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SUBMTTAL OF AMENDMENT TO ADD THE NITRIC ACID/RESIDUAL WASTE PROJECT TO THE URANYL NITRATE HEXAHYDRATE REMOVAL ACTION WORK PLAN AND RESUBMITTAL OF TANK T-2 THORIUM NITRATE PROJECT SPECIFIC PLAN

08/15/95

DOE-1360-95
DOE-FN EPAS
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PSP

Department of Energy
Fernald Environmental Management Project
P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155

AUG 15 1995

DOE-1360-95

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V - 5HRE-8J
77 W. Jackson Blvd.
Chicago, IL 60604-3590

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

Dear Mr. Saric and Mr. Schneider:

SUBMITTAL OF AMENDMENT TO ADD THE NITRIC ACID/RESIDUAL WASTE PROJECT TO THE URANYL NITRATE HEXAHYDRATE REMOVAL ACTION WORK PLAN AND RESUBMITTAL OF TANK T-2 THORIUM NITRATE PROJECT SPECIFIC PLAN

Reference: 1) Letter, J. Craig to J. Saric and T. Schneider, "Revised Uranyl Nitrate Hexahydrate Removal Action Work Plan," dated September 2, 1994.

2) Letter, J. Craig to J. Saric and T. Schneider, "Submittal of Updated Information for Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan," dated May 31, 1995

Enclosed for your review and approval, is a proposed amendment to add the Nitric Acid/Residual Waste (NA/RW) Project to the Uranyl Nitrate Hexahydrate (UNH) Removal Action #20 Work Plan (Reference 1). This amendment updates the Design Change/Summary Information provided in Reference 2 and in the NA/RW Project under Removal Action #20. The NA/RW Project addresses the treatment of the following waste streams:

1) 3,200 gallons of uranyl nitrate and organic material in tank D1-7;

2) UNH crystals in tank D1-11; and

3) 30,000 gallons of Nitric Acid stored in tanks F1-23 and F1-24.

The Fernald Environmental Management Project (FEMP) is proposing to conduct the treatment of these waste streams under Removal Action #20 because they can be treated with only minor modifications through the processes described in the approved work plan.

Recycled and Recyclable

Treatment of these waste streams will begin after the UNH solutions identified in the referenced work plan have been processed. The four storage tanks will be decontaminated following removal of their material to meet closure performance standards. Final closure of these units will be in accordance with the Director's Findings & Orders (DF&O) currently being negotiated with the Ohio Environmental Protection Agency (OEPA).

Also enclosed is the resubmittal of the Tank T-2 Thorium Nitrate Project Specific Plan (PSP) and a "crosswalk" which identifies the sections within the PSP to be accomplished under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) that meet the substantive requirements of the Resource Conservation and Recovery Act (RCRA). The PSP has been updated in response to verbal comments by the OEPA.

If you have any questions, please contact Chris White at (513) 648-3172.

Sincerely,

Johnny Reising

for Jack R. Craig
Fernald Remedial Action
Project Manager

FN:White

Enclosures: As Stated

cc w/encs:

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THORIUM NITRATE (TANK T-2) SOLIDIFICATION PROJECT
OEPA RCRA CLOSURE GUIDANCE - SUBSTANTIVE COMPLIANCE DEMONSTRATION

APPLICABLE Y/N	ITEM		CERCLA DOCUMENT	CROSS REFERENCE INDEX
Y	1.	Description/Detailed Drawing of Waste Management Unit(s) to be closed (Closure Guidance Item 3.2 and 3.4)	Project Specific Plan (PSP)	Figures 1-1, 1-2 and Section 1.2
Y	2.	List of Hazardous Waste(s) Managed in Unit(s) (Closure Guidance Item 3.5)	Project Specific Plan (PSP)	Table 1-1 and Section 1.2
Y	3.	Removal of Waste (Closure Guidance Item 3.6) a. Waste b. Staging c. Land Disposal Test Actions-Universal Treatment Standards	Project Specific Plan (PSP)	a: 4.3, 4.4, 4.5, 4.6 and Table 4-1 b: 4.2 and 4.3 c: 4.1.1
Y	4.	Schedule for Closure (Closure Guidance Item 3.7)	Project Specific Plan (PSP)	Attachment C
Y	5.	Health and Safety Issues (Closure Guidance Item 3.9)	Project Specific Plan (PSP)	Section 3.0
Y	6.	Decontamination Efforts (Tank T-2) (Closure Guidance Item 3.10)	Project Specific Plan (PSP)	Section 4.4
N	7.	Remediation Standards for Soils and Groundwater (Closure Guidance Items 3.11, 3.11.1, 3.11.2, and 3.12) Tank T-2 is within a secondary containment structure.		
Y	8.	Sampling Plan and Analytical Procedures (Closure Guidance Item 3.13) - Includes sampling to define the extent of contamination and sampling to verify the unit is clean.	Project Specific Plan (PSP)	Section 4.1
Y	9.	Description of Removal Efforts and Treatment Processes (Closure Guidance Item 3.14)	Project Specific Plan (PSP)	Sections 2.2, 2.3 and 2.4
Y	10.	Status of Facility (or Unit) After Closure (Closure Guidance Item 3.17)	CRU3 IROD	

Note: Compliance with the Applicable, Relevant and Appropriate Requirements (ARARs) is discussed in Section 4.10 and listed in Table 4-2 of the attached PSP.

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

NITRIC ACID/RESIDUAL WASTE PROJECT

REMOVAL ACTION WORK PLAN AMENDMENT TO EXISTING REMOVAL ACTION NO. 20

AUGUST 1995

Submitted by:

U. S. Department of Energy
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705

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NITRIC ACID/RESIDUAL WASTE PROJECT

1.0 PURPOSE/SCOPE

The material included in the scope of the Nitric Acid/Residual Waste Project was "Material in Process" until June 1991 when DOE reclassified it as a waste material. This reclassification caused the material to be characterized as a mixed hazardous waste under the Resource Conservation and Recovery Act (RCRA) due to its corrosive properties and hazardous constituents. The Nitric/Residual Waste materials are presently stored in four tanks in the Refinery area of the Fernald Environmental Management Project (FEMP). The location of the four tanks is provided in Figure 1.

