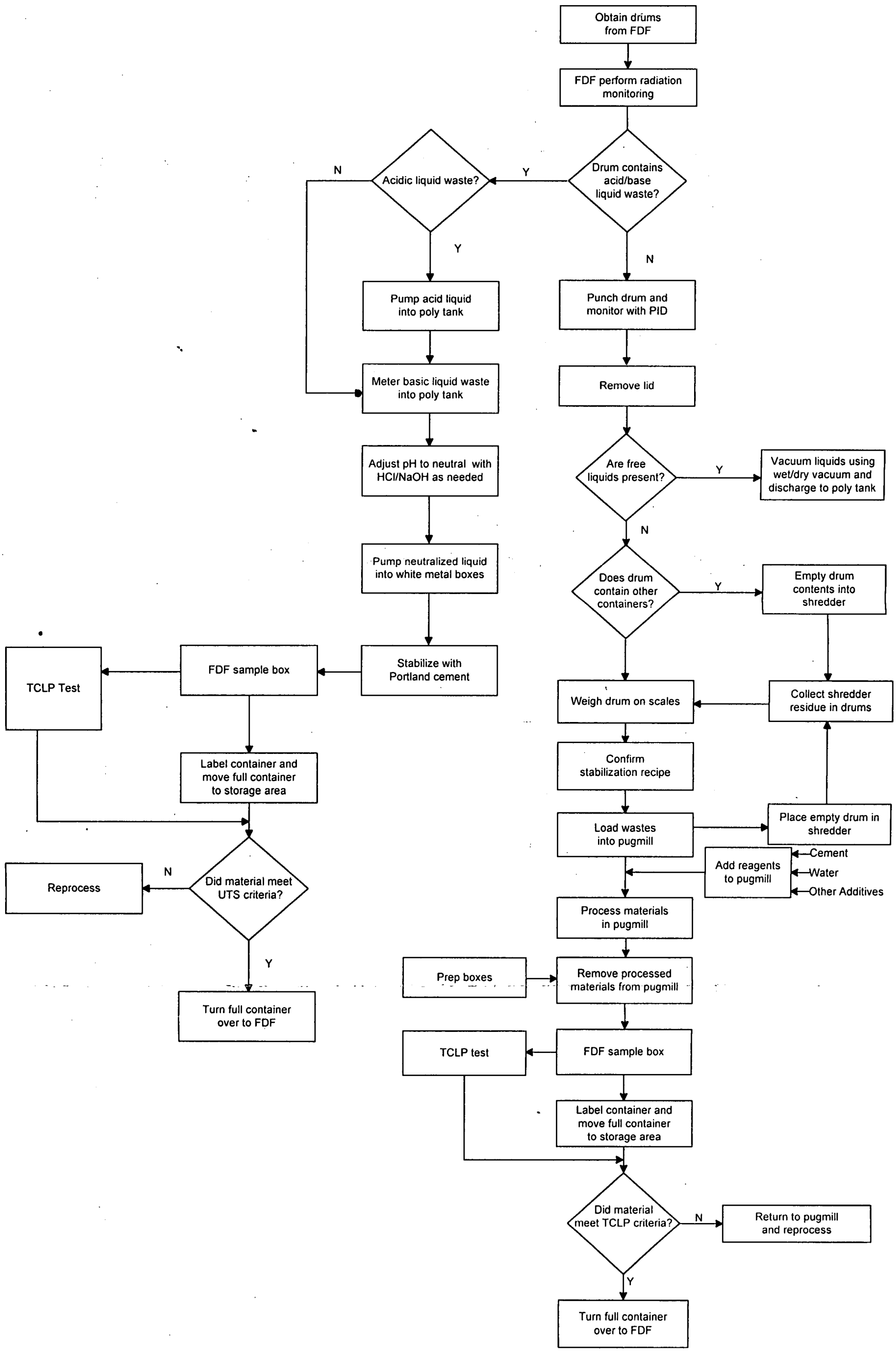
FIGURE 1.1
THORIUM LEGACY WASTE PROJECT
PROCESS FLOW DIAGRAM



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As the first step of the mixed waste treatment for the Thorium Legacy Waste Project, 23 drums containing contaminated liquid of acids and bases will be processed to neutralize and stabilize the liquids. This process consists of transporting the drums to the drum handling area. The acids will be pumped into a 2,000-gallon polyethylene storage tank. This tank will be located within a 1,950-gallon open top polyethylene containment basin. A seal-less drum pump will be used to pump the base liquids into the storage tank. After the acids are pumped into the tank, a chemical metering pump will be used to slowly add (at approximately 1 gallon per minute) the base materials to the tank and neutralize the materials. A tank mixer will be installed within the tank to properly mix the acids and bases. Additional hydrochloric acid or sodium hydroxide solution will be added, as needed, to complete the neutralization. A small medium-duty submersible dewatering pump will be used to pump the neutralized liquid into visqueen-lined white metal boxes. The liquids will then be stabilized by hand using Portland cement.

Following completion of the neutralization activities, the polyethylene storage tank will be used to store the water required for the pugmill stabilization activities. The small medium-duty submersible dewatering pump will be used to pump the water from the storage tank to the pugmill. A cold-water flow totalizer will be installed in-line to measure the amount of water added to the pugmill treatment batches.

In the Drum Handling Area, each drum containing solids will be remotely penetrated or punched and monitored for volatile organics with a photoionization detector (PID). This activity is a safety precaution and no volatile organics are expected to be found. Drums containing volatile organics will be plugged and set aside for further evaluation. If no detectable volatile organics are encountered, the lid will be removed from each drum and its contents inspected by an OHM Team Leader and the Fernald Atomic Trades and Labor Council (FAT&LC) Hazardous Waste Technician (HAZWAT). If free liquids are present in the drum, the liquids will be removed by a wet/dry vacuum. No free liquids are expected, but if they are found they will be handled in this manner. Based on the physical evaluation of the materials/solids contained in the drum, OHM's Team Leader will approve the drum for further processing or have it set aside for further evaluation.

In the Material Handling Area, each drum containing solids and free of inner containers will be weighed on a scale. The weighed drums will then be placed on a drum lifter and inverted over a 2-inch screen. Any material passing through the screen will fall into a pugmill. Oversized material removed during screening will be transferred to the shredder.

Material sent to the shredder will consist of the oversized material from the screening process, drums containing inner containers and emptied drums from the Material Handling Area. The drums containing inner containers will be lifted to the drum shredder with a forklift drum grappler attachment and processed through the shredder. Material from the shredder will be collected in 55-gallon drums and returned for weighing, screening, and stabilization treatment.

The material passing through the screen will fall into the 4-cubic-yard pugmill. Portland cement and other additives, identified during the Proof-of-Process testing, will be added to the pugmill. The amount of reagent(s) added will be based on the weight of the material contained in

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the drums. Following batch mixing in the pugmill, the processed material will be conveyed into 2-foot by 4-foot by 7-foot WMBs supplied by FDF. The WMBs will be moved to a storage area for sampling by FDF.

During each process operation, the emission of fugitive dusts will be controlled by enclosing each piece of operating equipment in a ventilation hood. The ventilation hoods will be connected to a high-efficiency particulate air (HEPA) filtered ventilation/exhaust system, which will be discharged to the outside of the existing building.

1.3 ORGANIZATION OF THE WORK PLAN

This TSWP is organized in a manner that is consistent with previously submitted and approved work plans. This TSWP and its appendices provide a complete description of how and where the Thorium Legacy Waste Project will be performed. The plan identifies the parties responsible for storage, handling, treatment, and disposal of the mixed thorium waste, and those parties having oversight responsibilities for quality assurance (QA), environmental compliance, and health and safety.

Section 2.0 of the TSWP provides a description of the wastes to be treated. Section 3.0 provides a description of the waste treatment process and all ancillary and support activities. This section also includes detailed descriptions of secondary waste treatment, facilities and equipment, project schedules, and decontamination activities. Section 4.0 describes the ARARs that form the regulatory compliance basis for this project. Section 5.0 describes the health and safety practices to be implemented during this project. Section 6.0 describes the organization of the project team and how the work and the project schedule will be managed. Section 7.0 describes the project-specific QAPP, which is included in Appendix B. Section 8.0 discusses the as low as reasonably achievable (ALARA) considerations employed for the Thorium Legacy Waste Project.

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2.0 WASTE DESCRIPTION

Since October 1991, the RCRA closure/corrective actions and CERCLA response actions at the FEMP have redirected the central mission of the FEMP toward implementation of waste management and environmental restoration initiatives. One of these initiatives is to identify, characterize, treat, and dispose of all legacy mixed waste stored at the FEMP in accordance with applicable federal, state, and local requirements. Approximately four hundred and forty-five 55-gallon drum equivalents of thorium mixed waste have been identified to be treated as part of this Thorium Legacy Waste Project.

As previously discussed in Section 1.1, the thorium waste material is divided into six general material types:

- Thoria gel (thorium hydroxide)
- Contaminated soil, rocks, sand, bricks, and ceramics
- Thorium dioxide (low fluoride)
- Thorium dioxide (powder)
- Scrap salts, including floor sweepings
- Thorium-contaminated acids and bases

Table 1.1 lists the estimated volume of each waste type.

Physical forms of the solid thorium waste vary and include the following: fine dry powder, moist paste, chalk-like chunks, thorium dioxide pellets, and sticky paste. The solid thorium material is considered hazardous in accordance with RCRA for exceeding the toxicity characteristic leaching procedure (TCLP) limits for metals, while the thorium-contaminated liquids are RCRA hazardous for corrosivity. Debris and trash may be found co-mingled with the thorium material. The debris will be size-reduced prior to treatment utilizing the shredder.

The thorium waste materials are generally containerized in 55-gallon drums, with some 5- and 10-gallon cans; although container size ranges from 3-gallon cans up to 110-gallon drums. Most of the containers are overpacked in drums or 4-foot by 4-foot by 7-foot WMBs with the remaining containers overpacked in drums.

3.0 TREATMENT DESCRIPTION

3.1 WASTE TREATMENT

This section includes detailed descriptions of the technology (see Section 3.1.1), the process (see Section 3.1.2 and 3.1.3), process control (see Section 3.1.4), documentation of material movement and processing (see Section 3.1.5), and waste minimization activities (see Section 3.1.6) for the Thorium Legacy waste Project.

3.1.1 Technology Description

The thorium-contaminated acids and bases will be neutralized to remove the corrosivity hazardous characteristic. Stabilization of the neutralized liquid will produce a treated material which meets the Universal Treatment Standards (UTS).

After the initial mechanical operations of drum handling, screening, and shredding, the thorium wastes will be processed with stabilization technology. Stabilization is BDAT for TC-metal wastes and will meet the LDR treatment standards. Stabilization, or chemical fixation, involves converting mobile or leachable waste contaminants into their least mobile, soluble, or toxic form. The stabilization technology is based on the design recipes established for each waste type during the Proof-of-Process testing.

3.1.2 Neutralization Process Description

As the first step of the mixed waste treatment for the Thorium Legacy Waste Project, 23 drums containing contaminated liquid of acids and bases will be processed to neutralize and stabilize the liquids. This process consists of transporting the drums to the drum handling area. The acids will be pumped into a 2,000-gallon polyethylene storage tank. This tank will be located within a 1,950-gallon open top polyethylene containment basin. A seal-less drum pump will be used to pump the base liquids into the storage tank. After the acids are pumped into the tank, a chemical metering pump will be used to slowly add (approximately 1 gallon per minute) the base materials to the tank and neutralize the materials. A tank mixer will be installed within the tank to properly mix the acids and bases. Additional hydrochloric acid or sodium hydroxide solution will be added, as needed, to complete the neutralization. A small medium-duty submersible dewatering pump will be used to pump the neutralized liquid into visqueen-lined white metal boxes. The liquids will then be stabilized by hand using Portland cement.

Following completion of the neutralization activities, the polyethylene storage tank will be used to store the water required for the pugmill stabilization activities. The small medium-duty submersible dewatering pump will be used to pump the water from the storage tank to the pugmill. A cold-water flow totalizer will be installed in-line to measure the amount of water added to the pugmill treatment batches.

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3.1.3 Stabilization Process Description

Drum Handling Operations

An area adjacent to the processing equipment will be designated for the staging of drums to be treated (see Figure 3.1). Each day, a minimum of twenty-five 55-gallon drum equivalents of thorium waste material are to be transferred to this area by FDF personnel.

A forklift, equipped with a forklift drum grappler attachment, will be used to maneuver the drums within the Drum Handling Area. Each drum will be remotely penetrated or punched and monitored for volatile organics with a PID. If no detectable organics are encountered, the lid will be removed from the drum and the contents of the drum inspected for the presence of free liquids and inner containers, conformance with material type, and suitability with the rest of the material handling and stabilization processing equipment. Free liquids will be removed from the drums by a suction hose and pumped into a wet/dry vacuum. As necessary, the contents of the wet/dry vacuum will be pumped into the liquid holding tank as make-up water for the stabilization process.

Following free liquid removal, the contents of the drum will be reinspected. Drums containing material types other than those specified by FDF and/or anticipated by OHM, or containing materials unsuitable for the material handling and stabilization equipment, will be resealed and staged for further evaluation and special handling. Drums deemed acceptable at the drum inspection station will be transported to the Material Handling Area using a forklift drum grappler attachment.

The Drum Handling Area will be enclosed inside a ventilated structure that will serve as a negative pressure dust collection system. The hoods have been designed to accept material for processing through draped entrances. The makeup air for the ventilation system will come from the building air, and as a result, maintain a slight negative pressure on the building. Blast gates will be provided on the vent ducts so that air flow can be diverted when a piece of equipment is not in service. Air will be drawn from the building into the ventilation hoods and discharged outside the building through a cyclone and a HEPA filter. Building 65 has an existing bank of eight HEPA filters to remove particulates from the building air.

Material Handling Operations and Equipment

Once in the Material Handling Area, a drum lifter will be used to lift and invert each drum that is free of inner containers above a 4-foot by 3-foot screen deck. The contents of the drum will be allowed to fall onto a 2-inch screen located inside a ventilation hood. Material passing through the screen will fall into a pugmill. The oversized material retained on the screens will be collected in a 55-gallon drum. Incompatible material, such as aerosol cans, will be removed and segregated from the over-sized material. After a sufficient amount of oversized material has been collected, it will be moved to the drum shredder for size reduction.

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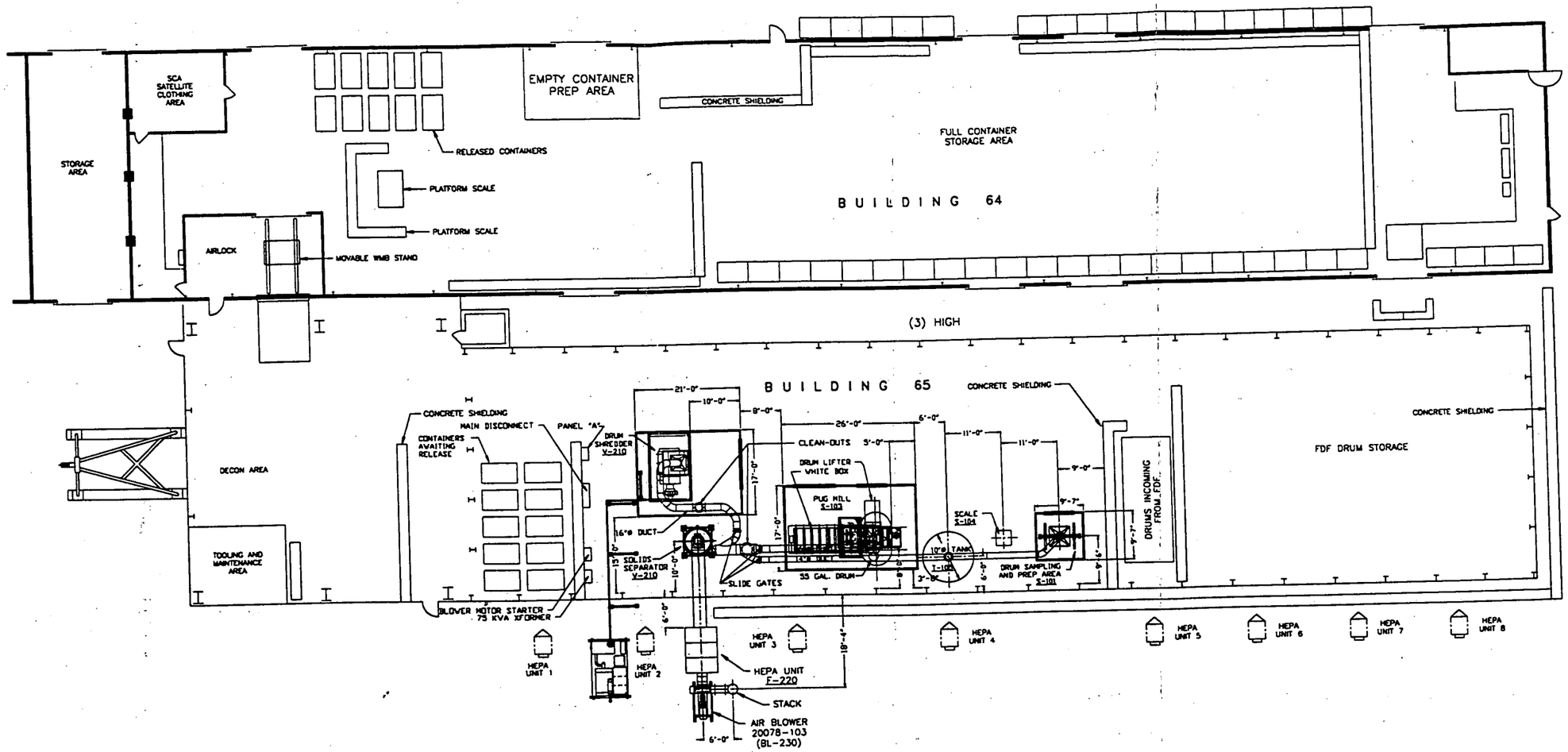

FIGURE 3.1

EQUIPMENT LAYOUT GA

PREPARED FOR
FDF
FERNALD, OHIO

OHM Remediation Services Corp.

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REV	DATE	DESCRIPTION	BY
2	17NOV97	ADDED SHELDING	CDB
1	3NOV97	REVISED DUCT CLEANOUTS	CDB
0	15SEP97	ISSUED FOR CONSTRUCTION	CDB

DRAWN BY	C. BINKLEY	15SEP97	SCALE 1"=10'	SHEET NO. 1 OF 1 / REV. 2
CHECKED BY	C. BINKLEY	15SEP97	DRAWING NO. 20078-040	
APPROVED BY	J. NEWBURN	15SEP97		

PLOT SCALE 1"=10'

G:\PROJECT\20078\040-2.

The over-sized material and drums containing inner containers will be lifted by a forklift drum grappler attachment and placed into a drum shredder. Material passing through the shredder will fall into 55-gallon drums and be transferred to the screen deck for further material handling. The shredder will also be enclosed inside a ventilation hood that will serve as a negative pressure dust collection system. The hoods have been designed to accept material for processing through draped entrances. The makeup air for the ventilation system will come from the building air and as a result, maintain a slight negative pressure on the building. Blast gates will be provided on the vent ducts so that air flow can be diverted when a piece of equipment is not in service. Air will be drawn from the building into the ventilation hoods and discharged outside the building through a cyclone and a HEPA filter.

Stabilization Operation and Equipment

A pugmill will be used to mix the screened material with the reagent(s). The pugmill has two top sectional doors to allow material to be placed into it from above. The pugmill is also equipped with a discharge gate, enabling it to be operated in a batch mode. The capacity of the mixing chamber is 4 cubic yards. The pugmill mix box is 4 feet by 10 feet and is rated at 100 tons per hour (tph) capacity at 90 pounds per cubic foot when run in a continuous mode. Based on its extended length configuration, coupled with closely placed paddles, the pugmill optimizes mixing thoroughness through increased blade interaction with material. Paddles are bolted onto structural steel shafts, with replaceable shafts flanged on both ends for ease of maintenance. The paddles are high carbon steel, heat treated, and welded at both ends. The mixer is V-belt driven by one 60-horse power (hp) electric motor.