The purpose of the Nitric Acid/Residual Waste Project is to safely remove, treat, and dispose of: the contents of Tank D1-7, consisting of uranyl nitrate solution and organic (Tributyl Phosphate [TBP]/kerosene) mixture; uranium crystals in Tank D1-11; and nitric acid from Tanks F1-23 and F1-24. A description of these four tanks is provided in Table 1. Processing will involve pretreatment steps as described herein as well as transfer of solutions, other than organic, to the existing Uranyl Nitrate Hexahydrate (UNH) dilution, neutralization, and filtration system (UNH system) for further treatment. The UNH system was recently activated to process bulk UNH material contained in other tanks located in and adjacent to the Refinery area.

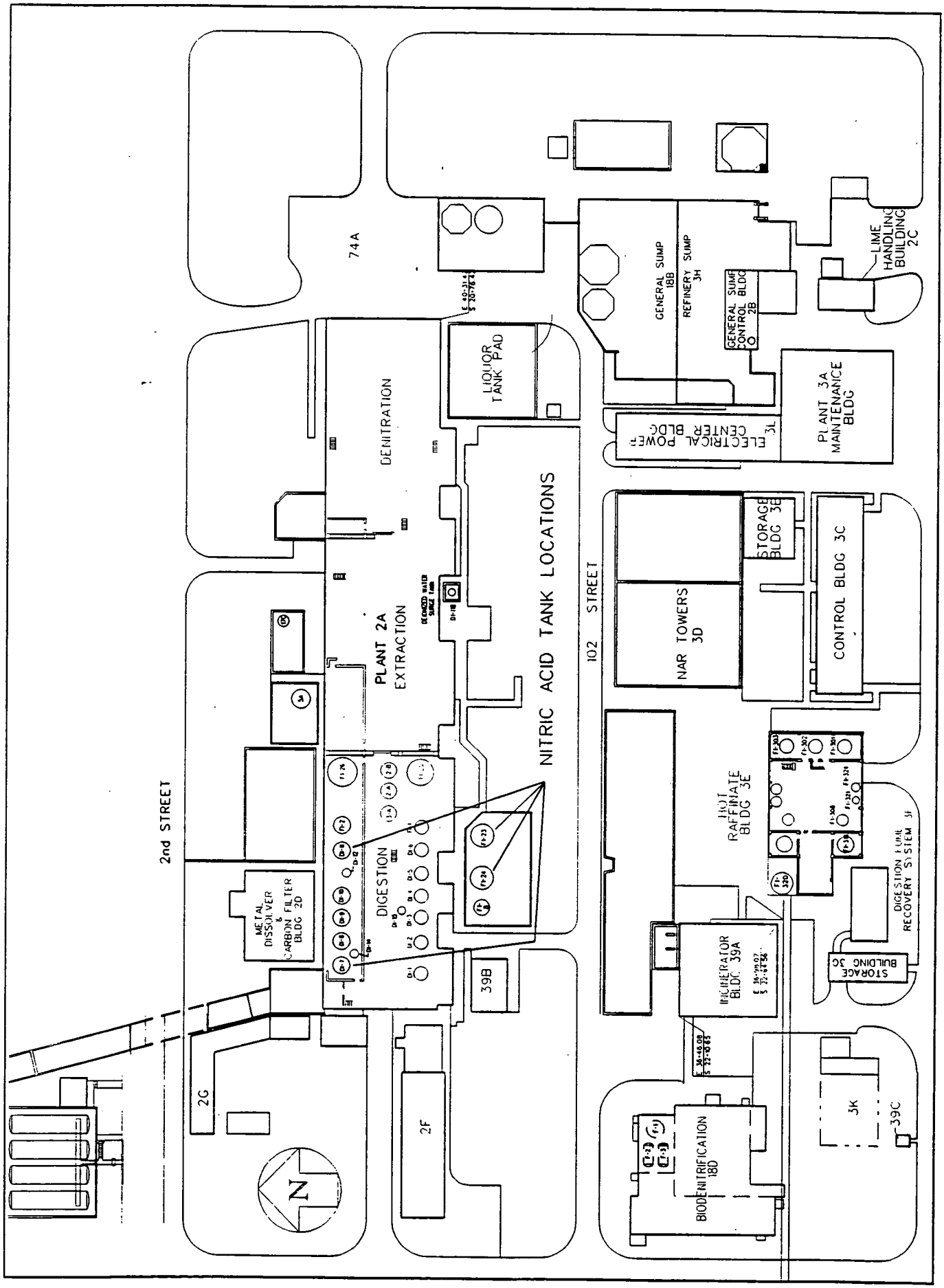
The low uranium organic mixture which results from pretreatment of the D1-7 tank will be drummed in another processing action. The drummed organics will eventually be combined with other organic materials and designated for ultimate shipment and disposal via the TSCA incinerator in Oak Ridge, Tennessee.

Non organic solutions processed through the UNH system will produce a solid filter cake that is expected to be non-RCRA hazardous and meet acceptance criteria for shipment to the Nevada Test Site (NTS) for burial as low-level radioactive waste. The liquid filtrate will be tested to confirm its acceptability for processing through the existing FEMP wastewater treatment system and discharging under the site's National Pollutant Discharge Elimination System (NPDES) permit.

1.1 General Process Description

To achieve the project's objectives, a number of processing steps will be implemented. Nitric acid in tanks F1-23 and F1-24 will be transferred to the UNH system for dilution, neutralization and filtration of the material. The heels of nitric acid remaining in the tanks will be neutralized with magnesium hydroxide. After heel neutralization, the tanks will be rinsed with process water and the heel and rinse water transferred to the UNH system. The tanks will continue to be rinsed followed by transfer of rinse waters to the UNH system until confirmation has been received that the rinsing has been effective in raising the remaining heel above pH 2 and metal levels below the rinse levels required by OEPA closure guidance.

FIGURE 1



NITRIC ACID TANK LOCATIONS

Table 1

NITRIC/RESIDUAL WASTE PROJECT TANKS

TANK NO.	LOCATION	TANK CAPACITY (gallons)	TANK CONTENTS	QUANTITY (gallons)	URANIUM CONC. (mg/l)	NORM.
D1-7	Digestion	3,625	Organic/ Water	3,218	Organic phase: 20,000 Aqueous phase: 110	0.005
D1-11	Digestion	3,500	UNH Crystals	---	---	---
F1-23	Denitration	20,000	Nitric Acid	15,000	13.5	2.02*
F1-24	Denitration	20,000	Nitric Acid	15,000	13.5	2.02*

* The nitric acid in Tanks F1-23 and F1-24 also contains chromium at a concentration of 8.5 ppm which is above regulatory limits.

Tank D1-7 will begin processing by removing a portion of the existing water phase within the tank. Subsequently, uranium and water separation and removal from the remaining organic mixture will be accomplished, followed by organic removal, packaging, and ultimate transport for incineration offsite. The closure of Tank D1-7 will be completed by performing a detergent rinsing of the vessel followed by a process water rinse.

Sufficient water will be placed in D1-11 to submerge the uranium crystals within the tank. This water will result from the transfers of water from D1-7 and, if necessary, process water will be added to Tank D1-11 to fill the vessel. The existing agitator will be operated to facilitate dissolving of the crystals. The resulting UNH material will then be transferred to the UNH system which will again be used for dilution, neutralization, and filtration of the material. The processing of D1-11 includes the rinsing of the vessel and confirmation that the rinsing has been successful.

1.2 Ongoing UNH Operations

Currently, approximately 200,000 gallons of UNH material are being processed at the FEMP through the UNH system. The details of this processing are explained in the Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan, Removal Action No. 20, Revision 1, August 1994, as amended by a Design Change/Clarification Summary issued on May 16, 1995, and recently updated as Revision No. 1, attached.

The Nitric Acid/Residual Waste Project will fully implement the applicable UNH system including ancillary systems, procedures, etc, as they currently exist or as specifically described in the remarks which follow.

2.0 Nitric Acid/Residual WASTE PROJECT SCOPE OF WORK

Processing of materials in Tanks D1-7, D1-11, F1-23 and F1-24 will be accomplished by utilizing a combination of new and existing equipment, including components currently in use on the UNH project. In general, systems currently employed for the UNH project will be incorporated into and form the nucleus of the process. Materials not previously handled, such as the organic mixture in the D1-7 tank, will also utilize known technology where possible.

2.1 Processing Plan

2.1.1 Tanks F1-23 and F1-24

No pretreatment of the 30,000 gallons of nitric acid in Tanks F1-23 and F1-24 is deemed necessary prior to transfer and treatment in the UNH system. However, several batches will need to be processed.

After transfer of the last two batches of nitric acid in Tanks F1-23 and F1-24 into the UNH system, a heel will exist in the bottom of each of the acid tanks due to the existing discharge nozzle being located several inches above the floor of each flat bottom tank. It is intended that sufficient magnesium hydroxide slurry (5# MgO/gallon) will be added to the tank heels to neutralize the remaining acid. The slurry will be transferred to the tanks using a hose connected to the existing UNH system magnesium hydroxide transfer Pump J-106.

Subsequently, the tanks will be rinsed and the rinse water from each tank transferred to the UNH system to join the last two batches of nitric acid. These last two batches will be held for subsequent mixing with discharges from Tank D1-11 as described further in Section 2.1.3. Rinsing will occur until the remaining heel is determined to meet required RCRA rinseate levels. The remaining heel will then be allowed to discharge out a tank drain into the existing secondary containment sump. The material will be transferred via the sump pump into facilities which will ultimately transfer the water to the Plant 8 wastewater treatment system.

2.1.2 Tank D1-7

The contents of Tank D1-7 have separated into two layers. These layers consist of a top layer of organics and a bottom aqueous layer. Analysis of the tank organic layer shows that more than 200 pounds of uranium is contained in the 1400 gallons of TBP/kerosene mixture, a concentration of approximately 20 g/l. The 1800 gallons of water forming the aqueous layer contains 110 mg/l uranium, which amounts to less than 2 lbs. U.

The following processing steps are anticipated. These steps are deemed necessary to remove the aqueous layer and bring about uranium removal from the organic layer in D1-7, which must be accomplished prior to disposal of the organics.

Initially, approximately 1,000 gallons of the aqueous layer will be removed from tank D1-7. This will be done by draining from the bottom of the tank at a controlled rate into an oil/water separator. The use of the separator will promote a sharp division with minimal organic carry over into the water phase. There will be a drain line in the separator which will be connected to a double diaphragm pump to allow for delivery of the water phase to Tank D1-11, where additional processing will occur, as further described in Section 2.1.3.

Following removal of the aqueous layer, the liquid level in D1-7 will fall below the overflow pipe in the tank. At that point, a wand inserted through the manway will be used to slowly flood the overflow line and force the trapped organic into the vessel for treatment along with the principal quantity of material. Approximately 150 lbs. of bagged sodium carbonate will then be added to the remaining water and TBP/kerosene mixture. An existing agitator will be operated to bring about a thorough mixing of the carbonate solution with the organic phase. This operation will be performed without any heat addition.

The addition of carbonate to Tank D1-7 will cause the uranium previously held in the organic phase to be transferred to the aqueous phase and allow it to remain in solution as a soluble complex of uranyl carbonate. The mixture of TBP/kerosene and carbonate water will be allowed to sit in a quiescent state for a period of time sufficient for the mix to separate within the tank, forming two phases. The TBP/kerosene will form the top layer, with carbonate water, including extracted uranium, forming the bottom layer. Result of this action is that the original uranium concentration of 20 grams per liter, organic phase, will become part of the aqueous phase. There will be virtually no uranium remaining in the organic phase at the completion of this action. The organic phase will be tested to ensure that the uranium has reacted with the carbonate and is in the aqueous phase.

Following separation, the carbonate water will be drained from the bottom of the tank into the separator. Again, the double diaphragm pump connected to a drain line in the separator will allow for delivery of the carbonate water phase to Tank D1-11, where additional processing will occur, as further described in Section 2.1.3.

The use of the separator will promote a sharp division with minimal organic carry over into the water phase. In the event that too much organic collects in the separator, the excess can be discharged into a drum to allow for appropriate visible control of the interface during the separation activity.

The organic phase remaining in D1-7 and the separator will then be removed by transferring into drums. The drummed material will ultimately be shipped to the TSCA incinerator at Oak Ridge, Tennessee for incineration.

After removal of the contents of Tank D1-7 is complete, a detergent rinse of the tank's interior will be performed.

The detergent rinse will be accomplished with a 1 % solution of Alconox® in water. A 1,000 gallon quantity of this solution (containing 85 lbs. Alconox®) will be made up in
D1-7 tank and agitated. While agitating, a stream of the solution will be withdrawn from the bottom drain line, through the oil-water separator and, using the double diaphragm transfer pump, pumped through a hose back into the tank to spray the internal surfaces of the tank above the liquid level. Any organic phase liquid or any emulsion of the two phases ("interfacial crud") will be removed from the separator vessel to a separate drum. This rinsing process will be continued, with periodic stops for inspection, until the internal tank surfaces appear visually clean.

After removal of the detergent solution, the tank will be rinsed with clean, process water (first rinse). After removal of the first rinse, a second rinse will be applied and a sample of this rinse discharge will be analyzed to verify satisfactory tank clean-out.