Based on the weight of the screened material in the batch, the stabilization reagents, e.g., Portland cement and other additives, will be added to the pugmill in a bagged form using the drum lifter. The types and amounts of stabilization reagents required to treat each material type was determined by Proof-of-Process testing conducted in OHM's Findlay, Ohio, treatability laboratory (see Table 3.1).

TABLE 3.1

RECOMMENDED FORMULATIONS FOR THE STABILIZATION OF THE THORIUM WASTE MATERIALS

Waste Type	Portland Cement	Ferrous Sulfate	Water
	Mix Ratio		
Thoria Gel	0.10	--	0.40
Low Fluoride Thorium Dioxide	0.10	--	0.15
Thorium Dioxide Powder	0.10	--	0.28
Scrap Salts	0.10	0.02	0.40

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Based on the anticipated moisture content of the screened material to be treated, water will be added during the stabilization treatment of the screened material. The anticipated rate of water addition is 100 gallons per batch. The process system is designed to utilize decanted free liquids as part of the makeup for the 100 gallons of water for each batch, reducing secondary waste generation.

The screened mixed waste residuals, reagents, and water will be mixed together in the pugmill for 10 minutes to produce a homogeneous, consistent treated material. The stabilization treatment will produce a soil-like treated material that fully complies with the LDRs for stabilization of RCRA characteristic wastes.

After the mixing period, the discharge gate of the pugmill will be opened and the treated material will be discharged directly into a FDF-supplied, visqueen-lined, 2-foot by 4-foot by 7-foot white metal B-12 box. As the WMB is filled, the discharge gate will be closed, the full WMB removed to the Treated Material Storage Area, and another WMB readied for filling.

The pugmill will be enclosed inside a ventilation hood, which will serve as a negative pressure dust collection system. The hoods have been designed to accept material for processing through draped entrances. The main air collection within the ventilation hood will be located where the drum lift will dump the material onto the screen. The makeup air for the ventilation system will come from the building air. Blast gates will be provided on the vent ducts so air can be diverted when the pugmill is not in service. Air drawn through the ventilation hood will be discharged through a cyclone and a HEPA filter to outside the building.

Treated Material Staging Operations

Each 2-foot by 4-foot by 7-foot WMB full of treated material will be staged in the Treated Material Storage Area. A grab sample will be collected from each box for TCLP analysis by FDF. Treated material will be released to FDF for transportation and disposal at the NTS once TCLP results are received and NTS WAC compliance is reviewed and verified by FDF.

Reprocessing of Previously Treated Waste

In the event that the treated material contained in a box fails to meet the LDR treatment standard for the particular characteristic metals, OHM will transport the material back to the Material Handling Area.

Since the treated material will have a soil-like consistency, minimal problems are expected with reprocessing the treated material. The treated material will be transferred by hand into 55-gallon drums. Each drum will be weighed on the portable scale to determine the weight of material it contains. Each drum will then be lifted by the drum lifter and be inverted above the screen deck. The material to be processed will fall through the 2-inch screen into the pugmill. Based on the weight of material to be processed, reagents and water will be added to the pugmill. After the mixing period, the treated material will then be discharged into a visqueen-lined

WMB. The treated material will then be re-introduced into the stabilization treatment process as described in "Stabilization Operation and Equipment."

3.1.4 Process Control Plan

Introduction

This plan identifies the specific controls intended to maintain the treatment process previously described, with acceptable performance boundaries so that critical failure does not occur. Critical failure means failure of the treated waste to meet the applicable LDR treatment standards or NTS WAC.

Process parameters which, if not adequately controlled, could lead to failure are identified in Table 3.2. Local controls are also identified in Table 3.2. Failure would most likely be indicated by TCLP extraction and analysis of the treated waste. Most of the postulated failure events would be partially or wholly attributed to human factors. To aid in controlling human factors, procedures have been developed, and operators will be trained to use them. Procedures are developed and implemented as part of a comprehensive management control system, which is used to control how the project is managed. The management control system is documented by a series of plans and procedures, that are summarized in Table 3.3. Application of the management system is a global process control that ensures the local controls shown in Table 3.2 and described herein are developed and implemented. Any actual failure event would likely have one or more of the contributing causes discussed in the remainder of this section.

TABLE 3.2

PROCESS CONTROLS FOR CRITICAL FAILURE PARAMETERS

Process Parameter	Most Likely Failure Indicator	Potential Cause of Failure	Primary Process Control Mechanisms to Prevent Critical Failure	Backup Process Control
Stabilization	TCLP Metals	Inadequate mixing	Operator Training	Reprocess
Reagent Selection	TCLP Metals	Inadequate stabilization chemistry	• Operator Training • Technical Support • Operations Supervision	Reprocess
Batching	Radionuclide Level	Highly radioactive drums batched together	• Operator Training • Operations Support	Reprocess

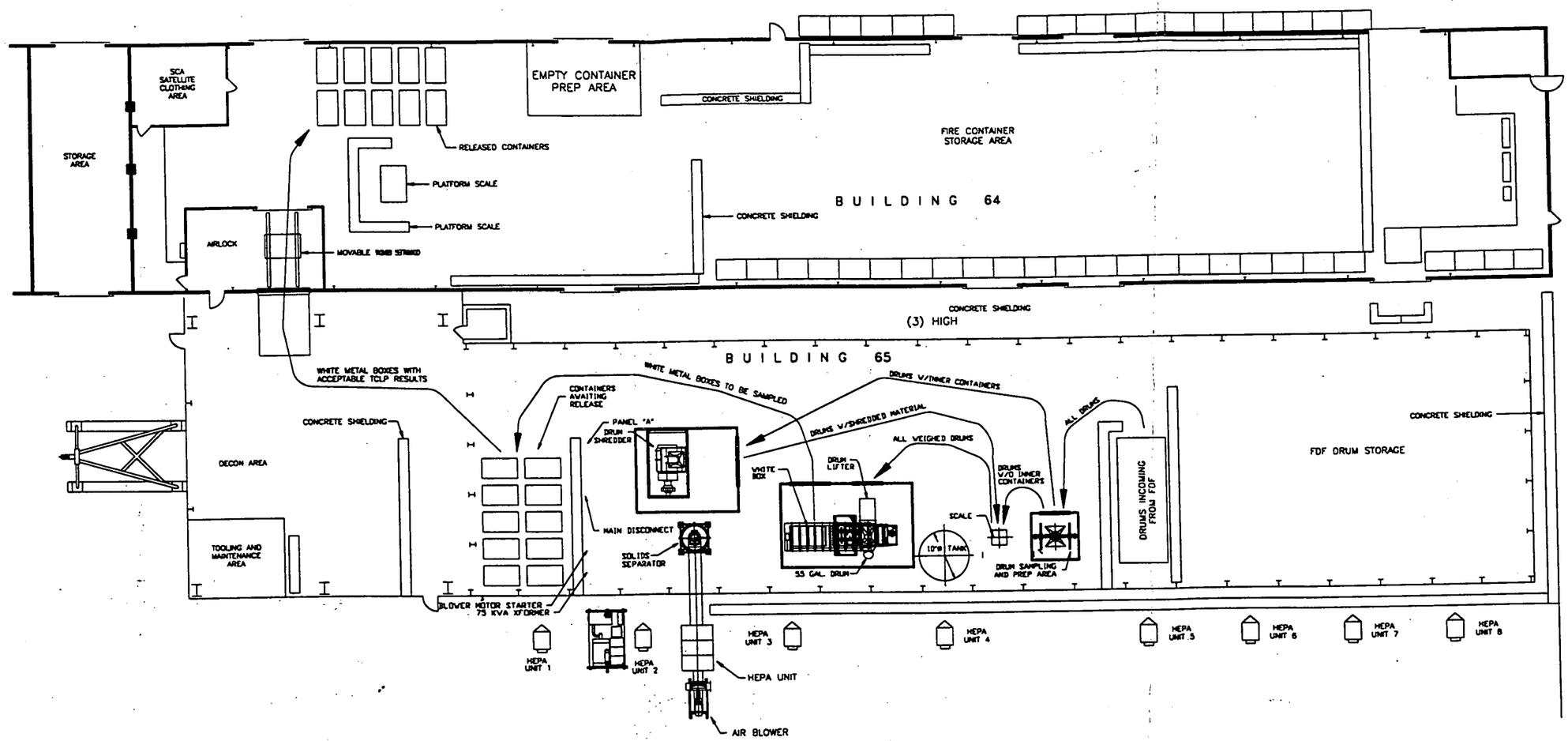

FIGURE 3.2

MATERIAL FLOW GA

PREPARED FOR
FDF
FERNALD, OHIO

OHM Remediation Services Corp.

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REV	DATE	DESCRIPTION	BY
2	17NOV97	ADDED SHELDING	CDB
1	3NOV97	BUILDING LAYOUT CHG	CDB
0	7OCT97	ISSUED FOR CONSTRUCTION	CDB

DRAWN BY	C. BINKLEY	7OCT97	SCALE 1"=10'	SHEET NO. 1 OF 1	REV. 2
CHECKED BY	C. BINKLEY	7OCT97	DRAWING NO. 20078-041	
APPROVED BY	P. LEAR	7OCT97		

PLOT SCALE 1"=10'

G:\PROJECT\20078\041-2

TABLE 3.3 PROJECT MANAGEMENT CONTROL SYSTEM DOCUMENTS	
Document	**Description**
Procedures	Provides sequential work instructions.
Quality Assurance Project Plan	Plans assessment to ensure acceptable work practices and waste products.
General and Specific Sampling Plan	Plans sampling of treated waste for process verification and waste acceptance.

TCLP-Indicated Failure Based on RCRA Metals Concentration

One possible critical failure is not meeting TCLP levels for RCRA/UTS metals. Passing the TCLP requires a combination of effective metals stabilization chemistry and adequate mixing.

The stabilization formulation is based on the Proof-of-Process testing results. The stabilization formulation for each waste type is provided to the operator at the stabilization work area; however, the possibility of TCLP-indicated failure exists even if the operator follows the stated formulation. Failure could be due to intergroup variability, chelation or complexing of metal ions, physical interference, or competing side reactions, which delete the reagent dose before all RCRA metals have been chemically fixated. Therefore, additional controls are provided in the form of technical support in evaluating the failures. Potential modification of the stabilization formulation may be required based on this evaluation.

Reprocessing

In the event primary controls described above fail to keep processes within critical failure bounds, the waste can be reprocessed. Strict enforcement of primary controls minimizes the likelihood of incurring lost effort and the expense of reprocessing.

3.1.5 Documentation of Material Movement and Processing

Figure 3.2 illustrates the movement of waste materials, waste treatment processing, and sampling for LDR compliance and waste acceptance purposes. This diagram shows how waste containers are transported between various locations in the Building 65 process area by FDF personnel. Each time material is moved from one processing area to another, FDF personnel will enter the incoming drum or container number and the new drum or container number on the appropriate processing area log sheet. Appendix A contains a copy of the log sheet for each processing area.

Documentation of the waste treatment activities is accomplished using a multi-page Operations Log Sheet, with each page representing a specific stage of the processing (see Appendix A).

3.1.6 Waste Minimization

Waste Minimization by Prevention of Contamination

The potential for the project to significantly contribute to the contamination of Building 65 is minimal. To minimize contamination risk from spills or container leaks, secondary containment (100%) will be provided around the free liquid collection tank in the Drum Handling Area by placing the free liquid collection tank inside of a second polytank. Another means of containing the spread of contamination will be the enclosure of fugitive dust sources within ventilation hoods. These hoods will be connected to the negative pressure dust collection system and vented to the outside through a HEPA filtration system.

Also, to minimize potential waste materials brought into Building 65, unwrapping, decontainerizing, or unpacking of equipment (including tools and materials) will be done prior to entry. This will reduce the amount of packing material in the contaminated areas. PPE, contaminated trash, and other LLW-generated will be disposed of in the headspace of the stabilized waste container. Original waste containers will be shredded and added to the stabilization mix.

Prevention of Environmental Media Pollution

Potential discharges of pollutants to soil, surface water, groundwater, and the atmosphere will be minimized by the following measures:

- For soil and groundwater pollution, all handling of materials will be performed within Building 65.
- For surface water pollution prevention, every effort will be made to prevent spills from occurring, and in the event of a spill, to prevent the spill from migrating into the environment.
- Engineered secondary containment of the free liquids collection tank and stocks of emergency spill response supplies will provide the first line of spill containment.
- The concrete floors, footings, and walls of Building 65 will provide an added level of protection against any spill inside the building reaching a water course outside the building.

Dust emissions from the treatment process will be minimized by the ventilation/filtration system. The ventilation system was designed in accordance with the practices recommended in the *American Conference of Governmental Industrial Hygienists Manual of Recommended Practice for Industrial Ventilation*. The dusts will be transported within prefabricated ductwork into a two-part system capable of filtering the captured air with an efficiency of 99.76% for particles exceeding 0.3 microns.

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Solids caught in the cyclone will be processed through stabilization to minimize waste. This step will reduce change frequency and disposal volume of HEPA filter elements. The system contains 12 HEPA filters arranged 3 wide by 4 high, having a total rated capacity of 12,000 cubic feet per minute (cfm). Along with the initial cyclone separation step, this capacity will give long filter life, thereby minimizing filter disposal impact, while maximizing the polishing efficiency.

Management of Facility Waste Containers

The OHM work force will manage all waste materials in cooperation with FDF to minimize hazards to project personnel, other personnel on the FEMP site, the public, and the environment. The OHM work force will assist FDF site personnel in complying with all substantive requirements under federal and state regulations identified in Section 4.0 that relate to identification, characterization, labeling, marking, inspection, tracking, and storage of hazardous waste in containers. Also, the OHM/FDF work force will comply with 40 CFR 265 and OAC 3745-65 requirements for emergency preparedness and response. The following Fernald site procedures will be used to ensure compliance with these waste management requirements:

- EW-0001, "Initializing Waste Characterization Activities Using the Material Evaluation Form"
- SOP-20-C-017, *"Movement of RCRA and Hazardous Waste"*
- SOP-20-C-500, *"Inspection of RCRA Waste Load/Unload and Staging Areas"*
- SOP-20-C-616, *"Inspection of Hazardous Waste Management Units"*
- SOP-20-C-630, *"Receipt Inspection and Placement of Hazardous, Mixed, PCB, and Asbestos Wastes into Storage"*
- SOP-20-C-606, *"Hazardous Materials Spill Cleanup"*
- EP-0004, *"Spill Incident Reporting and Cleanup"*

Facility and Tank Inspections

Inspections of the free liquid collection tank and equipment will be conducted daily when in use. Also, container storage, loading, and unloading areas will be inspected daily when in use. Inspections of these areas will include, but are not limited to, inspecting containers for leaks and damage, loose or illegible labels, aisle spacing, and waste compatibility. The presence and accessibility of adequate quantities of emergency response equipment will be verified.

Process equipment will be inspected for any mechanical or electrical conditions that could cause a failure, which could result in personal injury, property damage, or release to the environment, or render the equipment inoperable if not corrected. If such a condition is found,

the equipment will be immediately tagged out of service, and maintenance and repairs will be initiated. Before maintenance or repair work can take place, the equipment must be de-energized and locked out by the person performing the work so that it cannot be re-energized until the lock is removed. The lockout/tagout procedure in place at the FEMP Site will be used in these situations. Hot work is not anticipated; however, if hot work (e.g., cutting, grinding, or welding) is required, the FEMP Site hot work authorization procedure will be followed carefully to ensure that hot work is conducted safely.

Spill Response

In the event that an inspection reveals a leaking container or accumulations of dry mixed waste in process equipment or on the floor of Building 65, immediate action will be taken to contain, cleanup, and package the materials in question. The wet/dry vacuum, used to remove free liquids from drums containing solid thorium wastes, may be used for part of the spill cleanup, as necessary. Spill kits containing dry adsorbent, pads, or booms, will be located in close proximity to areas of potential spills or leaks. In the event of a large spill (>250 gallons), OHM and FEMP personnel will evacuate the area, notify the Fernald Communications Center, and stay outside the area until allowed to return by FDF health and safety personnel. Any material generated by the spill cleanup will be stabilized with the rest of the waste material.

Management of Contaminated Liquids

Any contaminated free liquids found within the waste containers will be removed in the Drum Handling Area. Free liquids will be removed from the drums by a wet/dry vacuum.

Management and Disposal of Secondary Waste

During the mixed waste treatment of the Thorium Waste Legacy Project, two main types of waste will be managed: primary and secondary waste. Primary wastes include the 513 waste containers of the 55-gallon drum equivalents comprising the three waste categories. Secondary wastes include by-product streams derived from the primary waste.

The project will generate the following as secondary wastestreams during the Thorium Legacy Waste Project:

- 400 sample jars
- 1,500 items of personal protective equipment (PPE) (e.g., Tyveks, boots, gloves, etc.)
- 2,000 gallons of decontamination water
- 12 HEPA filters
- 536 waste containers
- Drop cloths, rags, paper towels
- Disposable parts/equipment
- Hydraulic fluid

The sample jars will hold samples of the treated waste material while FDF completes NTS WAC acceptance testing. The PPE will be generated by the supervisors and laborers as they treat the thorium-mixed waste material. The decontamination water will be generated by equipment decontamination procedures. The HEPA filters will be generated during the treatment process as material is filtered out by the ventilation system.

The disposition of the secondary wastes depends on the secondary waste material and when it is generated. The sample jars, PPE, and HEPA filters will be containerized and periodically shredded. The shredded material will be mixed with thorium waste that has been shredded and/or screened and is awaiting stabilization treatment.

Decontamination water will be generated after the drummed waste treatment process has been completed; therefore, it cannot be incorporated into the treatment process or the treated waste material. The decontamination procedures will incorporate the reuse of decontamination water, to the extent practical, to minimize the amount of decontamination water to be generated. The decontamination water present at the end of equipment decontamination will be pumped into the 2-foot by 4-foot by 7-foot metal boxes and solidified with Portland cement. The 2,000 gallons of decontamination water will produce ten boxes of solidified material for disposal.

Table 3.4 summarizes the secondary waste generation and disposition for the treatment of the drummed thorium-mixed waste.

TABLE 3.4

SECONDARY WASTESTREAMS AND THEIR DISPOSITION

Item	Amount	Disposition
Empty sample jars	400 jars	Shredded and placed into waste to be stabilized.
PPE (includes Tyveks, gloves, respirator cartridges, etc.)	1,500 pieces	Shredded and placed into waste to be stabilized.
Decontamination fluids	2,000 gallons	Stored in poly tanks for treatment and stabilized.
HEPA filters/prefilters	12 filters	Shredded and placed into waste to be stabilized.
Waste containers	536 containers	Shredded and incorporated into waste to be stabilized.
Drop cloths, rags, paper towels	Two 55-gallon drums	Placed into stabilized decontamination fluids.
Disposable parts/equipment	Two 55-gallon drums	Placed into stabilized decontamination fluids.
Herculite	Five 55-gallon drums	Shredded and placed into stabilized decontamination fluids.
Hydraulic fluids	55-gallon drums	Packaged for disposal.

Materials Management

Non-waste materials, such as reagents, equipment spare parts, and consumable supplies, will be managed to prevent emergency situations, such as spills or releases, to prevent project delays due to shortages of critical supplies, and to assure procurement and use of safe and correct materials. The consumable supplies are vendor-supplied materials necessary to make the treatment process function. These include fuels, equipment maintenance supplies (e.g., lubricants, hydraulic fluid, filters, etc.), hand tools, spare parts, housekeeping supplies, emergency or spill response supplies, safety equipment materials, and office supplies.