The separated organic phase and/or the organic-aqueous emulsion will be combined with the previously separated organic phase in drums for disposal at the TSCA incinerator. The detergent solution and all rinse water will be disposed through the plant 8 waste water treatment system.

2.1.3 Tank D1-11

The carbonate water pumped from the separation vessel, along with the initial 1,000 gallon water transfer from D1-7, and additional process water, if necessary, will be used to provide the quantity of water necessary for dissolving the UNH crystals which currently remain on the internal surfaces of D1-11. The existing agitator on D1-11 will be operated to help ensure crystal removal from the tank. The resultant UNH material will be transferred into one of the last two batches of nitric acid contained in the UNH neutralization tanks F1-25 or F1-26. Tank D1-11 will be rinsed with process water until the rinseate level meets RCRA closure requirements. The rinseate will also be transferred to the UNH system to join the last two batches of nitric acid. The nitric acid will react with the sodium carbonate to 'free' the uranium for precipitation with the magnesium hydroxide used in the UNH system.

2.1.4 Dilution, Neutralization and Filtration in UNH System

Documentation of this section of the Nitric Acid/Residual Waste Project shall be considered to be identical to appropriate section of the UNH system including its ancillary systems, procedures, etc.

Therefore, this section of the Nitric Acid/Residual Waste Project Work Plan shall be the same as the UNH Dilution, UNH Neutralization, and UNH Slurry Filtration sections currently detailed and incorporated into the Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan, Removal Action No. 20, Revision 1, August 1994, as amended by a Design Change/Clarification Summary issued on May 16, 1995, and recently updated as Revision No. 1, attached.

2.2 Equipment and Instrumentation

2.2.1 Utilization of UNH Equipment & Instrumentation

Documentation of this section of the Nitric Acid/Residual Waste Project shall be considered to be identical to the applicable section of the UNH system including its ancillary systems, procedures, etc.

Therefore, this section of the Nitric Acid/Residual Waste Project Work Plan shall be the same as the UNH New Equipment and Instrumentation sections currently detailed and incorporated into the Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan, Removal Action No. 20, Revision 1, August 1994, as amended by a Design Change/Clarification Summary issued on May 16, 1995, and recently updated as Revision No. 1, attached.

Nitric Acid/Residual Waste Project exceptions to full implementation of the applicable UNH system including ancillary systems, procedures, etc, as detailed previously, shall be limited to those items and/or elements which are specifically described in the remarks which follow.

All transfers will be made using the Progressive Cavity Pumps installed with the UNH system except for the transfer of material from Tank D1-7. The transfer of tank D1-7 material will be performed by gravity feed into the separator, then by using an existing Double Diaphragm Pump as further discussed in Section 2.2.2.

2.2.2 Double Diaphragm Pump

UNH material has been successfully transferred on two occasions using a double diaphragm pump and hoses. This occurred during the transfer of UNH from Tank F1-26 to Tank F1-2. This transfer was performed prior to starting the UNH Neutralization Process so that Tank F1-26 could be prepared for use as a dilution/neutralization vessel for the project.

The second transfer using a double diaphragm pump occurred in early 1995 when UNH was transferred from Tank D1-1 to D1-2 when Tank D1-1 was no longer considered a "safe" containment vessel. The transfer of D1-7 materials will be moved using a double diaphragm pump and hoses.

2.2.3 Pipe Sleeve

Both the existing nitric acid storage area and the existing UNH processing system are located in a configuration which provide secondary containment in the event of a spill. However, in order to move the nitric acid into the UNH processing system located in the Digestion area of Plant 2/3, it will be necessary to tie these two areas together, via new, additional, secondary containment. To ensure complete secondary containment, a pipe sleeve will be fabricated and installed connecting the two separate areas. The sleeve will contain any leakage which may occur in the temporary suction piping which is installed within the sleeve, and will direct any liquid into either of the two adjacent secondary containment areas.

3.0 OPERATIONS SAMPLING

Documentation of this section of the Nitric Acid/Residual Waste Project shall be considered to be identical to the applicable section of the UNH system including its ancillary systems, procedures, etc.

Therefore, this section of the Nitric Acid/Residual Waste Project Work Plan shall be the same as the UNH Operations Sampling sections currently detailed and incorporated into the Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan, Removal Action No. 20, Revision 1, August 1994, as amended by a Design Change/Clarification Summary issued on May 16, 1995, and recently updated as Revision No. 1, attached.

4.0 PRE-OPERATION CERTIFICATION OF EQUIPMENT, PROCEDURE, AND PERSONNEL

Documentation of this section of the Nitric Acid/Residual Waste Project shall be considered to be identical to the applicable section of the UNH system including its ancillary systems, procedures, etc.

Therefore, this section of the Nitric Acid/Residual Waste Project Work Plan shall be the same as the UNH Pre-Operation Certification of Equipment, Procedure, and Personnel sections currently detailed and incorporated into the Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan, Removal Action No. 20, Revision 1, August 1994, as amended by a Design Change/Clarification Summary issued on May 16, 1995, and recently updated as Revision No. 1, attached.

Nitric Acid/Residual Waste Project **exceptions** to full implementation of the applicable UNH system including ancillary systems, procedures, etc, as detailed previously, **shall be limited to those items and/or elements which are specifically described in the remarks which follow.**

All systems and processes envisioned for this project essentially duplicate those used in the UNH Neutralization project. This includes those processes discussed in Section 2.1, Processing Plan. Therefore, no simulation testing is deemed necessary, and existing UNH training and qualification programs will be adequate for ensuring that personnel have the ability to operate and understand the processes. However, additional training will occur on use of the oil/water separator and table top reviews will be performed for each operating procedure.

5.0 ENVIRONMENTAL COMPLIANCE & SPILL RESPONSE

Documentation of this section of the Nitric Acid/Residual Waste Project shall be considered to be identical to the applicable section of the UNH system including its ancillary systems, procedures, etc.

Therefore, this section of the Nitric Acid/Residual Waste Project Work Plan shall be the same as the UNH Environmental Compliance & Spill Response sections currently detailed and incorporated into the Uranyl Nitrate Hexahydrate Neutralization Project Removal Action Work Plan, Removal Action No. 20, Revision 1, August 1994, as amended by a Design Change/Clarification Summary issued on May 16, 1995, and recently updated as Revision No. 1, attached.

ATTACHMENT

UNH Neutralization Project

Design Change/Clarification Summary

Revision 1

August 1995

APPROVED BY: _____ DATE: 8/11/95
UNH NEUTRALIZATION PROJECT MANAGER

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Fernald Environmental Restoration Management Corporation
P.O. Box 538704
Cincinnati, Ohio 45253-9704

I. PURPOSE

The purpose of this document is to: 1) provide a brief description of the design changes which have occurred on the UNH project since the Safety Analysis Report (SAR) was prepared and 2) clarify design items which have changed since other supporting project documents were issued.

Prior to issuing a design change, the change must pass through a Unreviewed Safety Question Determine (USQD) process, as outlined in DOE Order 5480.21, to ascertain if a change (modification, test, or experiment) to a nuclear facility or activity can be made without prior safety review and approval by the original approving body (DOE). If an issue could result in the facility/activity being outside its authorization basis, this issue involves an Unreviewed Safety Question (USQ).

NOTE: The FEMP USQD system is only applicable to issues that relate to an activity or facility that are the subject of a DOE-approved Safety Analysis Report (SAR), Basis of Interim Operation (BIO), Technical Safety Requirement (TSR), or Operational Safety Requirement (OSR).

This document will be updated on a periodic basis to accommodate additional USQs and other clarity items to reflect the appropriate revision of affected project documentation. It is intended that this document serve as an amendment to the noted documents.

II. UNH PROJECT DESIGN CHANGES

1. USQD

The USQD system aids in the tracking of design changes for the UNH project. Part I of the following table lists all the existing USQs for the UNH project. Each design change (USQ) is assigned a USQD number by the FEMP's Nuclear System Safety Department. The design change table gives a brief description of the original design and the current design and identifies other UNH project document(s) that are affected by the change. This will allow for a concise review of design changes as well as illustration of the impact of the change on project documentation.

Legend:
- SAR - Safety Analysis Report
- RAWP - Removal Action Work Plan
- POA - Plan Of Action
- DC - Design Criteria
- CP - Control Philosophy
- TFCP - Tank Failure Contingency Plan
- NA - Not Applicable to Document
- NR - No longer relevant as operational readiness review has been completed when these USQD items were added

2. Design Clarification

Part II of the following table lists items which, while described in any of the aforementioned documents, is no longer reflective of the current project direction. The specific document which is no longer correct is noted by an X in the appropriate location. The section number in the specific document where the item being discussed is located is also noted.

Legend: See previous section
RAWP - besides addressing the Removal Action Work Plan items, the reference is expanded to address correspondence with the OEPA where certain commitments were made concerning the UNH project.

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0001	Is non-related to the UNH Project							
95-0002	The SAR states that drain valves will be installed on either side of block valves to be used for flushing.	Engineering has determined that additional drain valves on each side of block valves are not required due to existing piping drains (as built) providing adequate drainage. More drain valves in the system will provide more potential leak locations.	2.5.1.1	2.2.1	1.3.1.1	NA	NA	NA
95-0003	The SAR states that the UNH Transfer pump skids will have a 12-inch tall stainless steel pan built around the skid.	Engineering has determined that the UNH Transfer pumps shall have a stainless steel pan with a 2-inch wall and the skid shall have a built-in reservoir to contain any released material. The reservoir in turn has a valved drain into existing secondary containment areas.	2.5.1.3.1	2.2.4	NA	NA	NA	NA
95-0004	The SAR states that transfer piping will connect to only one tank at a time.	The transfer piping may be connected to more than one tank but transfer of UNH will occur one tank at a time. Installed valves and blind flanges in the transfer piping will be used to ensure that only one UNH tank is being pumped at any given time.	2.5.1.1	2.1.1 2.2.1	NA	NA	NA	NA
95-0005	The SAR states that the UNH solution will be removed from the top of the storage tanks.	The connections to all tanks will be through bottom discharge. These discharges have or are being upgraded prior to the transfer of UNH from these tanks.	2.6.1	2.1	NA	NA	NA	NA
95-0006	The SAR states that the assembly connecting to the UNH tanks will be hydrostatically tested prior to use.	All pipes and hoses are hydrostatically tested prior to installation. Upon installation of pipes and hoses, all flanged connections will be leak tested except on dip tubes where not feasible.	2.6.1	NA	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0007	The SAR states that the pump skid will be anchored.	An engineering evaluation has determined that the weight of the pump skid is 1700 lbs and that pump vibration will not cause the pump to move, therefore, there is no requirement to anchor the pump skid.	2.6.1	NA	NA	NA	NA	NA
95-0008	The SAR states that the NO_x scrubber will remove 90% of the vapor contaminants and pull 100 ACFM.	There is no regulatory requirements to use the scrubber, however, the Removal Action Work Plan (RAWP) was approved based on the statement that the NO_x scrubber would be used to ensure worker safety. Engineering has determined that only 35 ACFM is necessary and that only the operating parameters (ACFM and caustic flow rate) need to be verified during the SOT.	2.8.1	5.1.1	NA	NA	4.1.1 4.3.3	NA
95-0009	All dikes in the Plant 2/3 area are configured to pump to tank [F1] 25A.	Existing procedures state all material captured in existing secondary containment systems for the UNH system are pumped to one of two different sets of storage tanks. One set (F1-25A & F1-26A) is located within the CD Blend area and the other set (F2E-601 and F1-608) is located in the General Sump Area.	2.8.3	NA	NA	NA	NA	NA
95-0010	Tank F2E-601 is located in the OK Liquor area.	The actual location for tank F2E-601 is the refinery sump area.	2.8.3	NA	NA	NA	NA	NA
95-0011	The use of compressed air to clear lines has been eliminated to reduce the potential of over pressurizing process components.	Compressed air will be used to purge lines of residual fluids.	3.3.2.3.1	NA	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0012	Internal dosimetry requirements described in the SAR does not reflect current site policy on internal dosimetry.	Approved site procedures will govern internal dosimetry requirements.	7.9	NA	NA	NA	NA	NA
95-0013	Access to Building 2A, NFS Tanks, OK Liquor Tank, Hot Raffinate, and CD Blend is controlled through the radiological control point in the Extraction area of Building 2A.	Access to Building 2A, OK Liquor Tank, Hot Raffinate Tanks, NFS Tanks and CD Blend Tanks is controlled through the radiological control point located south of the General Sump.	7.16	NA	NA	NA	NA	NA
95-0014	The SAR states that there shall be a SOT for scrubber effectiveness.	Engineering has determined that only the operating parameters (ACFM, caustic flow rate) need to be verified during the SOT.	10.3 (Table 10.3-1)	5.1.1	NA	NA	NA	NA
95-0015	The SAR states that a tanker truck filled with water will be positioned near each of the five different UNH tank locations.	Project management has determined that no tanker truck will be used. Simulation of operation will occur using process water, existing storage tanks, or portable tanks. This will not affect the effectiveness of simulation training.	10.3.1	4.0	NA	NA	NA	NA
95-0016	Throughout the SAR reference is made to high nitrate slurry.	In the operating procedures the slurry is referred to as MDU slurry.	General	NA	NA	NA	NA	NA
95-0017	Removable spool pieces are provided to isolate the NFS/CD Blend area and Hot Raffinate/OK Liquor area during processing.	Valves have been installed at these locations. The valves will be closed and tagged out as required by operating procedures.	Drawings 92X-5900-P-00063 & 92X-5900-N-00075	NA	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0018	The high level signals from tanks close valves on effluent lines.	Eliminated closing of valves on high level. Retain the alarm function of the high level signal. An engineering review of the operating logic resulted in a decision to use the high level point only as an alarm for operator action to stop the pump. NOTE: High-High level alarm will still close valves.	2.5.1.4, 2.6.7, 3.3.2.3.2, 11.5.5, 11.5.8, Appendix C, Appendix D	2.3.1	1.3.1.3	4.7	3.4.4	NA
95-0019	The overflow lines for the East & West EIMCO's do not have independent isolation valves to aid in line blockage removal capability.	Engineering has determined that these lines carry a slurry which makes them vulnerable to blockage. Therefore, isolation valves are being added on the East & West EIMCO overflow lines.	Dwg 92X-5900-N-00076	2.3.3	NA	NA	NA	NA
95-0020	The SAR discusses the installation of a filtrate line between Plant 8 and Plant 2/3 to allow use of filtrate water for acid dilution purposes.	Engineering has determined that the filtrate line will not be used. It has been decided to isolate and abandon in place the filtrate line between Plant 8 and Plant 2/3 by removing valves and installing blind flanges. Process water or previous batch supernatant will be used for dilution proposes instead of filtrate.	2.3.4, 2.3.6, 2.6.2, 2.6.4, 2.6.11, 9.6.2, 6.8, Table 8.0, Drawings	2.1.2 2.1.4 5.4	1.3.1.2	1.0 2.1 2.2 2.4 3.0 4.3.2	2.1 3.1 4.1.1	NA