Reagents and supplies will be received, handled, processed, and stored in accordance with applicable procedures. Records of supplies will be made and receipts kept. The record will show the date received, quantity received, and condition when received. Supplies will be handled carefully to prevent spillage. Bulk materials will be moved with pallets or other carriers. All supplies rejected at inspection will be restricted from use and will be considered for return, unless they are irreparably damaged or have become contaminated.

Each HEPA filter system will be tested using the Absolute Filter Testing Method with Emery 3000 or equivalent by FDF personnel in accordance with FDF procedures.

The reagents to be used during this project include Portland cement and ferrous sulfate. In addition, wash detergents, lubricants, greases, and hydraulic oils will be used to maintain and operate equipment. Prior to mobilization, Material Safety Data Sheets (MSDSs) will be supplied for each material and for any chemical subsequently identified as being necessary to the project. Hazard Communication Program requirements will be managed in accordance with 29 CFR 1910.120 and FDF Chemical Hazard Communication Program requirements.

Material control for this project is the method by which all materials, supplies, and purchased parts are obtained, inspected, and stored at the project site until they are used, and by which inventories are controlled to prevent shortages. The quantity of each item that triggers the ordering of replenishment stocks is determined considering lead time, supplier reliability, the value of materials, the cost of storage, and risks of deterioration. Documentation concerning the quality of the materials used in the process is retained with the project files. Materials will be received in advance of scheduled production processing. A visual check of materials and supplies in stock will be routinely made. Project personnel will determine when the reorder point is reached for bulk consumable items.

3.2 FACILITIES AND EQUIPMENT

This section describes the facilities and equipment to be used to treat the thorium-mixed waste. The FEMP Site will provide water, electricity, local phone service, and shelter for the waste treatment equipment. All tools, vehicles, and equipment will be inspected by Fernald site personnel for radioactive contamination prior to initial entry and upon removal from the designated processing area. An accurate and up-to-date floor plan for the equipment layout will be maintained in current condition, showing placement of equipment and work stations, as well as dimensions of work areas around equipment.

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3.2.1 Processing Facilities

The Thorium Legacy waste Project will be performed at Building 65 of the Fernald Site, Figure 3.1 shows the equipment layout within Building 65. The portion of the building used for the processing area has unrestricted overhead clearance of approximately 20 feet above floor level. The floor is capable of safely supporting the wheel load of the forklift, fully loaded. There are no floor drains in the area where the treatment process will take place. A HEPA wet-vac will be used in housekeeping of the process area to prevent the accumulation of contaminants on the floor and a floor scrubber will be used to clean the floors. The process area in Building 65 has substantial floor contamination, which is subject to future decontamination and decommissioning requirements.

3.2.2 Processing Equipment

The processing equipment required for the stabilization treatment of the thorium-mixed waste is listed below:

- Forklift drum grappler
- Screen deck
- Diesel generator
- Shredder
- Drum lifter
- Portable scale
- Pugmill

Maintenance will be performed on equipment, as needed, to maintain process operations. There will be two aspects to preventive maintenance. First, routine maintenance (such as lubrication and cleaning) will be performed regularly by the operating crew members and in accordance with manufacturer's instructions. Second, for major corrective maintenance, a mechanic will be brought in. Every attempt will be made to anticipate the need for maintenance and repair. Key features of the plan are as follows:

- Critical spare parts will be kept on hand in case of failure. These parts will include shredder knives, hydraulic fluid, HEPA filter elements, air and hydraulic hoses, and housekeeping supplies.

- Operating crew members will include experienced mechanics who can maintain equipment.

- Housekeeping will be performed daily.

- HEPA filter differential pressure will be monitored daily.

- Shredder blades will be replaced if and when they fail to perform their intended function.

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- Cleanup will be performed using fresh water, which will be drained, collected by a HEPA wet-vac, and recycled, by adding it to the waste during treatment.

- National Electric Manufacturers Association (NEMA) frame motors for the shredder will be available within 24 hours.

3.2.3 Utilities

The following utilities will be required to efficiently perform the work in Building 65:

- 60-hp Pugmill Motor: 440 vac, 3-phase, 75 amps, full load
- 60-hp Air Blower Motor: 440 vac, 3-phase, 75 amps, full load
- 1.5-hp Drum Lifter Motor: 440 vac, 3-phase, 3 amps, full load
- 2-hp Conveyor Motor: 440 vac, 3-phase, 4 amps, full load
- Single-phase Power: 110 vac, 1-phase, 100-amp service
- Utility Water: 10 gallon-per-minute (gpm) peak flow capacity

3.2.4 Services Provided by the Fernald Site

In addition to the utilities listed above, the Fernald Site will provide various services, equipment, and materials for this project, including the following:

- A 15,000-square-foot area inside Building 65 for the process area

- Waste operations personnel and equipment for drum and container staging, drum opening and inspection, decanting of free liquids, fork truck operations, and processing

- Laboratory analytical services for process verification and waste acceptance

- Specification WMBs for packaging stabilized waste for disposal at the designated disposal site

- FDF radiological control and industrial hygiene monitoring support

3.3 PROJECT SCHEDULE

Figure 3.3 is a project schedule showing major milestones of the Thorium Legacy waste Project. The schedule shown in Figure 3.3 will be maintained and updated for the duration of the project and will provide a basis for progress tracking and reporting.

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Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
Project Plans & Submittals				
10000000	Contract Award	0	13AUG97A	
10000010	Initial Plan Submittal	15	13AUG97A	17OCT97
10000011	Prepare Project Schedule	3	13AUG97A	15AUG97A
10000091B	Develop Proof of Process Test Plan	40	18AUG97A	04SEP97A
10000012	Prepare QAPP	4	02SEP97A	13OCT97
10000013	Prepare CONOPS Implementation Plan	10	02SEP97A	13OCT97
10000014	Prepare Project Procedures	12	02SEP97A	13OCT97
10000015	Prepare Labor Utilization Plan	4	02SEP97A	05SEP97A
10000016	Prepare Equip. Layout Drawing and Specifications	13	02SEP97A	13OCT97
10000018	Prepare Technology Specific Work Plans	5	02SEP97A	13OCT97
10000019	Prepare Secondary Waste Stream I.D. Plan	3	02SEP97A	04SEP97A
10000019A	Prepare Substance Abuse Program	2	02SEP97A	13OCT97
100000091C	Fluor Daniel Rev. of Proof of Process Test Plan	5	05SEP97A	11SEP97A
100000091D	Conduct Proof of Process Test	4	12SEP97A	03OCT97
100000091E	Revise & Resubmitt Plans to FDF and DOE	5	20OCT97	24OCT97
100000092A	Submitt Plans to FDF and DOE	0	27OCT97	
100000092B	Submitt Plans to OEPA/USEPA	0	27OCT97	
10000092C	FDF/OEPA/USEPA Review & Approval	90	27OCT97	24JAN98
10000092D	Notice to Proceed for Phase II	1	26JAN98	26JAN98
Mobilization and Project Setup				
10000030	Mobilization	1	27JAN98	27JAN98
100000030A	Delivery of Stabilization and Vent. Equip.	2	28JAN98	29JAN98
10000040	Project Setup	30	28JAN98	10MAR98
10000041	Stabilization Equipment Setup and Const. Accpt.	20	30JAN98	26FEB98
10000042	Ventilation System Setup and Const. Accpt.	20	30JAN98	26FEB98
10000043	Systems Operability Test	5	27FEB98	05MAR98
10000044	Stand-By and Start-Up Review	15	06MAR98	26MAR98
Stabilization of Waste				
10000060	Stabilization Process	87	27MAR98	27JUL98
10000061	Phase II, Option I Waste Stabilization	26	27MAR98	01MAY98
10000070	On Site QC	87	27MAR98	27JUL98
10000093	Equipment Maintenance	87*	27MAR98	27JUL98
10000062	Phase II, Option II Waste Stabilization	59	04MAY98	23JUL98
Decontamination and Demobilization				
10000080	Decon Of Equipment	25	28JUL98	31AUG98
10000082	Decontamination of Stabilization Equipment	25	28JUL98	31AUG98
10000081	Decontamination of Ventilation Equipment	5	25AUG98	31AUG98
100000082A	Teardown of Stabilization and Vent. Equip.	1	01SEP98	01SEP98
10000031	Demobilization	1	02SEP98	02SEP98
Final Reports and Project Close-Out				
9999999999	Site Administration & Support - Option I	77	27JAN98	13MAY98
999999999A	Site Administration & Support - Option II	57	16JUN98	02SEP98
10000090	Final Report Submittal	15	03SEP98	23SEP98
9999999	Project Complete	0		23SEP98

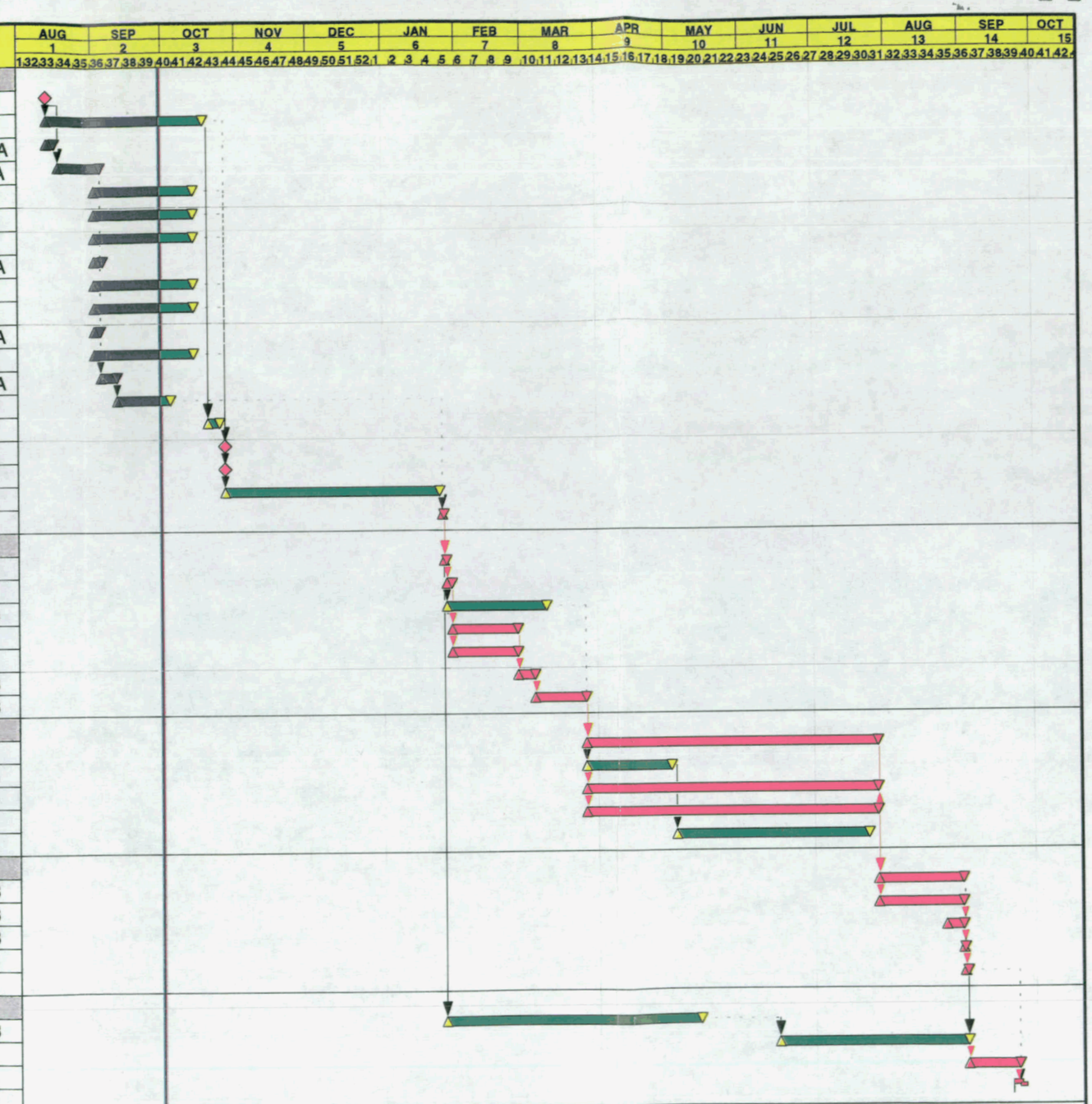

FIGURE 3.3

Project Start	01AUG97
Project Finish	23SEP98
Data Date	30SEP97
Run Date	06NOV97

Early Bar
Progress Bar
Critical Activity

FDF1

Fluor Daniel Fernald

Thorium Stabilization Project

Status as of Sep 30, 1997

Sheet 1 of 1

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3.4 DECONTAMINATION

Decontamination activities are an integral part of the Thorium Legacy waste Project. The primary method of decontamination will be performing the surface washing and rinsing of nonporous items using a diluted detergent solution (e.g., Simple Green), followed by a clean water rinse. This method will also be applied to the decontamination of reusable equipment and tools and also be used for area cleanup and housekeeping, as appropriate. During processing, recovered wash and rinse water will be collected and added to the waste material during stabilization.

At the end of the project, the Building 65 process area and equipment will be decontaminated. Dry vacuum, wash, rinse, and surface wipe procedures will be used, as appropriate, in the final decontamination of the reusable equipment and process area. Accumulated wash water will be collected and solidified for disposal. Rinse water will be reused as wash water, whenever practical. Excess rinse water will be collected and solidified. Decontamination activities will be performed in compliance with DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and FDF Site Procedure RP-0009, *Radiological Requirements for the Release of Material at the Fernald Environmental Management Project.*

3.4.1 Decontamination of Equipment Prior to Use

New equipment will be considered uncontaminated by hazardous or radioactive waste. No survey or measurements will be made unless requested by FDF. Before any previously used equipment is installed on the site, it will be surveyed by FDF for contamination and decontaminated, if necessary, to protect against cross-contamination and to avoid adding additional waste codes to the waste.

3.4.2 Decontamination for Routine Good Housekeeping

FDF Radiological Control Technicians will make routine surveys of fixed and removable contamination in the facility. If removable contaminants in excess of posted values are detected on floors or work surfaces in the exclusion zone, then the surface will be promptly decontaminated as described above.

3.4.3 Decontamination of Reusable Equipment and the Process Area After Waste Processing

For the purposes of this TSWP, most process equipment is considered to be reusable under Ohio EPA Closure Plan Review Guidance for RCRA facilities. Once the waste is processed, equipment that has become contaminated with waste constituents will be decontaminated and managed as follows:

- Decontamination will consist of the following steps: dry vacuuming, rinsing with a detergent solution to remove visible contamination, rinsing with clean water, and surveying.

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- Accumulated wash water will be collected and solidified for disposal. Rinse water will be reused as wash water whenever practical.

- Excess rinse water will be collected and solidified.

- The equipment will then be surveyed for radiological contamination by FDF Radiological Control for unrestricted free release. If the equipment requires further decontamination, it will be steam cleaned, pressure washed, or scrubbed prior to resurveying.

Wipe methods may also be used to enhance the efficiency of the decontamination effort. Any used wipes will be double contained in taped plastic sheeting or plastic bags. Drop cloths used during decontamination activities will be rolled to the inside and taped for reuse. Visible material contamination will be removed by the wash and rinse methods, except that the wash and rinse solutions will be collected using HEPA wet vacs. FDF Radiological Control Technicians will confirm that the process operations have not significantly increased fixed or removable contamination levels above as-found levels by repeating the measurements made in the baseline survey. If contamination exceeds baseline levels, FDF Radiological Control personnel will assist with further decontamination efforts.

The release of any equipment for unrestricted use is considered on a case-by-case basis at the time that it is proposed for release. The following guidelines apply:

- A reasonable effort will be made to eliminate residual contamination.

- Radioactivity on equipment surfaces shall not be covered by paint, plating, or other covering material unless contamination levels are determined by a survey to be below unacceptable limits.

- A 100% survey will be required on all accessible equipment surfaces. Inaccessible surfaces will be surveyed or evaluated for release by an authorized FDF Material Release Evaluator.

Equipment which can not be decontaminated will be released as radiologically-contaminated material to OHM for disposition in compliance with OHM's NRC license.

3.4.4 Equipment Demobilization

After decontamination, demobilization activities will include completion of the following checklist items:

- Empty and clean out personal areas.
- Return FDF furnished radio (if applicable).
- Return FDF radio pass (if applicable).
- Sign medical termination form.

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- Return Thermo Luminescent Dosimeter (TLD).
- Fill out request for final dosimetry reading.
- Provide an exit bioassay.
- Return identification badge.
- Provide forwarding address.
- Provide FDF with turnover debriefing information.

Upon completion of the work, the area of Building 65 where the process equipment was installed will be restored. All restoration work will be completed to FDF's satisfaction. Table 3.5 identifies a sequence of actions that will be performed for closure of the process area.

TABLE 3.5

SEQUENCE OF ACTIONS FOR CLOSURE OF PROCESS AREAS

Equipment Item	Actions
Ventilation Hoods	Disassemble and remove. Decontaminate by vacuuming and/or wiping. Survey for release/further decontamination, as required. Cut/size reduce unreleasable sections. Compact and manage clean/releasable scrap materials.
Metal Duct Work	Disassemble and remove. Decontaminate by vacuuming and/or wiping. Survey for release/further decontamination, as required. Compact and manage clean/releasable scrap materials.
HEPA Filtration Units and Wet-vacs	Remove and bag filter elements. Disassemble and survey. Decontaminate and resurvey. Final HEPA filters will be stabilized by hand.
Pugmill Screen	Decontaminate by vacuuming and/or wiping. Decontaminate by washing and rinsing. Survey for release/further decontamination, as required. Compact and manage scrap materials, if necessary.
Shredder Motor and Frame	Decontaminate by vacuuming and/or wiping. Decontaminate by washing and rinsing. Survey for release/further decontamination, as required. Compact and manage scrap materials, if necessary.

TABLE 3.5

SEQUENCE OF ACTIONS FOR CLOSURE OF PROCESS AREAS

Equipment Item	Actions
Shredder Knife Bed and Feed Hopper	Decontaminate surfaces by washing. Disassemble and remove knife blades for decontamination. Decontaminate shafts by vacuuming and/or wiping. Survey for release/further decontamination, as required. Compact and manage scrap materials, if necessary.
Pugmill Mix Box and Motor	Decontaminate surfaces by vacuuming and/or wiping. Decontaminate surfaces by washing and rinsing. Survey for release. Compact and manage scrap materials, if necessary.
Pugmill Shafts and Paddles	Decontaminate surfaces by washing. Disassemble and remove shafts and paddles. Decontaminate shafts and paddles by vacuuming and/or wiping. Survey for release. Compact and manage scrap materials, if necessary.
Hand Tools	Decontaminate by vacuuming and/or wiping. Survey for release.
Used Drums and Buckets	Decontaminate by vacuuming and/or wiping surfaces or by washing. Decontaminate by rinsing. Survey for release. Compact and manage scrap materials, if necessary.
Liquid Collection Equipment	Decontaminate inside and out by rinsing. Decontaminate inside and out by vacuuming and/or wiping. Survey for release.

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4.0 ENVIRONMENTAL COMPLIANCE, ARARs, AND SPILL RESPONSE

The Thorium Legacy Waste Project will be exempt from the requirement to obtain permit approval under Section 121(e) of CERCLA and 40 CFR 300, provided the project complies with all ARARs established under federal and state environmental regulations. Table 4.1 lists the ARARs for the Thorium Legacy Waste Project and identifies the compliance strategy that will be followed to attain compliance with these requirements.