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I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0021	The SAR indicates that the tank contents will be removed from the top through the use of dip tubes and that recycle lines will be used to ensure removal of solids from tanks where agitators do not exist.	Modifications will be made to existing tanks to allow connection of pumps to bottom discharge piping. Therefore, tank dip tubes on suction piping will be eliminated. Engineering has determined that a more complete removal of tank contents, and better overall operation of the transfer system and pumps is the justification for this change. Accordingly, no recycle piping will be installed where functioning agitators exist.	2.6.1, 2.6.4, Table 2.7-1	2.1 2.2.2	1.3.1.1	2.1	2.1	NA
95-0022	A schedule of tank process sequencing was translated to drawings in the SAR which indicated two pumps to be used at NFS and CD Blend and two pump locations to be used in Hot Raffinate and Plant 2/3 Digestion.	The sequence of tank processing has been modified to allow use of only one pump setup at NFS & CD Blend and only one location in Hot Raffinate & Plant 2/3 Digestion. Engineering has determined that this permits more efficient transfer of UNH to neutralization tanks by reducing the amount of time required to relocate the pump skids.	Numerous Drawings	NA	NA	NA	3.1 3.2.1 3.2.2	NA
95-0023	Proposed piping and valving is indicated on drawings included in the SAR.	A Field Change Request (FCR) provides a "T" downstream of the existing valve PW-1. It also provides a valve (HOV-309) downstream of this new "T" on the existing process water line and provides a valve (HOV-300) downstream of the new "T" on the new process water line. The purpose of this change is to isolate the existing water line with a new valve HOV-309 instead of a deteriorated existing valve (PW-1).	Drawing 92X-5900-P-00063	NA	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0024	Proposed piping and valving is indicated on drawings included in the SAR.	A FCR provides a new 1-1/2" carbon steel line between the existing 1-1/2" carbon steel line and the New Process Water Line and a new isolation valve (HOV-310). The purpose of this change is to supply process water from the new process water line to Tank 3-A for the production of Magnesium Hydroxide.	Drawing 92X-5900-P-00063	NA	NA	NA	NA	NA
95-0025	Proposed piping and valving is indicated on drawings included in the SAR.	A FCR addresses discrepancies in the piping and P&ID drawings. The purpose of this change is to correct the locations of TE-608 (Temperature Element, capillary tube) and TE-608A (Temperature Element, electric solenoid for steam on valve for steam control) to allow for proper operation.	Drawing 92X-5900-P-00063	NA	NA	NA	NA	NA
95-0026	Proposed piping and valving is indicated on drawings included in the SAR.	A FCR provides isolation valves on the suction lines of J-101 and J-105 upstream of the flush hose connection. The purpose of this change is to prevent flush water from entering the tanks during flushing operations.	Drawing 92X-5900-P-00063	NA	NA	NA	NA	NA
95-0027	Proposed piping and valving is indicated on drawings included in the SAR.	A FCR addresses installation of a siphon break at the connection flange on tank dip legs. The purpose of this change is to enable breaking the siphon produced during transfer operations so that suction line can be drained.	Drawing 92X-5900-P-00063	NA	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0028	Proposed piping and valving is indicated on drawings included in the SAR.	A FCR provides a new standpipe between valve HOV-223 and the overflow line from the West EIMCO filter. The LSH (Level Switch High) 104B from the West EIMCO filter has been blanked off and relocated to the new standpipe.	Drawing 92X-5900-N-00076	NA	NA	NA	NA	NA
95-0029	Table 10.4-1 of the SAR specifies surveillance requirements for the project and their frequency.	The frequency of the requirements is being revised to reflect vendor recommendations.	10.4	NA	NA	NA	NA	NA
95-0030	Leakage was observed coming from the carbon steel piping attached to the steam coil at tank D1-1. This raised concern that the steam coil inside the tank had ruptured and, because of the reactivity of carbon steel to nitric acid, presented a threat to the tank's integrity.	The contents of tank D1-1 were pumped to empty tank D1-2. A portion of the tank contents, plus tank D1-1 rinsing water, were also placed in Tank D1-3. Both tanks D1-2 and D1-3 will now require processing.	DWG 92X-5900-F-0069	1.2.1 Table 2 Dwg 92X-5900-F-0069	Dwg 92X-5900-F-0069	NA	NA	2.0 Appendix A
95-0031	Simulation of Operation: A tanker truck filled with water will be positioned near each of the five different UNH tank locations. This will be the Simulated UNH Tank. The Magnesium Hydroxide Supply Tank, tank 3A, located by tank F1-26, will be used to make up a quantity of Magnesium Hydroxide by mixing $Mg(OH)_2$ with water.	A temporary tank or existing tanks filled with water will be used for both the simulated "UNH tank and the Magnesium Hydroxide Supply tank. A series of Operations Work Instructions (OWI) will be used to cover all simulated operations.	103.1	4.0	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0032	The Southeast CD Blend tank (F2E-5) had filled to a level which was approaching overflow because of continued rainwater infiltration.	Existing valves and piping were used to gravity discharge approximately 3000 gallons of UNH solution from the Southeast CD Blend tank (F2E-5) to the empty Northwest CD Blend tank (F2E-7). Tank F2E-7 will now require processing.	DWG 92X-5900-F-00069	1.2.1 Table 2 Dwg 92X-5900 F-00069	Dwg 92X-5900-F-0069 5.1	NA	NA	NA Appendix A
95-0033	In the SAR, it is specified that the Training and Qualification requirements for the UNH project that the Plant 2/3 Facility Owners will be qualified by the use of a Qualification Card.	The project training and qualification plan does not include a Qualification Card for this position since this is a management position covered under requirements for management and technical support staff. This discrepancy is not considered a significant change to the procedures described in the SAR/TSR.	3.3, 5.4, 7.4, 8.6, 11.3, 11.5, 12.4, 14.3.2, 15.4.10 TSR - 5.4	NA	NA	NA	NA	NA
95-0034	UNH procedure 02-C-308 addresses the actions to take if electrical power, process water, or the air supply is lost.	UNH procedures 02-C-800 & 802 supersede UNH procedure 02-C-308. These new procedures explicitly address the actions to take on loss of power and air. The procedures do not explicitly address the loss of process water since this action only interrupts the procedure and prevents the procedure from being executed. The loss of process water is covered under the procedure compliance rules in the Facility Owner Standing Orders (M-115) and, therefore, is not a significant change to procedures described in the SAR.	2.3, 2.5, 2.6, 2.7, 2.8, 2.11, 3.3.2.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	NA	NA	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0035	UNH procedures 02-C-308, 02-C-608/609 were written to aid in the transfer of MDU slurry from Plant 2/3 to the filter feed tanks in Plant 8.	UNH procedures 02-C-801 & 803 supersede UNH procedures 02-C-308 and 02-C-608/609. These new procedures explicitly address the actions to take on loss of power and air. The procedures do not explicitly address the loss of process water since this action only interrupts the procedure and prevents the procedure from being executed. The loss of process water is covered under the procedure compliance rules in the Facility Owner Standing Orders (M-115) and, therefore, is not a significant change to procedures described in the SAR.		NA	NA	NA	NA	NA
95-0036	UNH procedure 02-C-308 was written to provide instructions for transfer, dilution, and rinsing of UNH tanks D1-10, F2E-6(NE), F1-2, and F1-25 in Plant 2/3.	UNH procedures 02-C-804/805/806/807 supersede UNH procedure 02-C-308. The new procedures are typical of the remaining UNH transfer procedures described in the SAR.	2.3, 2.5, 2.6, 2.7, 2.8, 2.11, 3.3.2.3, 5, 11.5, 12.3.1, 17.2.2	NA	NA	NA	NA	NA
95-0037	Temperature elements for tanks D1-10 and F1-1 are located in the existing manways.	ECN-UNH-028 requested that the temperature elements for each tank be moved from the manways to an existing nozzle. Also, if nozzles for tanks F2E-7, D1-2, and F1-2 could be selected for temperature element and a level transmitter. The ECN was approved.	DWG 92X-5900-P-00063	NA	NA	NA	NA	NA