TABLE 4.1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
National Emission Standards for Hazardous Air Pollutants (NESHAP) - 40 CFR Part 61, Subpart H, Emissions of Radionuclides Other Than Radon From DOE Facilities	40 CFR 51.92: Radiological emissions (except radon-222 and radon-220) to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive an effective dose equivalent of 10 mrem in any one year. 40 CFR 61.07 and 61.96(b): An application for approval does not have be filed for radionuclide sources if the effective dose equivalent caused by all emissions from the new construction or modification is less than 0.1 mrem per year. 40 CFR 61.93(b): Continuous emission monitoring is required for stacks and vents that have the potential, under normal operating conditions, but without emission control devices, to release radionuclides in sufficient quantities to cause any member of the general public to receive an effective dose equivalent of 0.1 mrem per year or greater.	The dose resulting from the proposed project will be included in the annual Fernald Site NESHAP, Subpart H Report. Emissions from the project will not result in exceedance of the annual standard. Radionuclide emissions from the project are not expected to cause any member of the general public to receive an effective dose equivalent of 0.1 mrem per year or greater. FDF will need to conduct CAP88PC modeling to determine if a stack sampler is required for project stacks.

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TABLE 4.1 (CONTINUED)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
Atomic Energy Act (10 CFR 835)	Radiation doses, levels, and concentrations in restricted and unrestricted areas.	Emissions from this removal action will not result in the radiation limits being exceeded in restricted and unrestricted areas in accordance with the FDF Site Health and Safety Plan.
Air Pollution Control - Permits to Install and Permits to Operate (OAC 3745-31 and OAC 3745-35)	OAC 3745-31-05(A) Permits to Install: Installation of the proposed solidification equipment must not prevent or interfere with the attainment or maintenance of applicable ambient air quality standards; and must not result in a violation of any applicable laws; and must employ the Best Available Technology (BAT) to control emissions. OAC 3745-35-02 (c) Permits to Operate: The solidification equipment must be operated in compliance with applicable air pollution control laws; must be constructed, located, or installed in compliance with the substantive requirements of the permit to install; and must not violate NESHAP standards adopted by the Administrator of the USEPA.	The proposed project will not interfere with the attainment or maintenance of any applicable air quality standards or cause a violation of any applicable laws. BAT will be implemented in the form of HEPA filtration to control radiological particulate emissions. Solidification equipment will be operated in compliance with applicable air pollution control laws and will not violate applicable NESHAP standards.
Radiation Exposure to the Public	Radiation Dose Limit (40 CFR 192.02[b]) Radiation Dose Limit (Drinking Water Pathway) (10 CFR 834)	The project will be designed and operated to minimize the release of radionuclides. Compliance will be demonstrated by site-wide environmental monitoring, including air, soil, and groundwater monitoring.

TABLE 4.1 (CONTINUED)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
Resource Conservation and Recovery Act (U.S.C. 6901 et. seq.)	Hazardous Waste Determinations (OAC 3745-52-11) (40 CFR 262.11)	Project wastes have been characterized as containing RCRA constituents regulated under EPA waste codes D002, D005, D007, D008, and D010. Wastes generated from the project will be characterized in accordance with Site Procedure EQ-0001 and the FEMP Waste Analysis Plan. Samples of treated material will be collected and analyzed to verify that LDR requirements and disposal facility WAC are met.
Resource Conservation and Recovery Act (U.S.C. 6901 et. seq.)	Preparing and Transporting Hazardous Waste Off Site (OAC 3745-52-20 through 31) (OAC 3745-52-40 and OAC 3745-52-42) (40 CFR 262.20 through 262.23 and 40 CFR 263.20)	Any generator who transports hazardous waste for off-site treatment, storage, or disposal must originate and follow up a manifest for off-site shipments. Pre-transport requirements include appropriate packaging, labeling, marking, and placarding. Off-site shipments of hazardous waste generated from this project will be manifested, packaged, labeled, marked, and placarded in accordance with regulatory requirements.

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TABLE 4.1 (CONTINUED)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
Resource Conservation and Recovery Act (U.S.C. 6901 et. seq.)	Interim Status: Treatment, Storage, and Disposal General Facility Standards (OAC 3745-65-13 through 17) (40 CFR 265.13 through 265.17)	The project will operate in accordance with RCRA regulations. Existing site security measures will be utilized. Inspections will be conducted in accordance with site procedures. Personnel will be trained in accordance with Fernald Site requirements. Appropriate warning signs will be posted in all waste processing areas associated with the project. Any mixing or commingling of incompatible wastes, or incompatible wastes and materials, will be conducted to prevent the generation of fumes, dust, violent reactions, or damage to the structural integrity of the device or facility containing the waste.
	Interim Status: Treatment, Storage, and Disposal Preparedness and Prevention (OAC 3745-65-31 through 35, 3745-65-37) (40 CFR 265.31 through 265.35, 265.37)	Preparedness and prevention equipment, as specified in the regulations, will be on site, available, and in operating condition throughout the duration of the project. The existing site-wide internal communications and alarm systems will be used. Portable fire extinguishers and spill control equipment will be placed in accessible locations to assist in emergency response. Warning signs are posted at all entrances. The site emergency preparedness and spill response procedures will be followed in the event of a spill or release.

TABLE 4.1 (CONTINUED)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
Resource Conservation and Recovery Act (U.S.C. 6901 et. seq.)	Interim Status: Treatment, Storage, and Disposal Facility Contingency Plan and Emergency Procedures (OAC 3745-65-51 through 56) (40 CFR 265.51 through 265.56)	The existing RCRA FEMP Contingency Plan and Emergency Procedures will be followed for any hazardous waste emergency associated with the project. In the event of an off-normal event or spill, Fernald site personnel will take appropriate actions, with input from OHM, as directed by the AEDO.
	Container Storage (OAC 3745-52-34, 3745-66-70 through 77) (40 CFR 262.34, 265.170 through 265.177)	Containers of hazardous waste will be managed and inspected in accordance with regulatory requirements. Secondary containment will be provided in areas where containers will be managed during the project. Containers will be handled in a manner to prevent rupture, leakage, or spillage. The containers will be compatible with all stabilized material and will remain closed during storage.
	Residue of Hazardous Waste in Empty Containers (OAC 3745-51-07) (40 CFR 261.7)	Containers used for the project will be considered empty in accordance with the requirements of this rule.
	Closure Performance Standards (OAC 3745-66-11, 3745-66-14) (40 CFR 265.111, 265.200)	Decontamination of the treatment system will be conducted to meet closure performance standards. Equipment contacting waste will be decontaminated in accordance with Ohio EPA Closure Plan Review Guidance.

TABLE 4.1 (CONTINUED)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
Resource Conservation and Recovery Act (U.S.C. 6901 et. seq.)	RCRA Tank Standards (OAC 3745-66-90 through OAC 3745-66-991) (40 CFR 265.190 through 40 CFR 265.200)	Wastes that are stored and/or treated in tanks will be managed in accordance with the provisions of these rules. These tanks will be constructed with appropriate materials and will be designed to ensure that they are compatible with project wastes and do not collapse, rupture, or fail. The tanks will be equipped with secondary containment devices capable of holding over 100% of liquids of the volume in each tank. Inspections of the tanks and secondary containment devices will be conducted daily. Inspections will be filed in the site RCRA Operating Record. The tanks will be decontaminated and demobilized as described in Section 3.4 of the TSWP.
	Land Disposal Restrictions (40 CFR 268) (OAC 3745-59)	Solid wastes treated under the Thorium Legacy Waste Project will be treated to meet applicable treatment standards found in 40 CFR 268.40. Liquid wastes will be treated to meet applicable treatment standards found in 40 CFR 268.48. Compliance with applicable treatment standards will be measured by analysis of grab samples of the treated waste. Appropriate certifications will be made in accordance with the provisions of this regulation. Copies of all notices, certifications, demonstration produced analysis data, and other documentation produced during the project will be maintained in accordance with the provisions of 40 CFR 268.7.

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TABLE 4.1 (CONTINUED)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
CERCLA Off-site Rule (40 CFR 300)	On-site response and remedial actions must comply with the substantive requirements of ARARs mandated under existing federal and/or state environmental regulations.	All material removed from the Fernald Site will be managed in compliance with applicable provisions of RCRA and other federal and state requirements, including EPA's off-site rule and the FEMP Waste Analysis Plan.
DOT Requirements for Transportation of Hazardous Materials (49 CFR 171 through 173 and 40 CFR 177 through 179)	No one may transport hazardous materials on public highways, except in accordance with these regulations.	Off-site shipments of hazardous wastes will be conducted in accordance with these requirements. Shipping papers, marking, labeling, placarding, and emergency response information will be prepared for off-site shipments.
Occupational Worker Protection and Training 29 CFR 1904 and 1910)	All facility personnel will be trained. Employers will develop and implement a written safety and health program for employees involved in hazardous waste operations.	This removal action will be conducted in accordance with the provisions of OSHA, FDF Site Health and Safety procedures, and project specific procedures.
National Environmental Policy Act (NEPA) (10 CFR 1021)	Ensure that all federal agencies (including DOE) consider environmental impacts in the planning and decision-making phases of their projects.	In June 1994, DOE issued a revised policy on compliance with the NEPA, which allowed DOE to rely on the CERCLA process to meet the procedural requirements of NEPA. Because the Thorium Legacy Waste Project is being conducted as a CERCLA response action, formal NEPA documentation will not be required for this project.
DOE Orders	To be considered.	All project design activities will be implemented according to the DOE-FN procedures.

Representatives from DOE-Fernald and FDF will conduct inspections during the performance of this project to ensure that actions are conducted consistent with the discussions in this TSWP. These inspections will ensure that the equipment associated with the project is properly cleaned and decontaminated and that all wastes resulting from the project are properly stored, labeled, and characterized.

4.1 RCRA LDR COMPLIANCE REQUIREMENTS - UNIVERSAL TREATMENT STANDARDS

Table 4.2 lists the anticipated UHCs for the 23 drums of D002 wastes that will be treated under the Thorium Legacy Waste Project. Table 4.2 was developed by applying process knowledge to identify those UHCs that would reasonably be expected to be present in the process or routine operations that generated the mixed wastes. Information on site-specific usage of potential UHCs was obtained from process descriptions, analytical data, and source information for constituents analyzed in the OU3 and OU5 Remedial Investigation and Feasibility Studies. MSDSs for various products used at the Fernald Site were also reviewed for this purpose. Information on commercial applications of UHCs was obtained from references such as the Merck Index and the Kirk-Othmer and USEPA electronic databases. Process knowledge documentation was also obtained from the MEF files for each waste category.

The 23 drums of D002 wastes were assessed on a case-by-case basis using information developed from the sources described above. Constituents were removed from consideration if 1) they were pesticides or herbicides (and thus not reasonably expected to be present in process or operations waste); 2) there was no documented usage of these constituents in on-site production or operations activities and the constituents had limited commercial application and/or were associated with wastes generated by processes not used at the Fernald Site; or 3) the results of analyses conducted during waste characterization indicated the concentration of a particular UHC was below its corresponding UTS value. Wastestreams which may be added as the project progresses will also be evaluated in the same manner.

The rationale used to determine applicable UHCs for the Thorium Legacy Waste Project is consistent with the methods described in the interim final rule for the treatment of certain ignitable (D001) and corrosive (D002) wastes (58 FR 29860) and the preamble to the final LDR Phase II rule which established treatment standards for D018-D043 wastes (59 FR 47982). In these rule makings, the USEPA supported the use of process knowledge to determine the applicability of UTS, realizing that it would be unnecessary and wasteful to require facilities to monitor for all UHCs when only a subset of these constituents would be expected to be present in a particular wastestream. As a result, 40 CFR 268.2(l) requires monitoring only for those constituents "reasonably expected to be present at the point of treatment standards." Accordingly, USEPA specified the determination of "reasonably expected to be present" for purposes of compliance may be based on knowledge of the raw materials used, the process, and potential reaction products, or the results of a one-time analysis for the entire list of underlying hazardous constituents (59 FR 48015).

TABLE 4.2

UHC IDENTIFICATION FOR D002 WASTES

Constituent	NW Treatment Standards
Antimony	2.1 mg/l TCLP
Arsenic	5.0 mg/l TCLP
Barium	7.6 mg/l TCLP
Beryllium	0.014 mg/l TCLP
Cadmium	0.19 mg/l TCLP
Chromium (Total)	0.86 mg/l TCLP
Lead	0.37 mg/l TCLP
Mercury - All Others	0.025 mg/l TCLP
Nickel	5.0 mg/l TCLP
Selenium	0.16 mg/l TCLP
Silver	0.30 mg/l TCLP
Thallium	0.078 mg/l TCLP

5.0 HEALTH AND SAFETY

The health and safety program for the Thorium Legacy Waste Project is intended to provide the project team, the project team's corporate management, and Fernald management with confidence that project objectives will be, are being, or have been achieved in a safe manner. Project-specific health and safety concerns have been identified and are included as Appendix C.

The Thorium Legacy Waste Project will be conducted under the Site Health and Safety Program, including the Site Radiological Control Requirements Manual (RM-0020) and the Site Safety Performance Requirements Manual (RM-0021).

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6.0 PROJECT MANAGEMENT

6.1 ORGANIZATION

Figure 6.1 shows how the OHM project team is organized for the Thorium Legacy Waste Project. Figure 6.2 describes the organizational structure of the FDF team assigned to the project. The overall organization will function as a unit under the leadership and direction of the FDF-designated Technical Manager and the FDF Contracting Officer.

6.2 STOP WORK ACTION

All project team personnel have the authority to stop work for a significant condition adverse to safety or quality, during which continued work could prevent repair or cause a major programmatic breakdown that impacts a major portion of the work. Stop Work Orders, as authorized by the Site Supervisor/QA Coordinator, will be issued through the Project Manager.

Any employee who feels that his/her personal safety is or has been jeopardized has the right to refuse work without fear of reprisal, harassment, or retaliation and should make these situations known to his/her supervisor immediately.

6.3 WORK BREAKDOWN STRUCTURE

Figure 6.3 shows the work breakdown structure (WBS) for the Thorium Legacy Waste Project.

6.4 DATA QUALITY CONTROL LEVELS

The purpose of data quality control is to specify the requirements for the control or accuracy, precision, and completeness of data. Data control is exercised from the point of sample collection, through laboratory analysis, to transmittal and validation of generated data. Data Quality Objectives (DQOs) represent a formal decision process that establishes the level of uncertainty FDF is willing to accept in analytical results derived from the process data. The DQO process must strike a balance between time, cost, and data quality. The criteria for the DQOs are the end use of the data to be collected and the cost to produce the data.

6.4.1 Analytical Support Levels

Analytical Support Levels (ASLs) provide data reliability. The ASLs apply to all of the techniques and methods that contribute to the generation of analytical data. ASL A through E are described in DOE-FN/EPA 200 Report, Site-wide CERCLA Quality Assurance Project Plan, Volume I. These ASLs are summarized in Table 6.1.

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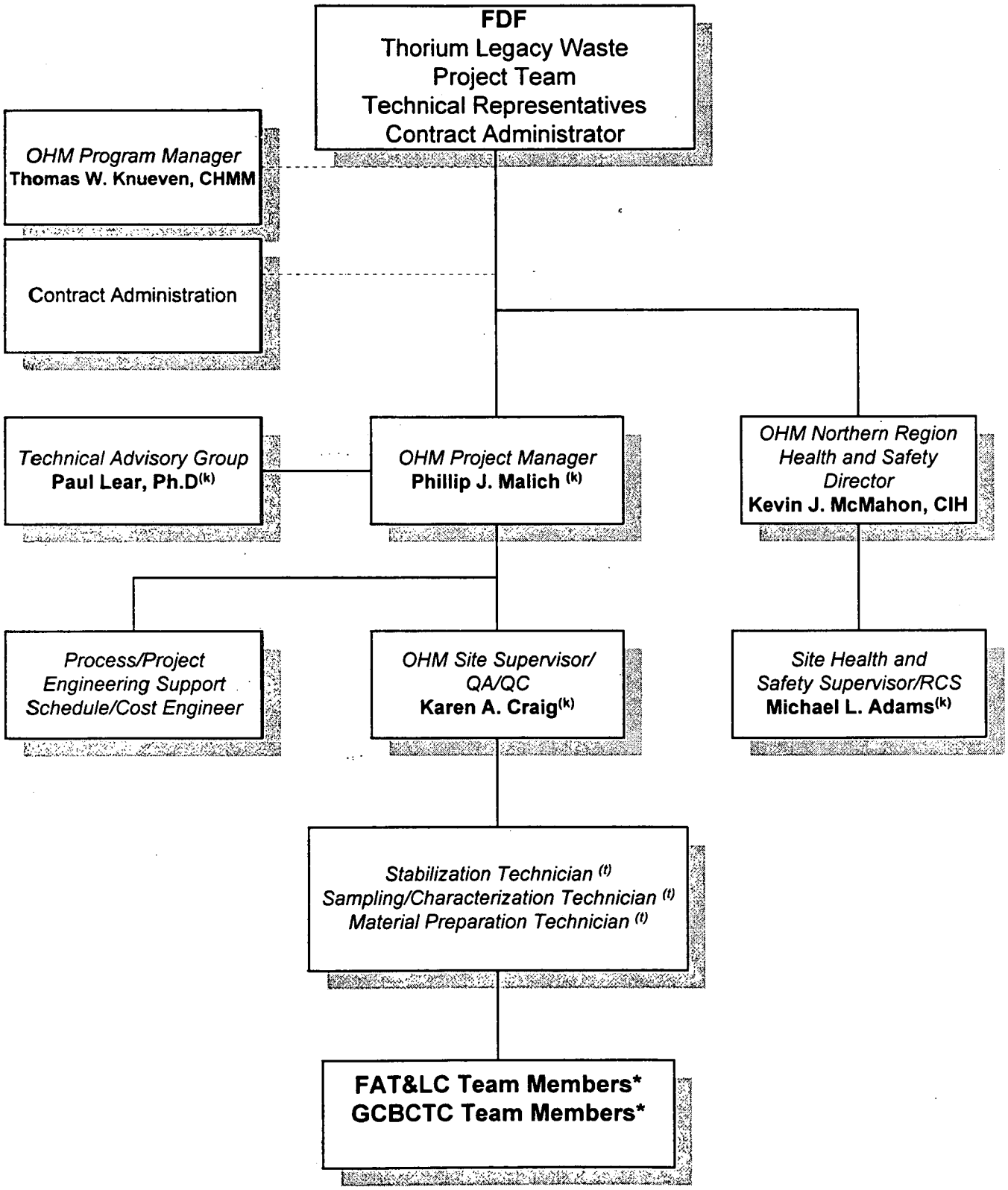
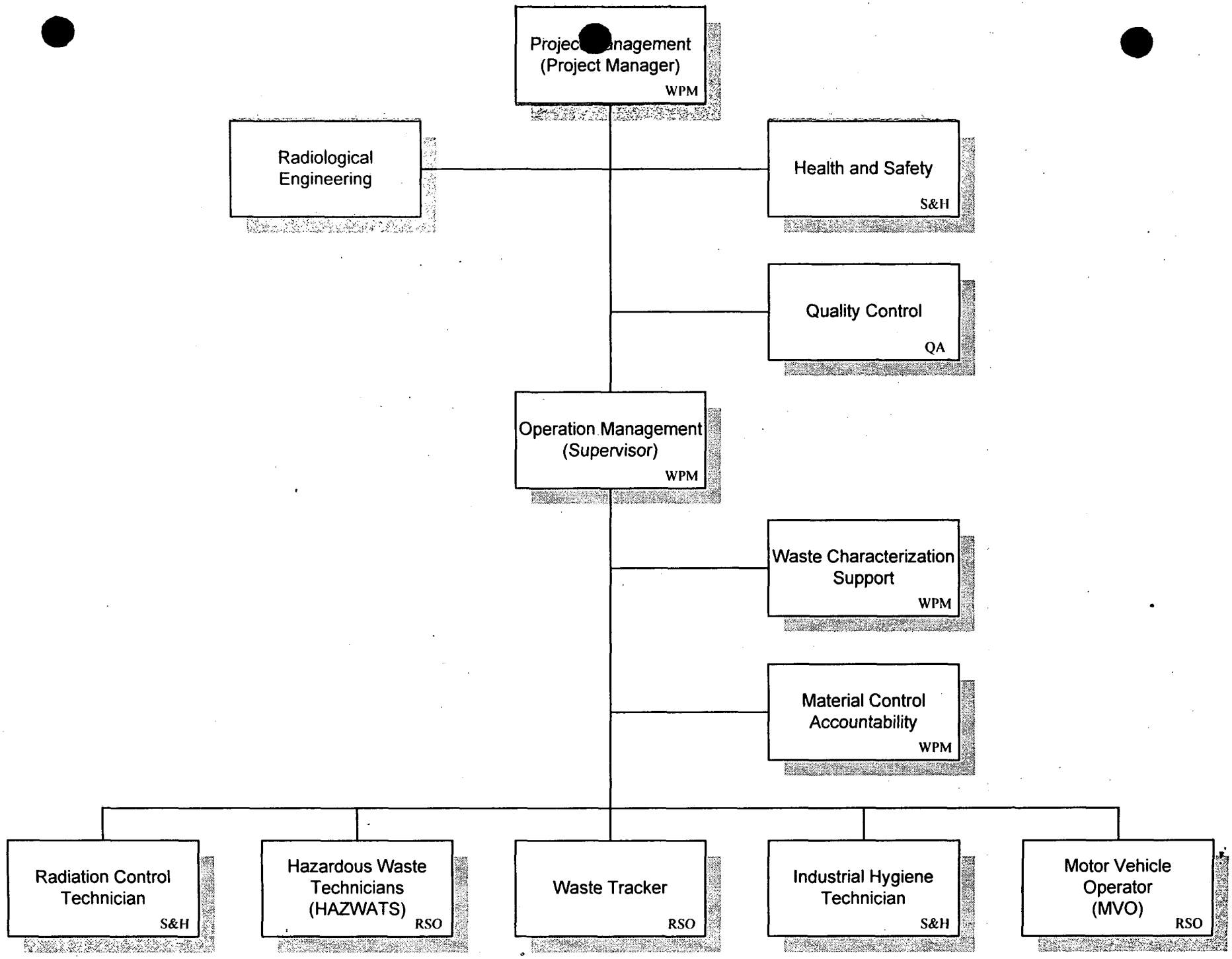
Figure 6.1

FDF THORIUM LEGACY WASTE PROJECT ORGANIZATION CHART



000045

k = Key personnel
t = Task Leader
* = FDF supplied labor to support equipment installation and operation



DF Division:
M - Waste Program Management
&H - Safety and Health
SO - Remedial Support Operation
QA - Quality Assurance

FIGURE 6.2
FDF ORGANIZATION SEQUENCE

000040

F 1119

FIGURE 6.3

THORIUM LEGACY WASTE PROJECT
WORK BREAKDOWN STRUCTURE

Phase	Task	Sub-Task	Description
01			Preconstruction Work
	01.003		Project Plans & Submittals
		01.003.92	First Plan Submittal
		01.003.93	Second Plan Submittal
02			Testing & Analysis
	02.091		Proof of Processing Testing
		02.091.00	Proof of Processing Testing
15			Stabilization, Fixation & Encapsulation
	15.006		Stabilization of Waste
		15.006.01	Stabilization of Waste - Phase II Option I
		15.006.02	Stabilization of Water - Phase II Option I
		15.006.03	Stabilization of Waste - Phase II Option II
21			Project Shutdown
	21.030		Decontamination - Phase II Option I
		21.030.00	Decontamination - Phase II Option I
21			Project Shutdown
	21.060		Final Report
		21.060.00	Final Report
99			General Project Activities
	99.000		General Project Administration & Support
		99.000.00	General Project Administration & Support
	99.001		Mobilization / Demobilization
		99.001.00	Mobilization / Demobilization
	99.010		On-Site Q/C
		99.010.00	On-Site Q/C
	99.020		Training
		99.020.00	Training
	99.030		Standown Time
		99.030.00	Standown Time
	99.040		Unbudgeted Work Items
		99.040.00	Unbudgeted Work Items

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TABLE 6.1

ANALYTICAL SUPPORT LEVELS

Level	Examples of Data Use
A - Qualitative Field Analysis	• Preliminary site characterization • Real-time monitoring of implementation • Field screening
B - Qualitative, Semi-Quantitative, and Quantitative Analyses	• Site characterization • Evaluation of alternatives • Engineering design • Real-time monitoring of implementation • Field screening
C - Quantitative with Fully Defined QA/QC	• Risk assessment • Evaluation of alternatives • Engineering design • Site characterization • Real-time monitoring of implementation
D - Confirmational with Complete QA/QC and Reporting	• Risk assessment • Evaluation of alternatives • Engineering design • Vertical and horizontal extent • Evaluation of remediation results
E - Non-standard	• Risk assessment • Evaluation of alternatives • Engineering design • Vertical and horizontal extent • Evaluation of remediation results

The choice of level is based on the type of site to be investigated, the level of accuracy and precision required, and the intended use of the data. The ASL for the analysis of samples to verify that the RCRA LDRs and NTS WAC are attained will be ASL D.

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6.4.2 Project Documentation and Data

Project documentation will be maintained in dual storage per the requirements of NQA-1. These locations will include the project office at the Fernald Site and the OHM office. This documentation will include contractual records, official correspondence, operations logs, waste logs, sampling and analysis logs, self assessments, audits, and records of FDF product acceptance.

6.4.3 Waste Acceptance Sample Control

Sampling and analysis for waste acceptance purposes will be performed according to the MEF-specific sampling plans provided by FDF.

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7.0 QUALITY ASSURANCE

The QA program for the Thorium Legacy Waste Project is intended to provide the project team, the project team's corporate management, and Fernald management with confidence that project objectives will be, are being, or have been achieved in a safe manner. A project-specific QAPP has been prepared and is included as Appendix B. The program outlined in the QAPP is designed and will be implemented to satisfy the requirements for QA specified by FDF in their QA Program Plan (RM-0012) for Quality Level Three. It will interface with and compliment the FDF overall project QA program for mixed waste treatment and disposal. The project QA program is also designed to implement applicable requirements of ASME NQA-1, EPA QAM-005/80, DOE Order 5700.6C, and 10 CFR 830.120.

The QAPP will be implemented by the project team with roles and responsibilities as described in the plan.

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8.0 AS LOW AS REASONABLY ACHIEVABLE CONSIDERATIONS

The equipment, unit operations, and hardware configurations for the Thorium Legacy Waste Project have been designed to minimize worker exposures to radioactive materials to ALARA. The criteria for the design are based on the following documents:

- Mobile Radioactive Waste Processing Systems, American National Standards Institute, ANSI/ANS-40.37 - 1993
- Health Physics Manual of Good Practices for Reducing Radiation Exposure to Levels that are ALARA, DOE
- Radiological Control Manual, DOE
- Occupational Radiation Protection, DOE, Title 10, CFR Part 835

The basic philosophy of reducing personnel exposure to radiation to ALARA is appropriate for all aspects of the work at the Fernald Site. The ALARA principles are demonstrated with thorough planning, complete design of components and the system, and training for employees. These principles have been considered during the evaluation of the Thorium Legacy Waste Project. Four general areas have been identified to demonstrate the application of ALARA principles, including:

- Worker exposure
- Equipment decontamination
- Equipment exhaust ventilation
- Other design features

8.1 WORKER EXPOSURE

Worker exposure to ionizing radiation has been considered for both internal and external pathways for exposure. OHM has designed its processes in a manner that will minimize worker exposure. This goal is accomplished by local exhaust ventilation, containment of individual components, batch operations, dust control measures, trained team members, PPE, and detailed operating procedures.

External exposure to radiation is reduced by shielding, and as necessary, by limiting the number of filled drums inside the process building and moving finished containers from the building in a timely fashion. Radiation surveys will be performed by FDF to monitor the changing radiation fields, as well as the measurement of removable contamination in different areas of the exclusion zone. It is not anticipated that the drums or process material will represent a significant external exposure pathway. Shielding will be required while storing drums, prior to their introduction to the Drum Handling Area. As necessary, the distance will be maximized

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between this operation and the drums stored inside of the building. The operation is a batch operation, which will be effective in limiting the quantity of material that is processed at any one time.

The layout of the equipment has been optimized to minimize the distance between components in order to limit the spread of contamination and increase the efficiency of the ventilation system. Project team members will wear protective clothing, as well as respiratory protection to limit the inhalation pathway. Air samples will be collected by FDF. Individuals leaving the exclusion zone will be required to perform personnel whole body monitoring while using the appropriate survey instrumentation.

8.2 EQUIPMENT DECONTAMINATION

The equipment selected for the project are discrete modules loaded in batches. Decontamination is minimized by using equipment that has hydraulics and electrical systems physically separated from the processing area. The processing area, such as the cutter wheels in the barrel shredder or the teeth in the pugmill, are manufactured with smooth steel and surrounded by a complete "throat" to direct the processed material. Each component is loaded from the top and fed by gravity flow. The blades, teeth, and other moving parts that contact the contaminated waste can be removed from the main drive shaft to provide complete access for decontamination. Drip pans or boxes will be used to catch materials or liquids that fall from the process equipment. The surfaces will be free of cracks, crevices, and sharp corners. The throat and funnel can be easily washed down for purposes of decontamination. There are few pockets or ledges where debris can collect or be diverted from the flow of waste.

8.3 EQUIPMENT EXHAUST VENTILATION

Local exhaust ventilation will be provided around each piece of processing equipment to capture fugitive dust emissions generated during processing. The ventilation hoods will be constructed to serve as a containment system and direct the flow of air into the hoods. The air will be drawn from the building into the ventilation hoods, through the cyclone separator, and filtered by a HEPA filter. The hoods have been designed to accept material for processing through draped entrances. The makeup air for the ventilation system will come from the building air, resulting in a slight negative pressure on the building. Blast gates will be provided on the vent ducts so that air flow can be diverted when a piece of equipment is not in service. Operating procedures will require that air flow is verified before processing begins.

The ventilation system will be equipped with several HEPA filters connected in parallel. Pressure gauges will be provided for each filter bank to measure the relative difference in pressure across the filter and provide an indication that the filter may be experiencing excessive loading. Each filter will be tested by the manufacturer and Oak Ridge National Laboratory to verify that the filter meets the requirements. Each HEPA filter system will be tested using the Absolute Filter Testing Method, using Emery 3000 or equivalent. The ventilation system will be

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tested after installation to verify that the criteria are satisfied and the filter can remove at least 99.97% of 0.3-micron particles. The tests will be performed and documented as part of the project records.

8.4 OTHER DESIGN FEATURES

The equipment selected for this project satisfies the recommendations in the ANSI standard for mobile waste processing systems. The pugmill is loaded in discrete batches so that overloading is not a significant concern. The processes have been selected so that a single component failure or operator error cannot result in an uncontrolled release from the facility. Liquids will be absorbed into solid sorbents, such as ground corn cobs, in order to minimize the risk of a liquid spill and uncontrolled release. The operation will be located inside of a building to limit access to authorized personnel and limit the spread of contamination from the exclusion zone. Experienced operators will be used, who will review the specific procedures to use the equipment correctly and are able to identify conditions that may cause an upset. Written procedures will be reviewed and used by operators to confirm that the processing criteria are satisfied. Valves, switches, and visible alarms will be uniquely labeled to aid the operator in responding to problems quickly. The drum shredding equipment is provided with an automotive reversing cycle in the event that the teeth are jammed and cannot cut the material to be processed. The shredder is loaded remotely and will retain missiles that are generated during shredding.

8.5 CONCLUSION

The processing system for the Thorium Legacy Waste Project has been designed to reduce employee radiation exposures to ALARA. The design criteria established by the DOE and FDF have been incorporated into the design in order to reduce exposures. This approach demonstrates OHM's commitment to manage the hazards in the workplace. Engineering and administrative controls are effective methods to control chemical and physical hazards.

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APPENDIX A

PROCESSING AREA LOG SHEETS

Drum Handling Log

Date	Drum Description	Stated Material Type	Discrepancy (Y/N)	Overpacked Container (Y/N)	Free Liquids (Y/N)	Initials

Material Type: **G** = Thorium gel **C** = Contaminated soil and debris **F** = Thorium dioxide (low fluoride)
P = Thorium dioxide (powder) **S** = Scrap salts and floor sweepings

Note: Drums with material-type discrepancies must be set aside for consultation with FDF. Free liquids must be decanted. Overpacked containers must be sent to the shredder for processing.

Shredder Processing Log

Date	Drum Description	Empty Container (Y/N)	Shredded Material Drum Number (Y/N)	Initials

Stabilization Processing Log

Date	Stabilization Batch No.	Drum Description	Material Added to Pugmill (lbs)	Cement Added to Pugmill (lbs)	Water Added to Pugmill (gals)	Mixing Time (min)	White Metal Box No.	Initials

APPENDIX B

QUALITY ASSURANCE PROGRAM PLAN

FINAL
QUALITY ASSURANCE PROGRAM PLAN (QAPP)
FOR
MOBILE COMMERCIAL SUPPORT SERVICES
FOR THE THORIUM LEGACY WASTE PROJECT
AT THE FLUOR DANIEL FERNALD SITE
IN FERNALD, OHIO

Submitted to:

Fluor Daniel Fernald
Fernald, Ohio

Submitted by:

OHM Remediation Services Corp.
Northern Region

Prepared by:

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Regional QA/QC Manager

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FOR

Karen Ann Craig
Project Supervisor

Approved by:

Phillip J. Malich
Project Manager

November 20, 1997
Project 20078.2

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LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
CAR	Corrective Action Request
DCAA	Defense Contractors Audit Agency
FAR	Federal Acquisition Regulations
FAR&LC	Fernald Atomic Trades and Labor Council
FDF	Fluor Daniel Fernald
GCBCTC	Greater Cincinnati Building and Construction and Trades Council
GET	Groundwater Extraction and Treatment Systems
M&TE	Measuring and Test Equipment
NCR	Nonconformance Report
NIST	National Institute of Standards and Technology
OHM	OHM Remediation Services Corp.
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Program Plan
QITs	Quality Improvement Teams
SOPs	Standard Operating Procedures

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QUALITY ASSURANCE POLICY STATEMENT

It is the policy of OHM Remediation Services Corp. (OHM) to provide environmental remediation services in a manner that meets regulatory and contractual requirements, while sustaining the highest level of confidence in the quality of work. This will be accomplished through the rigorous pursuit of continual quality improvement and successful implementation of the OHM Corporate Quality Management Program, plans, and procedures.

The foundation of OHM's Corporate Quality Management Program is built upon the same underlying principles used to develop the most current quality standards invoked by both government and commercial industry. The program is implemented by our administrative, project management, and operations staff and is continually evaluated for efficiency, effectiveness, and improvement. The framework of this program is structured to ensure that quality assurance and quality control elements, requirements, and processes are appropriately established and implemented through approved plans and procedures. Each plan will translate applicable requirements into our work processes and will apply quality management and OHM Standard Operating Procedures to achieve the most cost-effective and proven approach.

Our responsibility for quality begins with OHM senior management and is shared by each employee. The OHM Corporate Quality Management Program, plans, and procedures are binding to all OHM employees and the elements of the program will be applicable to all OHM activities.

OHM's commitment to quality will not be second to cost and schedule. Our quality objectives will be achieved while we deliver our services in a way that strives to meet our customer's expectations, while doing so on time and within budget.

Gary L. Gardner
Vice President and Regional Manager
Northern Region

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1.0 INTRODUCTION

The purpose of this Quality Assurance Program Plan (QAPP) is to identify the requirements and delineate the responsibilities for the performance of quality affecting activities by OHM Remediation Services Corp. (OHM) applicable to the Fluor Daniel Fernald (FDF) Thorium Legacy Waste Project. This plan provides a flow down of requirements that are consistent with the OHM Corporate Quality Management Program and the quality assurance (QA) requirements specified within the contract documents. This plan is presented in a format focusing on three functional categories:

- Management
- Performance
- Assessment

This format permits managers, those performing the work, and those assessing the planning, implementation, and results of the work, to focus on their unique responsibilities in carrying out the provisions of the QA program. The three categories capture the range of activities common to all work, from organizing and staffing, to assessing results and providing feedback for purposes of improvement.

OHM recognizes the importance of a well documented quality assurance/quality control (QA/QC) program and integrates quality into the performance of all environmental remediation projects. The framework of OHM's program is contained in the OHM Corporate Quality Management Manual, which effectively implements the requirements to comply with 10 CFR 830.120 and ISO 9001.

Integral to the implementation of the OHM Corporate Quality Management Manual are the controls detailed in OHM Standard Operating Procedures (SOPs) and in detailed project work plans, health and safety plans, and QA program plans. These procedures and plans identify and quantify process controls, inspection protocols, and test methods to be employed on the project.

The QA/QC activities to be performed will ensure that:

- Appropriate plans, procedures, and drawings are available at the work location and implemented.

- Prerequisites are performed in accordance with established requirements.

- Equipment is provided and installed in accordance with applicable drawings and plans and maintained in accordance with instructions and procedures.

- Areas are established (e.g., drum handling, material handling, stabilization and treatment, and treated material storage) and maintained per plan requirements.

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- Sampling and analysis is conducted in accordance with plan and procedural requirements.

- Material and equipment used during operation and treatment is that which is specified in accordance with approved plans, procedures, and drawings.

- Measuring and test equipment (M&TE) used for activities affecting quality are controlled, calibrated, and adjusted at specified frequencies and are of the proper type, range, accuracy, and tolerance to accomplish their intended function.

- A system is implemented for the prevention, early detection, correction, and reporting of deficiencies, including any breakdown in the management system.

- Nonconforming conditions will be identified, documented, evaluated, and corrected in a controlled manner.

- Activities affecting quality are appropriately documented and sufficient records are maintained to demonstrate compliance in the form of objective evidence.

To provide correlation between FDF contract QA requirements and those of this QAPP, a quality requirements matrix is presented in Appendix A, OHM QAPP Requirements Matrix.

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2.0 QUALITY ASSURANCE PROGRAM

2.1 ORGANIZATIONAL STRUCTURE

The OHM project organization is structured in a manner that ensures that quality is achieved and maintained by those responsible for performing the work.

- Independent assessment is performed by persons other than those responsible for the performance of work.
- Both internal and external organizational interfaces are clearly defined and established.

The organization chart provided in Figure 2.1, reflects the project organization.

2.2 FUNCTIONAL RESPONSIBILITIES, AUTHORITIES, AND ORGANIZATIONAL INTERFACE

OHM senior management retains the ultimate responsibility for quality. This responsibility begins with the President and Chief Executive Officer and is delegated to the Vice President and Regional Manager, Northern Region.

The responsibility for project quality is delegated by the Vice President and Regional Manager to the Program Manager, and in turn, to the Project Manager, who is provided with the necessary support to ensure that quality objectives are accomplished in accordance with this QAPP. The Project Manager is responsible for the following:

- Interfacing with the QA/QC Officer, and when necessary, the Regional QA/QC Manager, on matters involving the QA program.
- Ensuring that procedures for controlling work activities and processes are developed, documented, available, understood, and implemented.
- Ensuring that work is performed in accordance with applicable federal, state, and local codes, standards, and regulations. Where such codes, standards, and regulations are not applicable, best industry practices will be employed.
- Providing interface with the FDF project management team, work groups, and contracting personnel.
- Achieving project administrative and operational objectives through implementation of the QA program.