000027

7112

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0038	UNH transfer pumps J-101/102/103/104/105/106 low pressure trip does not allow the pumps to continue operating since the discharge pressure stays below the alarm set point.	ECN-UNH-029 proposed to install a one-inch orifice plate into the discharge line of pumps J-101/104/105. An orifice plate was also installed in the recirculation line of pumps J-102 and J-103. An orifice plate would not work on pump J-106, therefore, the low pressure trip setpoint has been lowered to 1 psig to prevent inadvertent trips. However, this has effectively defeated the low pressure protection of the pump, therefore operations must take precautions to ensure pump J-106 is not run dry.	2.5.1.3	NA	NR	4.6 4.8	3.4.2 3.4.5 3.4.8 4.2.1	NA
95-0039	The back flow preventer (V-128) in line TW-3"-A-2400-ET was used to preclude any contamination of the process water system. Process water flows through the back-flow preventer to the dilution water heater (C-101), then to the dilution/neutralization tanks F1-25 and F1-26. Filtrate return line (FT-3"-A-2500-ST) returned filtrate from plant 8 and was connected to line TW-3"-A-2400-ET between the back-flow preventer and the dilution water heater.	ECN-UNH-032 proposes the removal of back-flow prevent (V-128) from line TW-3"-A-2400-ET and replace it with a spool piece. The filtrate return line has been isolated and abandoned in place by removing valves and installing blanks at either end of the line. Since the filtrate line has been abandoned, the back-flow preventer is no longer required.	DWG 92X-5900-P-00063 & 92X-5900-N-00074	NA	NR	NA	NA	NA
95-0040	In the SAR the mitigator for the event/hazard "Transfer of UNH solution to plant 8" is the installation of a line to return off spec. material to tanks F1-25 or F1-26.	The installation of the line to return off spec. material never happened. Therefore, this particular mitigator needs to be deleted from Appendix C of the SAR.	Appendix C, table C-1, number 1.10, item C	2.1.4	NR	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0041	UNH procedures 08-C-608/609 were written with reference to double diaphragm pumps.	The proposed revision of these procedures incorporated the latest system changes including the progressive cavity pumps, new valves, and new instrumentation.	2.3, 2.5-2.8, 2.11, 3.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	NA	NR	NA	NA	NA
95-0042	UNH Transfer procedures 02-C-804/805/806/807	The UNH transfer procedures were revised to eliminate flush of UNH transfer lines and pump if tank is not completely drained during batch transfers; minor editorial changes to update valve lineups; to clarify requirements to sample any crystals remaining in the empty & rinsed UNH tanks.	2.3, 2.5-2.8, 2.11, 3.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	NA	NR	NA	NA	NA
95-0043	SAR UNH Process Flow Diagram	ECN-UNH-035 addresses all changes to the PFD since the initial Rev. O release.	2.5, 2.6	Dwg. 92X-5900-F-00069	NR	Dwg. 92X-5900-F-00069	Dwg. 92X-5900-F-00069	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0044	UNH Neutralization Procedures 02-C-800 & 802	Revisions to the UNH neutralization procedures were necessary to re-structure prerequisites and restoration of separate neutralization and recirculation operations; revise valve number for temporary valve TUNH-100; eliminate initial suction line fill since line will remain full; eliminate QA verification of chemistry; Revised sampling steps to obtain a more representative sample; added steps to log temperatures after adding MgOH; added steps to place system in standby and to unlock rotor of pump; input minor editorial changes	2.3, 2.5-2.8, 2.11, 3.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	NA	NR	NA	NA	NA
95-0045	UNH Procedure 02-C-807, Transfer & Dilution of UNH From Tank F1-25 Using Pump J-103	Technical Change Notices were written for this procedure to allow for valve UNH-290 to be opened and then closed to allow an additional flow path from the bottom of F1-25. This is a one time change for the first transfer from F1-25.	2.3, 2.5-2.8, 2.11, 3.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	NA	NR	NA	NA	NA
95-0046	UNH Procedure OWI-95-05, Transfer of MDU Slurry From Tank F1-25 or F1-26	This new procedure was issued to allow additional dilution water to be added to the remaining contents in tank F1-26.	2.3, 2.5-2.8, 2.11, 3.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	NA	NR	NA	NA	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0047	UNH Procedure 02-C-800, UNH Neutralization in Tank F1-26	A TCN was issued for this procedure to allow for the addition of dilution water to the MDU slurry.	2.3, 2.5-2.8, 2.11, 3.3, 5, 11.5, 12.3.1, 17.2.2, App. C, App. D	2.1.3	NR	NA	NA	NA