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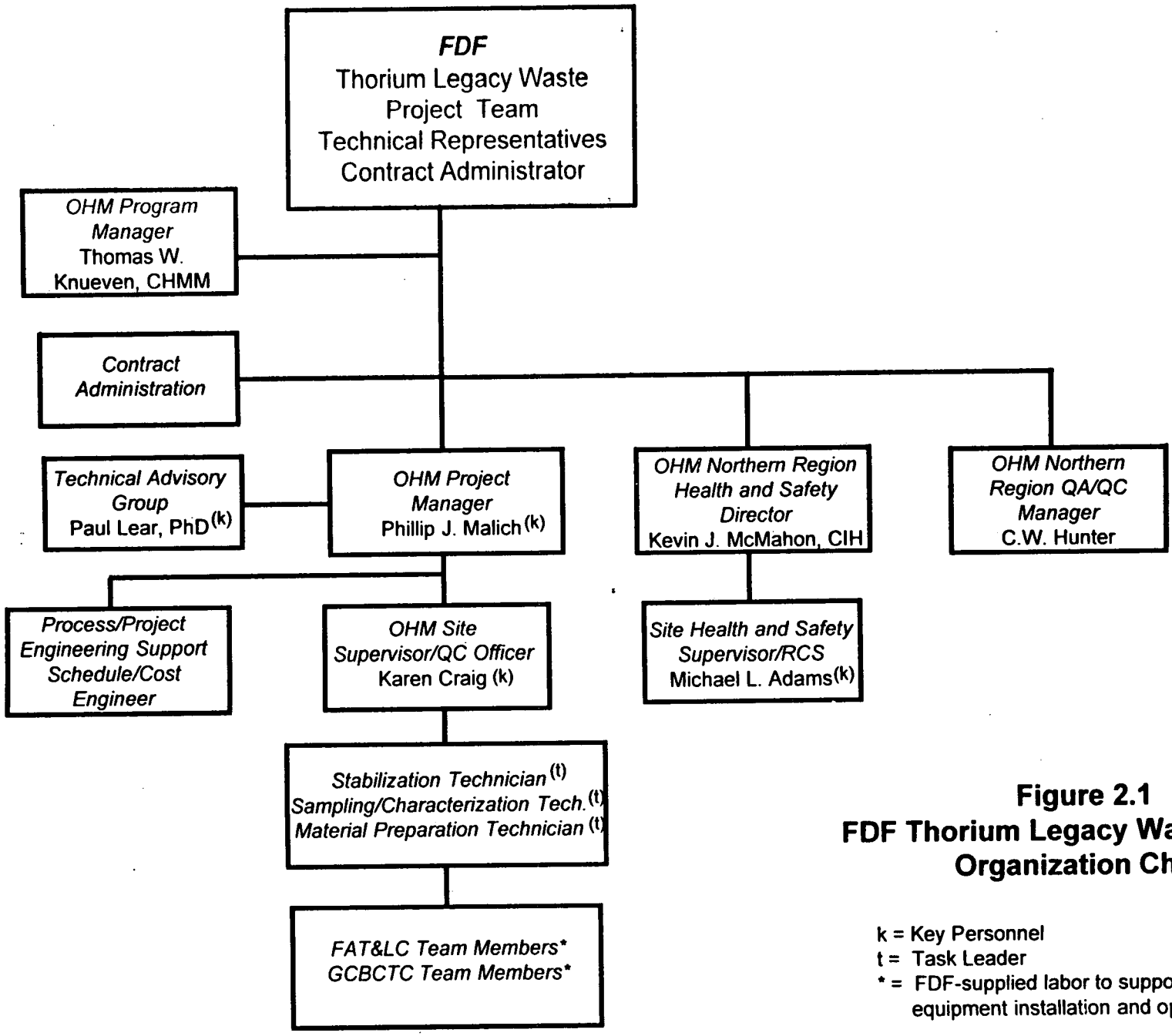

Figure 2.1
FDF Thorium Legacy Waste Project Organization Chart

k = Key Personnel
t = Task Leader
* = FDF-supplied labor to support equipment installation and operation

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- Providing project data and deliverables that have been reviewed for technical accuracy and completeness before release to FDF.

- Assigning project personnel that have been appropriately oriented and trained before performing quality affecting activities.

The Site Supervisor reports to the Project Manager and is responsible for implementing the requirements of this QAPP. The Site Supervisor will be responsible for the following:

- Planning and implementing applicable requirements as the designated representative of the Project Manager.

- Performing collateral responsibilities as the QA/QC Officer, serving as the formal contact for matters involving quality.

- Providing personnel, resources, and equipment necessary to meet the QA requirements of this plan.

- Ensuring that quality-related issues and problems are immediately identified and corrected in a timely manner.

- Performing other responsibilities as requested by the Project Manager.

- Performing reviews and evaluations and approving changes to project plans and procedures.

- Scheduling and performing QC inspections and surveillance activities to ensure compliance with established plans and procedure requirements.

- Verifying that appropriate methods are specified and accomplished for obtaining required data of known quality and integrity.

- Verifying that corrective actions are effectively implemented for nonconforming conditions and conditions adverse to quality.

- Instituting quality improvements through procedure and process reviews, observations, and evaluations.

- Assisting in identifying the needs and requirements for instructions, procedures, and drawings.

- Administering QA training to ensure effective plan and procedure implementation.

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The QA/QC Officer is delegated Stop Work Authority to control further process, delivery, installation, or use of nonconforming items, such that planning and scheduling considerations do not override safety, quality, or environmental considerations.

Each member of the OHM organization will be responsible for achieving and maintaining quality. The QA program shall be binding on all personnel, including those having responsibility for planning and scheduling.

The Regional QA/QC Manager is responsible for providing independent assessment of quality affecting activities performed in accordance with this plan. Independent assessments will be planned, scheduled, and performed in accordance with the OHM Corporate Quality Management Program and the requirements of this QAPP.

Management assessment will be performed by OHM management staff ,who will be responsible for assessing the efficiency and effectiveness of the QA program and determining by assessment, that the project is meeting its objectives for quality, safety, and environmental requirements.

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3.0 PERSONNEL TRAINING AND QUALIFICATIONS

3.1 INDOCTRINATION AND TRAINING

The QA/QC Officer will serve as the Training Coordinator for the project and will ensure that all project personnel receive FDF-required site training. This training will include, at a minimum, the following:

a. G.E.T. - General Employee Training

b. Radiation Worker II Training

c. Respirator Training

d. Respirator Fit Test

e. Site Worker Training

f. NVO-325 Training (Waste Acceptance Criteria Overview) - Required by all individuals associated with waste for shipment to Nevada Test Site (2 to 4 hours).

g. INVIVO whole-body monitoring (½ hour) and baseline bioassay samples

h. Lock and Tag Training

i. Construction Rules and Regulations Training

j. Drug Screen - Prior to beginning work at the FEMP

k. Physical - Not required if personnel have had a physical in the last 6 months. Physicals from outside sources must be reviewed and accepted by FDF.

FDF-required training will be scheduled through an FDF Training Coordinator and will be administered to all OHM personnel who perform work at the FEMP. This training will be conducted prior to commencement of Phase II, after written notice to proceed. FDF-required training will also be required prior to FEMP site access, for any additional OHM and subcontractor personnel after Phase II has commenced.

Personnel assigned to the project will be capable of performing their assigned tasks and trained as required. When training is provided, an evaluation will be administered to verify the individual's understanding. When considered necessary, training will include performance evaluations to demonstrate effectiveness.

Training will include operating procedures that pertain to particular work functions and will focus attention on doing the right things right the first time and addressing the consequences of doing improper work.

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Indoctrination and training will be provided to ensure the understanding and the spirit of the QA program, as well as an understanding of the processes and tools required to accomplish the work.

Additional needs for training will be determined by the Project Manager and the QA/QC Officer.

Training may be presented in a formal classroom setting or administered by requiring individual(s) to read and attest to their understanding of requirements, processes, and procedures. Each method will be selected based upon the complexity of the task(s) to be performed and the education and experience level of the individual performing the task(s).

The administration of training will be documented using Figure 3.1. This completed document and all other training records will be maintained in accordance with Section 5.0, Documents and Records.

When training is provided by others, the records of such training will be acquired and also maintained in accordance with Section 5.0, Documents and Records.

3.2 PERSONNEL QUALIFICATIONS AND CERTIFICATION

Personnel performing work that requires special skills or abilities or legally required training will be qualified (and certified, if required) prior to performing that work.

Records pertaining to personnel qualifications will be maintained in accordance with Section 5.0, Documents and Records.

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FIGURE 3.1

INDOCTRINATION AND TRAINING ATTENDANCE RECORD

OHM REMEDIATION SERVICES CORP. — **INDOCTRINATION & TRAINING ATTENDANCE RECORD**

Course Title/Description: _____

Course Offered By: _____

Instructor(s): _____

Course Duration: _____ Written Examination : ☐ Yes ☐ No

Date(s) Administered: _____ Proficiency Evaluation: ☐ Yes ☐ No

Instructional Method(s): _____

Attended By: (Printed Name)	Signature of Attendee:

4.0 QUALITY IMPROVEMENT

4.1 QUALITY IMPROVEMENT PROCESS

OHM will implement a process to detect and prevent quality problems from occurring, while fostering continuous quality improvement. Items or processes that do not meet established requirements will be identified, controlled, and corrected. Corrective action will include identifying the causes of problems and steps to prevent their recurrence. Item reliability, process implementation, and other quality-related information will be reviewed and the data analyzed to identify items and processes needing improvements.

The OHM quality improvement process is implemented through reviews, evaluations, and formally submitted suggestions and through the formation of Quality Improvement Teams (QITs), that develop specific missions and objectives for improving a particular item or process. Each method of improvement promotes a culture in which every employee can make a difference in the quality of OHM's products or services. The concepts of improving quality and preventing problems will be paramount to OHM's success and the focus of continual improvement will be to enhance the quality of items, processes, and performance.

4.2 DIFFERING STAFF OPINIONS

It is the policy of OHM that differing staff opinions are valued and that they can be brought to management's attention without fear of reprisal.

Employees are encouraged to resolve differing staff opinions informally, by direct communication with their immediate supervisor or manager. If these attempts cannot be resolved, the person involved may formally process their differing opinion via memorandum to the Project Manager.

The Project Manager will discuss the opinion with the concerned individual and propose a scheduled resolution. If the proposed resolution cannot be accepted by the individual expressing the opinion, the matter will be escalated to the Director level for resolution. Each step in the process will be documented via memorandum.

4.3 PREVENTIVE ACTION

OHM recognizes preventive action as that action taken to eliminate the cause of a potential nonconforming condition, defect, or other undesirable situation, in order to prevent occurrence. Any such condition will be brought to the attention of the Site Supervisor.

The Site Supervisor will determine the steps needed to deal with any problems requiring preventive action and the initiation of controls to ensure preventive action effectiveness.

The QA/QC Officer will verify the performance of such controls to ensure compliance with established plans and procedures and evaluate the effectiveness of preventive action(s).

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4.4 CORRECTIVE ACTION

Corrective action will be initiated by OHM for all conditions adverse to quality. Items and processes that do not meet established requirements must be identified, documented, analyzed, and resolved. The implementation of corrective action must be followed up and verified to ensure its effectiveness.

For conditions adverse to quality involving deviation(s) from established requirements, (i.e., failure to follow procedure, inadequate procedure, or other programmatic deviations), corrective action will be initiated by identifying the condition. These conditions will require a timely response, including identification of the root cause, steps taken to remedy the condition, and actions to be taken to preclude recurrence. Such conditions will reported to appropriate levels of management.

Conditions adverse to quality will be identified by the QA/QC Officer by use of the Corrective Action Request (CAR) (see Figure 4.1), and will be immediately reported to FDF and OHM management. The CAR will be issued to the responsible organization that will be responsible for providing a proposed response for corrective action in a timely manner.

The QA/QC Officer will be responsible for evaluating the response and providing indication of response acceptance to the responsible organization. When the corrective action has been completed, the QA/QC Officer will verify the actions taken and close the CAR by signature and date.

Copies of both issued and completed CARs will be distributed to the FDF Project Manager, OHM Program Manager, OHM Project Manager, and the Regional QA/QC Manager.

4.5 STOP WORK ORDERS

Significant conditions adverse to quality, such as those that may pose a breakdown in controls affecting quality, safety, or environment, will be immediately evaluated for the need to issue a Stop Work Order (see Figure 4.2).

Once a significant condition adverse to quality is identified, the QA/QC Officer will immediately notify the Project Manager and document the condition on a CAR. If the condition represents a breakdown in controls, a Stop Work Order will be issued by the QA/QC Officer.

Work will only resume after appropriate actions have been verified as effective and the Stop Work Order has been closed.

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FIGURE 4.1

CORRECTIVE ACTION REQUEST

OHM REMEDIATION SERVICES CORP. **CORRECTIVE ACTION REQUEST**

Project No: _____ Report No: _____

Responsible Organization: _____
Activity/Item: _____
Location: _____ Project Manager: _____
Requirement(s) Not Met: _____

Description: _____

Corrective Action Required:

- ❒ Steps to correct the reported condition
- ❒ Action regarding similar work
- ❒ Action to prevent recurrence
- ❒ Root cause determination/analysis

Corrective Action Response Required By: _____

Initiated By: _____ Date: _____
QA/QC Officer

Responsible Organization to Complete:

Proposed Corrective Action: _____

Scheduled Completion Date: _____

Submitted By: _____ Date: _____
Responsible Organization Representative

QA/QC Organization to Complete:

Response Evaluated and Accepted By: _____ Date: _____
QA/QC Officer

Corrective Action Verified By: _____ Date: _____
QA/QC Officer

FIGURE 4.2

STOP WORK ORDER

OHM REMEDIATION SERVICES CORP. STOP WORK ORDER

To:_____ Responsible Organization:_____

From:_____ Date:_____ Project No. _____
OHM QA/QC Officer

STOP WORK ORDER NO. _____

Subject or Description: _____
_____
_____

Referenced CAR No._____

Instructions: Provide below an overall description of the unsatisfactory condition. Include background information and a description of the events leading to the unsatisfactory condition. Identify the basis for the stop work order and describe what activities must stop. Identify the conditions that must be satisfied for work to resume.

FIGURE 4.2 (CONTINUED)

STOP WORK ORDER

STOP WORK ORDER CLOSURE RECORD

1) Describe actions taken and verified:

2) Comments:

Actions are sufficient to eliminate/control previous problems and resumption of work activities is appropriate.

Closure Approval Signature: _____ Date:_____

OHM QA/QC Officer

4.6 CONTROL OF NONCONFORMING CONDITIONS

For material and hardware items, corrective action will be addressed through the nonconformance control process. This process will ensure immediate identification of material and hardware deficiencies and will document such dispositions as Use-As-Is, Repair, or Rework.

Any OHM employee can identify a nonconforming condition without fear of reprisal. Such conditions are to be reported to the QA/QC Officer, who will document the condition.

The QA/QC Officer is responsible for identifying nonconforming conditions by use of the Nonconformance Report (NCR) (see Figure 4.3). The NCR will be issued for hardware items or material products that are found to be deficient in characteristic, documentation, or procedures, such that they render the quality of that item or material unacceptable. These conditions are generally disclosed during receipt, handling, installation, and testing of items or material.

The NCR will be completed by the initiator, in accordance with the form instructions, and be entered into the NCR log by the QA/QC Officer. This log will include the following information for purposes of NCR tracking:

- NCR number
- Date initiated
- Responsible organization
- Date of disposition
- Date of completion
- Date of verification and closure

The NCR will be issued to the responsible organization for recommended disposition and corrective action.

NOTE: Decisions to Use-As-Is, Repair, or Rework nonconformances will be forwarded to FDF for approval.

Once the disposition and corrective action has been completed, the QA/QC Officer will verify the disposition and corrective action and close the report, if acceptable. If unacceptable, the report will be returned to the responsible organization with a basis for rejection and request for correction. An NCR will not be closed until the action is performed to the satisfaction of the QA/QC Officer. Dispositions and corrective actions must take the following into account:

- Rework and replacement of items and processes will be inspected and tested in accordance with original requirements.

- Repaired items and processes will be inspected and tested in accordance with specified alternatives to original requirements.

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FIGURE 4.3

NONCONFORMANCE REPORT

OHM Remediation Services Corp. **NONCONFORMANCE REPORT**	NCR Report No. Date:
Project:	Job No.
Feature of Work:	Responsible Organization: (OHM, Subcontractor, Supplier, etc.)
References: (Specification, Drawing, Procedure, incl. rev.)	
Description of Nonconforming Condition:	
Organization Code:_____ Inspection Code:_____ Nonconformance Cause Code:_____	
Disposition Category: ☐ Rework ☐ Repair ☐ Use-As-Is	
Corrective Action:	

NCR Initiated By:_____ Date:_____
OHM QA/QC Officer

Recommended Disposition and Corrective Action Provided By:_____ Date:_____
OHM Site Supervisor/Engineer

FDF Approval:_____ Date: _____
FDF Representative

Disposition and Corrective Action Completed By:_____ Date:_____
Responsible Organization Representative

Disposition and Corrective Action Verified By:_____ Date:_____
OHM QA/QC Officer

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FIGURE 4.3 (CONTINUED)

NONCONFORMANCE REPORT

Nonconformance Report Form Instructions:

Initiator: Complete the upper portion of the report by providing the following information:

NCR Report Number - Each NCR will be provided with a unique number for traceability.
Date - Date that the nonconforming condition was detected.
Project - Name of the project.
Job Number - Job number assigned to the project.
Feature of Work - Actual feature of work (i.e., soil/concrete placement, pump installation, etc.)
Responsible Organization - Organization responsible for the nonconformance.
References - Source requirements in which the condition is nonconforming to.
Description Of Nonconforming Condition - Complete description of the condition, supplemented by photographs, sketches, reports and other documents.
Organization Code - See below.
Inspection Code - See below.
Cause Code - See below.
Provide signature and issue date at the bottom of the form.

Organization Codes:

001 Engineering/Design
002 Vendor/Supplier
003 Operations
004 Subcontractor
005 Quality Control
006 Field Sampling/Analytical
007 Purchasing
008 Project Management
009 Health & Safety
010 Program Management

Inspection Codes:

100 Receipt Inspection
200 In-process Inspection (Preparatory, Initial, or Follow up)
300 Completion / Final Inspection

Nonconformance Cause Codes:

101 Indeterminate
102 Inadequate Documentation
103 Inadequate Plan/Procedure
104 Failure to Follow Plan/Procedure
105 Fails to Meet Specification
106 Fails to Meet Drawing Dimensions
107 Damage
108 Improper Handling, Storage, or Shipping
109 Poor Workmanship
110 Incomplete Work Performance
111 Test Failure
112 Poor Maintenance

Disposition Category: To be checked by the individual responsible for providing both disposition and corrective action. Check the appropriate box.

Corrective Action: Provide a complete corrective action that will ensure that the condition will be made to meet the disposition requirements. Corrective action shall include identification of the cause, steps to be taken to correct the condition, and steps to be taken to preclude recurrence, where possible. Use attachments, where necessary. Sign and date the "Disposition and Corrective Action Provided By" line at the bottom portion of the form.

Performing Organization: Complete the corrective action as described in the corrective action portion of the form and its attachments. Sign and date the "Disposition and Corrective Action Completed By" line at the bottom portion of the form.

Disposition & Corrective Action Verification: Disposition and corrective action will be verified by the QA/QC Officer. Once verification is considered complete and acceptable, the QA/QC Officer will sign and date the "Disposition and Corrective Action Verified By" line at the bottom of the form, indicating closure of the report.

When the nonconforming condition has been corrected, areas will be reinspected or retested, as appropriate.

Copies of issued and completed NCRs will be distributed to the FDF Project Manager and the responsible organization.

5.0 DOCUMENTS AND RECORDS

5.1 DOCUMENT AND DATA CONTROL

Preparation, issuance, and change to documents that specify quality requirements, or those that prescribe activities that affect quality, will be controlled to ensure that current and correct documents are being employed by those personnel performing the work. Such documents as instructions, procedures, and drawings, including changes thereof, will be reviewed for adequacy and approved for release by authorized personnel. At a minimum, the following will apply:

- Documents to be controlled will be identified.
- Personnel responsible for preparing, reviewing, and approving documents will be identified.
- Prior to approval and issuance, documents will be reviewed for adequacy, completeness, and correctness.

The organization originating a controlled document will be responsible for the document's identification, approval, distribution, control, and level of revision.

On-site document control will be accomplished by the QA/QC Officer by use of a Controlled Document Distribution Log (see Figure 5.1). This log will reflect, at a minimum, the following information:

- Document number
- Revision level
- Effective date
- Document title
- Copy number (sequential starting with No. 01)
- Type of document (controlled or uncontrolled information copy)
- Date of distribution
- Transmittal receipt date

Controlled documents will be issued using a Document Transmittal Form (see Figure 5.2), with return receipt acknowledgment required by the recipient.

5.2 REVISIONS

Revisions to controlled documents will be subject to the same level of review and approval as the original document and will be distributed to controlled distribution holders of the original document.

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FIGURE 5.1

CONTROLLED DOCUMENT DISTRIBUTION LOG

OHM REMEDIATION SERVICES CORP.				CONTROLLED DOCUMENT DISTRIBUTION LOG		
Document No.				Revision	Effective Date	
Document Title						
Copy No.	Type Document		Name of Recipient	Date Sent	Transmittal Receipt Rec'd	Comments
	Controlled	Uncontrolled				

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FIGURE 5.2

DOCUMENT TRANSMITTAL FORM

OHM REMEDIATION SERVICES CORP.			DOCUMENT TRANSMITTAL FORM	
To:			Copy No.	Date:
Sender:				
The following document(s) is/are transmitted to you for your:			☐ Use ☐ Information	
Title/ID No.	Rev. No.	No. of copies	Controlled	Uncontrolled

5.3 QUALITY ASSURANCE RECORDS

On-site control of records will be the responsibility of the QA/QC Officer. A list of QA records will be established and maintained similar to the example list shown in Attachment B. Requirements pertaining to record classification, retention, and turnover will be specified by the customer and agreed to by OHM.

QA records will include, but not be limited to, completed project documents providing objective evidence of activity performance, design, procurement, data analysis, reviews, QC inspection, test, assessments, etc. These records will be assembled, maintained, and stored until disposition and/or transfer.

To ensure record retrievability, the QA/QC Officer will establish a project record index, which will identify documents to be included within the records management system. The location of project record files will be determined by the QA/QC Officer and access to files will be limited to authorized personnel only.

Records will be maintained on site in a manner that will preclude damage, deterioration, or loss.

Records will not be erased or obliterated when corrections are necessary. Each correction will include a line drawn through the error or items deleted, entry of the corrected information, as appropriate, the initials of the individual making the change or correction, and the date the correction or change was made.

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6.0 WORK PROCESSES

6.1 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

Specific procedures, both administrative and technical, will be developed, approved, and implemented and will ensure that work is performed to established technical standards and administrative controls. Procedures will address radiological, industrial, and environmental safety for every facet of the operation. Procedures will ensure that activities affecting quality will be performed under suitable controlled conditions and will provide for the documented completion of designated process steps. These documents will be reviewed by the Site Supervisor for accuracy and completeness. Procedures and instructions will address, but not be limited to, the following:

- Process Control Procedures
- Equipment Operation Procedures
- System Operability Testing Procedures
- Mobilization
- Installation
- Maintenance
- Removal and Demobilization

OHM will be responsible for identifying work activities/special processes (as required by the specifications) and translating these specifications into working procedures. Procedures will contain sufficient quantitative and qualitative criteria to ensure satisfactory performance and will provide for documenting completion of designated process steps. The specific procedures will be included in the Systems Operability Testing Procedure and the Operation and Maintenance Manual developed by OHM for the Thorium Legacy Waste Project.

The OHM Site Supervisor will ensure that site procedures are implemented and followed. Where process and operation procedures require step-by-step performance, the OHM Site Supervisor will institute these controls and ensure implementation.

Any revisions to site procedures will be subject to the same controls as required for the original document.

Each individual must take responsibility for the quality of the work they perform and must be knowledgeable of relevant instruction, procedures, quality standards, and other technical documents. Personnel should be capable of using applicable tools and measuring devices and have a clear understanding of their task. When considered necessary, training will be administered in accordance with Section 3.0, Personnel Training and Qualifications.

6.2 PROCESS CONTROLS

Plans and procedures will address methods for on-site storage and handling of items and materials. These plans and procedures will ensure item and material traceability from the time

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of receipt through installation, operation, processing, and preparation for transportation and disposal. Records will be established to demonstrate appropriate inventory control, use, and disposition.

Project procedures define how containers of contaminated materials (for storage or processing) are uniquely identified. Items procured in quantity or off-the-shelf, that do not have specific material test or inspection requirements, will be identified by the catalog numbers, standard identification numbers, containers, or by other appropriate means.

Measures will be established for controlling the handling, storage, treatment, and preparation of waste for transportation and disposal.

Items and materials will be inspected and accepted in accordance with Section 9.0, Inspection and Acceptance.

Nonconforming items and materials will be identified and controlled in accordance with Section 4.0, Quality Improvement.

Waste receipts and shipment records for transfer to other project units will be maintained in accordance with project procedures.

6.3 CONTROL OF MEASURING AND TEST EQUIPMENT FOR MONITORING AND DATA COLLECTION

Processes will be developed and implemented to ensure that equipment used for monitoring and collecting data is accurate and suitable for its intended use.

Measures will be established and documented to ensure that measuring and test equipment used in activities affecting health, safety, and quality are properly identified, controlled, calibrated, and adjusted at specified periods, to maintain accuracy within necessary limits.

M&TE will have an initial calibration and will be re-calibrated at scheduled intervals against certified standards that have a known and valid traceability to National Institute of Standards and Technology (NIST), or other recognized standards organizations. Calibration intervals for each item will be in accordance with manufacturer's recommendations. Calibration certificates and reports will be maintained on file at the site for each piece of M&TE in service. M&TE documentation will include the following information:

- Identification of the M&TE calibrated.
- Traceability to the calibration standard used for calibration.

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- Calibration data, including as-found, adjusted, and as-left readings.
- Identification of the individual performing the calibration.
- Identification of the date of calibration and the recalibration due date or interval, as appropriate.
- Results of the calibration and statement of acceptability.
- Reference to any actions taken in connection with out-of-calibration or nonconforming M&TE, including evaluation of results.
- Identification of the implementing document (including revision level) used in performing the calibration.

A usage log will be maintained by the QA/QC Officer for each piece of M&TE in service. This log will identify the M&TE by model and serial number and/or any unique identification number applied. The log will identify the custodian and date assigned, for what and where the M&TE was used, and the condition and date returned from service.

M&TE found to be out of calibration, or considered suspect, will be immediately removed from service by the QA/QC Officer and its prior use evaluated, if necessary. This M&TE will be segregated and not used until repaired/re-calibrated.

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7.1 DESIGN CONTROL MEASURES

Design control measures will be commensurate with the requirements of the OHM Corporate Quality Management Program and the OHM Design Manual. These documents a) establish the system for the design of items and processes employing sound engineering/ scientific principles and appropriate standards; and, b) prescribe the responsibilities and identify the activities associated with the control of design inputs, processes, outputs, changes, verifications, reviews, records, and organizational interfaces.

OHM will provide, with FDF input, detailed equipment layout drawings, process and instrumentation drawings, equipment specifications, and service requirements (e.g., interface control). These drawings, specifications, and requirements will comply with the contractual requirements established by FDF.

All equipment will be designed to require minimal assembly (e.g., skid mounted), to minimize field setup activities. OHM's design will meet the limitations of the facility and utilities available for use at the FEMP.

OHM will incorporate time, distance, and shielding principles into the process in order to maintain radiation exposures as low as reasonable achievable (ALARA).

Field changes (including nonconforming items that are disposition "Use-As-Is" or "Repair") will be subject to the same design control measures and approval as the original design.

Documentation and development of as-built drawings will be provided by OHM, as required.

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8.0 PROCUREMENT

8.1 PROCUREMENT DOCUMENT CONTROL

The OHM procurement process complies with the Federal Acquisition Regulations (FARs) and has been approved for use on government projects by the Defense Contractors Audit Agency (DCAA).

Under the requirements of the OHM Corporate Quality Management Program, the quality system provides procedures for the following:

- Controlling the quality of procured goods and services considered critical to quality.
- The inclusion of applicable design basis and other requirements necessary to assure adequate quality of procured items and services.
- To the extent necessary, suppliers are to have a QA program that is consistent with applicable requirements.
- Technical requirements to be specified in procurement documents, by reference to specific drawings, specifications, codes, standards, regulations, procedures, or instructions, including revisions thereto.
- Identification of test, inspection, and acceptance requirements for monitoring and evaluating supplier performance.
- Rights of access to facilities and records for inspection or audit.
- Identification of documentation to be submitted for information, review, and approval.

These procedures address the vendor pre-qualification system and provide for vendor performance monitoring and receipt inspection.

OHM does not anticipate additional off-site or on-site subcontracted services to meet the technical and contractual requirements of this project. If subcontractors/suppliers are needed, OHM will prepare procurement packages and technical specifications for the work to be subcontracted. To expedite this process, OHM reviews the qualifications of subcontractors who have performed successfully in the past on OHM projects and who maintain acceptable health and safety and QA/QC programs.

OHM maintains full responsibility for the administration of its subcontractors in accordance with the terms and conditions of the contract. To successfully achieve and maintain control over subcontractors' performance, subcontractors are required to adhere to the same requirements OHM follows. These requirements include QA/QC, health and safety, cost and schedule control, and financial responsibility. OHM also conducts field QC checks, inspections,

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9.0 INSPECTION AND ACCEPTANCE

9.1 QUALITY CONTROL INSPECTION

QC inspection will be performed by the QA/QC Officer to verify that specified requirements are met. Inspections (e.g., source, in-process, final receipt, maintenance, and in-service) will be keyed to the phase of work to be performed and to those activities or steps in the work evolution which, if verified, measured, or compared to established tolerances and acceptance criteria, will provide assurance that the completed job will be correct and the system or item will perform its intended function.

QC inspections will be performed on equipment, material, and processes during receipt, installation, testing, operation, and treatment phase activities. Inspections will include:

- Performance of receipt inspections to verify the acceptance of material, items, and equipment in accordance with approved plans, purchase orders, and specification requirements.

- Performance of in-process inspections to ensure that equipment is assembled, tested, maintained, and operated in accordance with applicable instructions, procedures, and drawings. These inspections will include weekly inspections of equipment maintenance and housekeeping and daily inspections of container storage, staging, loading, and unloading areas.

9.2 QUALITY CONTROL INSPECTION REPORTING

Receipt inspections will be documented using Figure 9.1, QC Receipt Inspection Form.

Nonconforming conditions will be documented on an NCR and returned to the supplier or placed "On Hold," pending disposition.

In-process inspection results will be documented on the QC Inspection Report (see Figure 9.2). The report will include all necessary information needed to demonstrate compliance with applicable requirements. Specific information will include:

- Item(s) or process(es) inspected, including characteristics examined

- Inspection location

- Date of the inspection

- Source documents used to determine acceptability

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FIGURE 9.1

QUALITY CONTROL RECEIPT INSPECTION FORM

OHM REMEDIATION SERVICES CORP. **QC RECEIPT INSPECTION FORM**

Project:_____ Customer:_____
Project No._____ P.O. No._____
Manufacturer:_____ Vendor:_____
Specification No._____ Inspection Report No._____
Inspection date:_____ Quantity:_____
Item/material description:_____
_____
_____
Referenced Plans, Procedures, and Drawings:_____
_____

QC Checklist Items	Sat.	Unsat.
1. Verify identification and marking in accordance with applicable codes, specifications, purchase order, and drawings.		
2. Examination of item/material for conformance with specified requirements and original purchase order documents.		
3. Visually inspect for physical damage that may have occurred during shipment.		
4. Verify receipt of manufacturer's documentation.		
5. Verify presence of inert gas blanket, if applicable.		
6. Verify condition of desiccant and note any environmental damage or deterioration.		
7. Inspect to ensure physical properties are in conformance to specified requirements and if chemical and physical test reports meet requirements.		
8. Inspect important dimensions for conformance to specified requirements.		
9. Verify weld preparations are in accordance with applicable drawings and specifications.		
10. Visually inspect workmanship.		
11. Verify the presence of proper lubricants and oils, if required.		
12. Verify the receipt of required test data.		
13. Verify shelf life data, if applicable.		

Inspected By:_____ NCR No. _____ (if applicable)
QA/QC Officer

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FIGURE 9.2

QUALITY CONTROL INSPECTION REPORT

OHM REMEDIATION SERVICES CORP.	QC INSPECTION REPORT	
Subject Item/Process:	Date:	Report No.
Location:_____ Source Documents:_____	❒ Surveillance ❒ Inspection/Test Type of Inspection: ❒ Source ❒ Initial ❒ In-process ❒ Follow-up ❒ Pre-Final ❒ Final Project No._____	

Item No.	Description, Details, and Inspection Attributes	Satisfactory	Unsatisfactory

Inspected By:_____ Referenced NCR No._____
QA/QC Officer

- Type of inspection performed, including the identification of equipment and calibration requirements
- Inspection points verified
- Environmental conditions and required safety measures
- Results or acceptability
- Information on action taken in connection with nonconformances

Unsatisfactory or deficient conditions will be documented on the inspection report and referenced to the applicable NCR, issued in accordance with Section 4.0, Quality Improvement.

Inspection reports will be maintained on file and will serve as objective evidence of the inspection and acceptance effort.

9.3 FIELD QUALITY CONTROL INSPECTION AND TEST

QC inspections will be planned and performed to ensure that items and activities are in compliance with established requirements.

At the discretion of the QA/QC Officer, hold or witness points may be established for verifying a series of activities or specific activities within a process. These will be accomplished by identifying inspections points in controlling documents or by conveying them to the OHM Site Supervisor in writing.

A witness point will require that the QA/QC Officer be notified prior to the activity commencing.

A hold point will require that the QA/QC Officer be notified and the inspection performed prior to the activity commencing or proceeding beyond that point.

Inspection techniques may vary from visual examination to actual testing and dimensional measurements.

Inspection results will be documented on the QC Inspection Report (see Figure 9.1). The report will include all necessary information needed to demonstrate compliance with applicable requirements. Specific information will include:

- Item(s) or process(es) inspected, including characteristics examined
- Inspection location

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- Date of the inspection
- Source documents used to determine acceptability
- Type of inspection performed, including the identification of equipment and calibration requirements
- Inspection points verified
- Environmental conditions and required safety measures
- Results or acceptability
- Information on action taken in connection with nonconformances

Unsatisfactory or deficient conditions will be documented on the inspection report and reference to the applicable NCR, issued in accordance with Section 4.0, Quality Improvement.

Inspection reports will be maintained on file and will serve as objective evidence of the inspection and acceptance effort.

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10.0 MANAGEMENT ASSESSMENTS

10.1 METHODOLOGY

The thrust of management assessment is to identify, correct, and prevent management problems that hinder the achievement of the organization's objectives. The assessment methodology is in contrast to the traditional audit/appraisal that determines the adequacy and extent of the QA program development, documentation, and implementation in accordance with specified requirements. It is not conducted to verify conformance to regulations, product standards, or established procedures. Rather, management assessments evaluate customer and employee perceptions relative to the following key issues:

- Mission and strategic objectives of the organization
- Employees' role in the organization
- Customers' expectations and degree to which expectations are being met
- Opportunities for improving quality and cost effectiveness
- Recognizing and enhancing human resource capabilities

10.2 CONDUCT OF MANAGEMENT ASSESSMENTS

During the course of this project, OHM will perform at least one management assessment to assess how well the integrated QA program is working and how well it is achieving objectives involving quality, safety, and environmental requirements. The assessment team will be comprised of OHM regional managers.

10.3 REPORTING

The results of management assessments should be treated in such a way as to ensure that some level of formality is afforded the process. Decisions and related actions resulting from management assessment recommendations should be promptly followed up to evaluate their effectiveness.

10.4 FOLLOW-UP

Based on the results of the initial management assessment, including the implementation of recommendations, the need for additional management assessments will be evaluated and conducted by OHM.

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11.0 INDEPENDENT ASSESSMENTS

11.1 PLANNING AND SCHEDULING INDEPENDENT ASSESSMENTS

Independent assessments will be performed by the OHM Regional QA/QC Manager. These assessments will be planned and scheduled in a manner that will ensure that activities are assessed at the earliest practical time, in the beginning of the project and at intervals that are consistent with the project schedule and the performance critical activities.

11.2 PERFORMANCE

Independent assessments will monitor work performance, identify noncompliance activities, and other abnormal performance and precursors of potential problems, identify opportunities for improvement, report results to a level of management having the authority to effect corrective action, and verify satisfactory resolution of problems.

11.3 REPORTING

The OHM Regional QA/QC Manager will document each independent assessment in a formal report that will be distributed to the responsible organization for response and to OHM upper management. The assessment will be formatted in the same fashion as a formal QA audit. The report will provide for an executive summary, details of the assessment (to include its findings and identification of the activities observed), and the objective evidence reviewed during the performance of the assessment.

11.4 RESPONSE

Management of the responsible organization will respond to the assessment as follows: take action to correct the deficiency; identify the root cause; take action to prevent recurrence; and take action for improvement. Follow-up reviews of deficient areas will be conducted to verify corrective actions have been implemented.

11.5 FOLLOW-UP, VERIFICATION, AND CLOSURE

The OHM Regional QA/QC Manager will evaluate responses to the independent assessment findings and ensure timely closeout by document review, surveillance, or subsequent assessment. All documentation to support closure will be assembled and reviewed. Following verification of actions completed, a closure memorandum will be issued to the same distribution as the original assessment report.

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APPENDIX A

OHM QUALITY ASSURANCE PROGRAM PLAN REQUIREMENTS MATRIX

Appendix A

OHM QUALITY ASSURANCE PROGRAM PLAN
REQUIREMENTS MATRIX

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
Functional Category A: Management **Criterion 1 - Program**		
A. Program shall establish a system for the prevention, early detection, correction, and reporting of deficiencies, including any breakdown in the management systems, to ensure quality of the product.	Introduction, Item h. Section 3.0	
A1. Program shall describe the document control system and the system for the compilation of records that document the Seller's management of the QA program.	Introduction, Item j. Section 4.0	
1-1. Seller shall have an implemented written quality assurance program.	Introduction	
1-2. Management shall be responsible for the scope and implementation of the QA program and the achievement of quality.	QA Policy Statement Section 1.0	
1-2a. Each individual shall be responsible for the quality of his or her work.	Section 1.0 Para. 1.2.6	
1-3. The QA Program shall describe the organization structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the adequacy of work.	Section 1.0	
1-3a. An independent quality assurance individual shall be functionally independent from project/process management and not be responsible for cost or schedule.	Section 1.0 Para. 1.2.4	
1-4. The QA Program shall be binding on all personnel, including those having responsibility for planning and scheduling.	QA Policy Statement Section 1.0 Para 1.2.6	

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OHM QUALITY ASSURANCE PROGRAM PLAN
REQUIREMENTS MATRIX

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
1-4a. Management shall take the necessary actions to ensure that the QA Program is understood and implemented.	Section 2.1	
1-5. Management shall assign the responsibility and authority to stop unsatisfactory work and control further process, delivery, installation, or use of nonconforming items, such that planning and schedule considerations do not override safety, quality, or environmental considerations.	Section 1.2 Para. 1.2.5	
Functional Category A: Management **Criterion 2 - Personnel Training and Qualification**		
2-1. Personnel performing work shall be capable of performing their assigned tasks and trained as required.	Section 2.1 Para. 2.1.1	
2-1a. Training shall provide worker with an understanding of the processes and tools required.	Section 2.1 Para. 2.1.3	
2-1b. Training shall emphasize correct performance of work and provide understanding of why quality requirements exist (training on the QA Program).	Section 2.1 Para. 2.1.1	
2-1c. Training shall focus attention on doing the right things right the first time and address the consequences of improper work.	Section 2.1 Para. 2.1.2	
2-2. Personnel performing work that requires special skills or abilities or legally required training shall be qualified (and certified, if required) prior to performing that work.	Section 2.2	
2-3. Personnel training records shall provide evidence that the training, as given, has been understood and that performance measures have been set.	Section 2.1 Para. 2.1.1 & 2.1.6	

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OHM QUALITY ASSURANCE PROGRAM PLAN
REQUIREMENTS MATRIX

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
2-3a. Evaluation shall be given to the trainees to verify performance and documented accordingly.	Section 2.1 Para. 2.1.1	
Functional Category A: Management **Criterion 3 - Quality Improvement**		
3-1. The QA Program shall establish processes to detect and prevent quality problems and to promote continuous quality improvement.	Section 3.0	
3-1a. The focus of quality improvement shall be to improve the quality of the items and processes.	Section 3.0 Para. 3.1.2	
3-2. The QA Program shall establish a system that provides controls to identify, document, evaluate, and correct quality problems, to prevent their inadvertent test, installation, or use.	Section 3.6	
3-2a. Corrective action shall identify causes of problems and actions to prevent recurrence.	Section 3.4	
3-3. The Seller shall document and identify quality problems to FDF immediately upon discovery.	Section 3.4, Para. 3.4.3 & 3.4.5 Section 3.6, Para. 3.6.7	
3-3a. Decisions to "Use-As-Is," "Repair," or "Rework" of nonconformances shall be forwarded to FDF for approval.	Section 3.6 Para. 3.6.5	
3-4. The QA program shall ensure reworked and replacement items and processes are inspected and tested in accordance with original requirements.	Section 3.6 Para. 3.6.6	

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OHM QUALITY ASSURANCE PROGRAM PLAN
REQUIREMENTS MATRIX

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
3-4a. Repaired items and processes shall be inspected and tested in accordance with specified alternatives to original requirements.	Section 3.6 Para. 3.6.6	
Functional Category A: Management **Criterion 4 - Documents & Records**		
4-1. The QA Program shall establish a system to control preparation, review, approval, issuance, use, revision, and storage of documents that establish policies, prescribe work, specify requirements, or establish design (QA Records).	Section 4.0	
4-1a. The scope of the Document Control System shall be defined.	Section 4.1 Para. 4.1.1	
4-2. The QA Program shall provide for documenting completion of designated process steps.	Section 5.1 Para. 5.1.1	
4-2a. These records shall be reviewed by Seller management.	Section 5.1 Para. 5.1.1	
4-3. QA records shall not be erased or obliterated when revised.	Section 4.3 Para. 4.3.5	
4-3a. Instead, a line shall be drawn through errors or items deleted.	Section 4.3 Para. 4.3.5	
4-3b. The person making the revision shall initial and date the revision.	Section 4.3 Para. 4.3.5	

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
4-4. Control of superseded and canceled documents shall include measures to ensure that only correct documents are in use.	Section 4.0 Para. 4.1.1 & 4.1.3	
Functional Category B: Performance **Criterion 5 - Work Processes**		
5-1. Work shall be performed to established technical standards and administrative controls.	Section 5.1 Para. 5.1.1	
5-1a. Work shall be planned, authorized, and accomplished under controlled conditions using technical standards, instructions, procedures, or other appropriate means.	Section 5.1 Para. 5.1.1	
5-2. The QA Program shall provide for documenting completion of designated process steps.	Section 5.1 Para. 5.1.1	
5-2a. These records shall be reviewed by Seller management.	Section 5.1 Para. 5.1.1	
5-3. Personnel performing work are responsible for the quality of their work. Management shall review work and related information to ensure that the desired quality is being achieved and to identify areas needing improvement.	Section 5.1 Para. 5.1.1. & 5.1.5	
5-4. The Seller shall identify work activities/special processes (as required by specifications) and translate these specification requirements into working procedures to be used to accomplish the scope of work.	Section 5.1 Para. 5.1.2.	

OHM QUALITY ASSURANCE PROGRAM PLAN
REQUIREMENTS MATRIX

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
Functional Category B: Performance **Criterion 6 - Design Control**		
6-1. The QA Program shall establish a system for the design of items and processes using sound engineering/scientific principles and appropriate standards.	Section 6.1 Para. 6.1.1	
6-1a. This system shall include provisions to control design inputs, processes, outputs, changes, verifications, interfaces, records, and organizational interfaces.	Section 6.1 Para. 6.1.1	
6-2. Changes to final designs (including nonconforming items that are disposition "Use-As-Is," or "Repair") are to be subject to design control measures and the approval cycle of the original design.	Section 6.1 Para. 6.1.3	
Functional Category B: Performance **Criterion 7 - Procurement**		
7-1. The QA program shall establish a system to ensure that purchased items and services meet established requirements and perform as expected.	Section 7.1 Para. 7.1.2	
7-2. The Seller shall invoke applicable technical and administrative requirements (such as specifications, codes, standards, tests and inspections, and acceptance criteria), including FDF requirements and this requirement, for procurement of items and services.	Section 7.1 Para. 7.1.2	
7-3. The QA Program shall establish appropriate controls for the selection, determination of suitability, evaluation, and receipt of all purchased items, including commercial-grade items, to ensure that they perform as expected.	Section 7.1 Para. 7.1.2	

OHM QUALITY ASSURANCE PROGRAM PLAN
REQUIREMENTS MATRIX

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
7-3a. Note: FDF shall have right of access to the Seller's facility and all subtier vendors/suppliers for pre-award assessments and in-process audits, surveillance, and/or inspections, as deemed appropriate.	Section 7.1 Para. 7.1.2	
Functional Category B: Performance **Criterion 8 - Inspection and Acceptance**		
8-1. The QA Program shall establish a system to specify when and what type of inspections and testing (e.g., source, in-process, final receipt, maintenance, and in-service) are required. Administrative controls are to be used to preclude inadvertent bypassing of required inspections or testing and to prevent inadvertent operation or use of the item.	Section 8.1 Para. 8.1.1, 8.2.1 & 8.3.2	
8-2. When acceptance criteria are not met, deficiencies are to be resolved and corrected areas are to be reinspected or retested.	Section 3.6, Para. 3.6.6 Section 8.1, Para. 8.3.4	
8-3. All goods supplied shall conform to all requirements of the purchase order/contract.	Section 8.2 Para. 8.2.1	
8-3a. "Objective Evidence" of conformance to each specific drawing and specification required by the purchase order/contract, shall be on file and available for examination by FDF.	Section 8.2, Para. 8.2.1 Section 8.3, Para. 8.3.4	
8-4. "Objective Quality Evidence" shall mean any statement of fact pertaining to the quality of an item, based on observation, measurements, or tests, which can be fully verified.	Section 8.2, Para. 8.2.1 Section 8.3, Para. 8.3.4	
8-4a. Evidence must be expressed in terms of specific quality requirements or characteristics.	Section 8.2, Para. 8.2.1 Section 8.3, Para. 8.3.4	
8-4b. These characteristics are identified in drawings, specifications, and other documents that describe the item.	Section 8.2, Para. 8.2.1 Section 8.3, Para. 8.3.4	

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FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
8-5. The QA Program shall establish a system to control the calibration, maintenance, accountability, and use of equipment used for acceptance of items during inspection and testing.	Section 8.4	
8-6. Measuring and test equipment for monitoring and data collection shall be of the accuracy and type suitable for the intended use.	Section 8.4 Para. 8.4.1	
8-7. Measuring and test equipment found out of calibration shall be tagged or segregated and not used until it is re-calibrated.	Section 8.4 Para. 8.4.6	
Functional Category C: Assessment **Criterion 9 - Management Assessment**		
9-1. Management shall periodically assess how well the integrated QA Program is working by identifying barriers that hinder the organization from achieving its objectives in accordance with quality, safety, and environmental requirements.	Section 9.1, Para. 9.1.1 Section 9.2, Para. 9.2.1	
Functional Category C: Assessment **Criterion 10 - Independent Assessment**		
10-1. The QA Program shall establish a system for planning and performance of independent assessments.	Section 10.1 Para. 10.1.1	
10-1a. The Quality Assurance organization shall be primarily responsible for independent assessments.	Section 10.1 Para. 10.1.1	
10-2. Personnel performing independent assessments are not to have direct responsibilities in the areas they are assessing.	Section 1.0 Para. 1.2.7	

FDF Quality Requirement(s)	OHM QAPP Quality Requirement(s)	Remarks
10-3. Personnel performing independent assessments are to monitor work performance, identify non-compliance activities and other abnormal performance and precursors of potential problems, identify opportunities for improvement, report results to a level of management having the authority to effect corrective action, and verify satisfactory resolution of problems.	Section 10.2, Para. 10.2.1 Section 10.3, Para. 10.3.1	
10-4. Management's response to assessments shall include: action to correct the deficiency; Root Cause identification; actions taken to prevent recurrence; and, actions taken for improvement.	Section 10.4 Para. 10.4.1	
10-4a. Follow-up reviews of deficient areas shall be conducted to verify corrective actions have been implemented.	Section 10.5 Para. 10.5.1	

APPENDIX B

TABLE OF QUALITY ASSURANCE RECORDS (EXAMPLES)

Appendix B

TABLE OF QA RECORDS (EXAMPLES)

General

Contract documents and addenda
Notice to proceed
Licenses and permits
Conduct of operations implementation plan
Standing order supplements
Systems operability testing procedures
Operating procedures
Process control procedures
Schedule
Quality assurance program plan
Labor utilization plan
On-site health and safety plan
Technology-specific work plan
Secondary wastestreams plan
Substance abuse program
Proof-of-process testing
Meeting minutes
Correspondence

Design Records

As-built and shop drawings
Calculations
Design specifications and amendments
Drawings (i.e., equipment layouts, piping and instrument drawings, equipment specifications and service requirements, etc.)
Technical analysis, evaluations, and reports

Procurement Records

Procurement specifications
Purchase orders, including amendments

Operational Processes

Radiation screening, drum handling, shredder, and stabilization process logs and records

Manufacturing Records

Certificates of compliance
Material test reports
Catalog cut sheets
Performance test procedures and results
Instructions and recommendations

Installation Records

Mechanical
Electrical
Instrument and control
Start up and operation tests
Operation and maintenance

Quality Control/Quality Assurance

QC receipt inspection reports
QC field inspection and test reports
Log books (i.e., sampling, sample shipping, equipment calibration checks, photographs, etc.)
Measuring and test equipment
Calibration records
Laboratory data and analytical results
Nonconformance reports
Corrective action requests
Stop work orders
Assessment reports

Personnel Training/Qualification Records

Qualification records and resumes
OSHA training certificates
Radiation safety and site-related training

APPENDIX C

PROJECT-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

PROJECT-SPECIFIC HEALTH AND SAFETY REQUIREMENTS

The Thorium Legacy Waste Project will conducted under the Site Health and Safety Program, including the Site Radiological Control Requirements Manual (RM-0020) and the Site Safety Performance Manual (RM-0021). Project-specific safety concerns are discussed below.

C.1 HAZARD COMMUNICATION

The OHM Hazard Communication (Employee Right-To-Know) Program and the Site Chemical Hazard Communication Program (RM-2086) will be instituted at the Thorium Legacy Waste Project. The purpose of Hazard Communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals covered in the program at field project sites, shops, and facilities are transmitted (communicated), according to 29 CFR Part 1910.1200 and 29 CFR Part 1926.59, to all personnel associated with stabilization activities.

C.2 HEARING CONSERVATION

OHM will use engineering controls and/or PPE to control the effects of noise exposure in excess of 85 decibels (dB) during an 8-hour workshift. The requirements of the Site Hearing Conservation Program as listed in the Site Safety Performance Requirements Manual (RM-0021); and Site Safety Performance Procedure (SPR 12-14, "Hazardous Noise Exposure"), for the protection of personnel from the harmful effects of noise, will be adhered to during all stabilization activities.

C.3 HEAT AND COLD STRESS

Because stabilization efforts will begin while the weather is still cold and because personnel will be wearing PPE, both heat and cold stress are concerns during stabilization activities. Workers will be instructed on the hazards of both heat and cold stress and will be aware of the symptoms. A thorough discussion of heat and cold stress, including emergency actions to be taken, is included in the Manned Operations Procedure for Mobile Commercial Support Services for the Thorium Legacy Waste Project. Site Safety Performance Requirements SPR 12-9 "Working in Cold Temperatures" and SPR 12-10 "Working in Hot Temperatures" will be followed.

C.4 SLIPS, TRIPS, AND FALLS

It is important during operations to note the hazards associated with slips, trips, and falls and those work practices that will reduce or eliminate the injuries associated with these types of hazards. The intent is to prevent injuries and maintain an efficient and healthy workforce.

Workers will be instructed on the precautions, hazards, and proper methods to eliminate these hazards, which are discussed in detail in the Manned Operations Procedure for Mobile Commercial Support Services for the Thorium Legacy Waste Project.

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C.5 LOCKOUT/TAGOUT PROCEDURES

Lockout/tagout procedures (OP-0004, FDF Lockout/Tagout Procedure) will be used to ensure that the machinery or equipment being worked on is isolated from all potential hazardous energy sources. Equipment will be locked out or tagged out before an employee performs any servicing or maintenance activity, during which an unexpected energization, startup, or release of energy could cause an injury. Energy sources can be electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy. Lockout/tagout activities will comply with the requirements in the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1910.147, *The Control of Hazardous Energy*, and 29 CFR Part 1910.333, *Selection and Use of Work Practices.* Only personnel who have successfully completed the FDF Lockout/Tagout Procedure (OP-0004) will be authorized to perform lock and tag activities on site.

C.6 RADIOLOGICAL CONTROL

The Radiation Work Permit (RWP) will be used to delineate conditions and protective measures to prevent inadvertent exposure of personnel to radiation or radioactive contamination. The radiological conditions associated with the work to be performed will be recorded on the RWP. Also specified are the protective measures required by personnel entering the designated area.. The area shall be posted IAW RP-0007, Radiological Posting and Access to Radiological Areas.

It is the responsibility of FDF Radiological Controls personnel to initiate the issuance of RWPs. If, during operations under valid RWPs, the radiological conditions change, the scope of work is changed, or the scope of work is expected to change, another RWP will be required and a pre-job conference will be held.

FDF will determine the degree of monitoring required for a specific operation. This determination should be based on the potential for radiological problems and the experience of the personnel conducting the operation.

C.7 PERSONAL PROTECTIVE EQUIPMENT

FDF Radiological Control and Industrial Hygiene personnel will specify what PPE is to be used by employees for each of the site tasks and operations being conducted. The information in this section comprises the PPE program for the site. The type of PPE to be worn by each individual will be stated in the FDF work permit. This decision will be based on specific task assessments and potential exposure to contaminants or other hazards.

C.8 RESPIRATORY PROTECTION

Appendix A of 10 CFR Part 835 lists concentration limits for continuous exposure to airborne radioactivity for personnel occupationally exposed to radiation. Respiratory equipment is required as a supplementary control to keep personnel exposures ALARA. Respiratory protection during the Thorium Legacy Waste Project is the responsibility of FDF Radiological Control personnel.

C.9 EVACUATION FROM WORK SITE

If work site evacuation is necessary, notification will be given by site management to all personnel. Workers will be instructed on the various site-wide emergency notifications and project-specific notifications. All equipment should be turned off, if possible, and left in place. Personnel in Buildings 64/65 should proceed immediately to the primary rally point (Rally Point 3 on Fernald site map [refer to Figure C.1]) or the alternate rally point (Rally Point 5 on Fernald site map). Evacuation will be rapid; therefore, radiation control monitoring will be minimal at the access and control point. If life-threatening situations develop, evacuation will take precedence over monitoring.

C.10 EQUIPMENT OPERATION

Workers will only operate heavy equipment on which they have been properly trained and are qualified to operate. Training on the processing equipment will be provided during setup and startup.

C.11 INJURY REPORTING

Any injury, no matter how minor, will be reported immediately to FDF Medical for evaluation and/or treatment. The injured worker will be accompanied by the FDF supervisor in charge.

C.12 ADDITIONAL HEALTH AND SAFETY REQUIREMENTS

In addition to the health and safety requirements and issues discussed above, all work performed under this project will be subject to the controls encompassed by the issues listed below. These issues will also be programmatically controlled or controlled through project-specific procedures.

- Occupational Health and Environmental Controls (i.e., safety showers, sanitation, accident reporting, medical programs, etc.)
- Fire Protection
- Hoisting and Rigging Requirements
- Power and Hand Tool Safety
- Confined Space Safety
- Burning, Welding, and Open Flame Work Permits
- Electrical Safety
- Aerial Lifts Safety
- Motor Vehicle and Mechanized Equipment Safety
- Site Training Requirements

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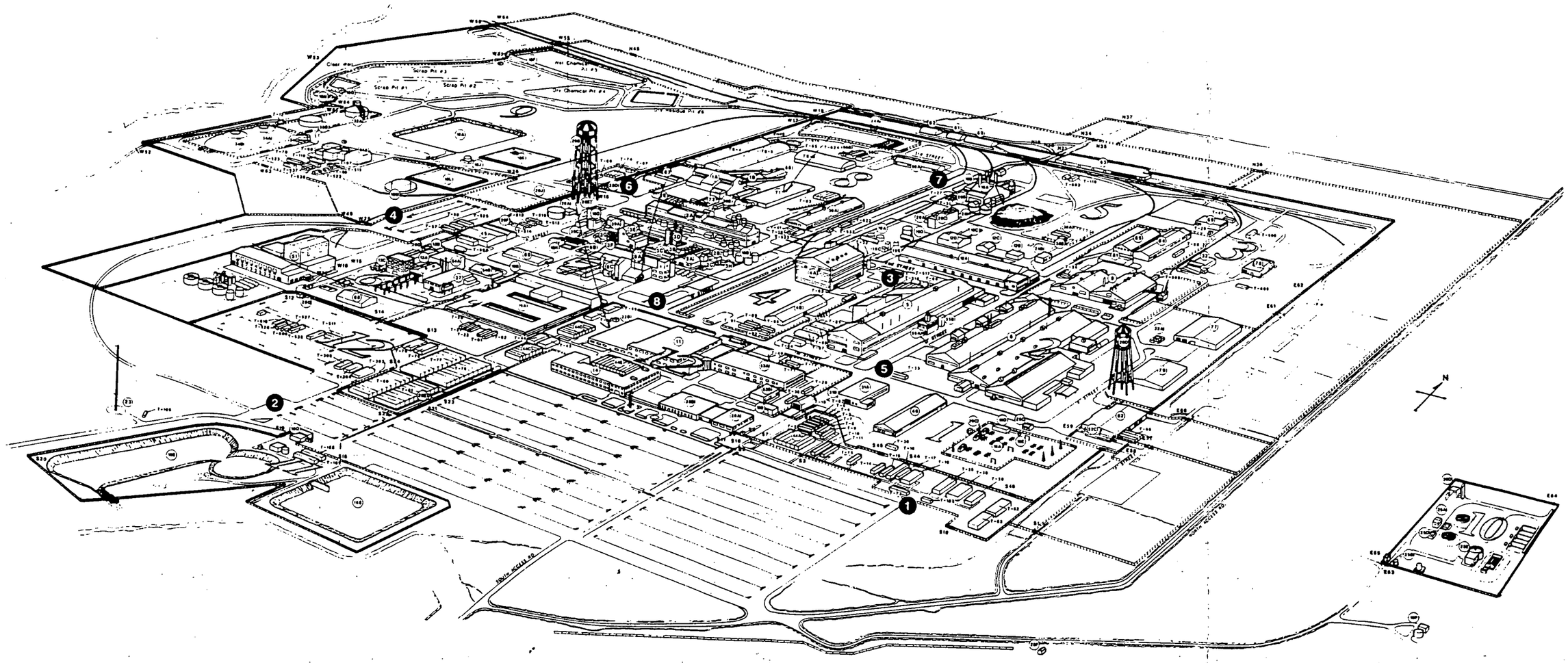

FIGURE C.1
FERNALD SITE MAP