95-0048	TSR required that all MDU slurry have a pH of 7 before transfer to plant 8.	The proposed change would allow the transfer of MDU slurry to plant 8 that has a pH value of $6 < pH < 9$. This is acceptable criteria for transfer to Plant 8.	2.6.6	2.1.3	NR	2.3 3.0	3.2.3	NA
95-0049	Temperature requirements for UNH neutralization process	UNH project management/operations has proposed a SAR change involving the statement that UNH liquid temperature is controlled to less than 130 degrees F to minimize formation and emissions of NO_x. This proposed change would eliminate from the SAR any reference to specific neutralization temperature limits.	2.3.5, Item 1.04 of Table C-1	2.1.3	NR	NA	4.1	NA
95-0050	The pH interlock and alarm were intended to provide a secondary means of preventing the addition of too much MgOH.	ECN-UNH-039 proposes the removal of the pH interlock and alarm for pump J-106. The applicable pH instrumentation is so unreliable that an alarm may be given even though the pH is considerably below the setpoint. Therefore, the pump pH interlock and alarm are ineffective and should not be used.	11.5.6, DWG 92X-5900-P-00063, 92X-5900-N-00075	2.1.3	NR	2.3	3.4.4	NA

I. USQD ITEMS

USQD NUMBER	ORIGINAL DESIGN	BRIEF DESCRIPTION OF DESIGN CHANGE	AFFECTED DOCUMENTS					
			SAR, Section	RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
95-0051	Level Transmitters LT-101 and LT-105	ECN-UNH-040 proposes to eliminate the use of these level transmitters in the UNH storage tanks. The basis for the design change is that the UNH storage tanks will only be pumped out of and not into.	2.5.1.5, 11.5.2, DWG 92X-5900-P-00063 & 92X-5900-N-00074	NA	NR	4.1	3.4.1 4.2.1	NA
95-0052	Temperature Elements TE-101/A/B/C	ECN-UNH-038 proposes to eliminate the use of these temperature elements in the UNH storage tanks. The basis for the design change is that the UNH storage tanks will not be heated and seasonal climatic conditions are not expected to significantly affect the contents of the tanks.	2.5.1.5, DWG 92X-5900-P-00063 & 92X-5900-N-00074	2.3.2	NR	4.1	3.4.1	NA
95-0053	Addition of Lime to MDU Slurry	The UNH Neutralization Project has proposed the addition of Lime to the MDU slurry prior to transfer to Plant 8. The MDU slurry has a pH of approximately 5.5. The MDU slurry, because of its large volume is difficult to raise above 7 without an over consumption of MgOH. Lime is a reagent with a higher solubility and will raise the pH above 7.	2.3.5	2.1 2.1.3 2.3.1	NR	2.3	3.1 3.2.3	NA

II. DESIGN CLARIFICATION

NUMBER	ORIGINAL STATEMENT	BRIEF DESCRIPTION OF DESIGN CLARIFICATION	AFFECTED DOCUMENT				
			RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
1	EIMCO filters will be operated per existing operation procedure #08-C-605	New procedures have been written. Procedure #08-C-608 addresses operation of the east EIMCO filter and #08-C-609 addresses operation of the west EIMCO filter.				X 3.3	
2	Rinse tank with Plant 8 filtrate	The procedures allow for rinse water to come from process water as well as Plant 8 filtrate.				X 3.3	
3	All piping to be heat traced	While heat tracing was originally installed for the project, the tracing was not reinstalled when recent system modifications were made. A letter from Engineering (RSO:FP:95-0106) explains that the UNH operation is expected to be completed before cold weather returns and, therefore the need to heat trace has been removed.				X 4.4.4 4.5.2	
4	Material in tanks is classified as RCRA hazardous waste due to toxicity characteristic resulting from the presence of two heavy metals (chromium and barium).	Table 2 actually shows that four metals are over RCRA limits (chromium, barium, mercury, and lead).	X 1.2.1				
5	Two samples will be taken from the filter cake for each batch. However, after the first 7 batches are processed, and a strong correlation is developed, sampling may be reduced.	Per agreement with U.S. EPA and Ohio EPA (Letter, DOE-0400-95), a minimum of 2 samples will be taken from each batch.	X 5.5				
6	Digestion Area of Plant 2/3 has adequate capacity to contain the largest inventory of UNH in the area.	The secondary containment area for Plant 2/3 digestion area and CD blend area were combined into a single containment area to address what was subsequently determined to be inadequate capacity in Plant 2/3 Digestion. This was documented in a transmittal to US EPA and Ohio EPA (DOE-0320-95).					X 4.0

II. DESIGN CLARIFICATION

NUMBER	ORIGINAL STATEMENT	BRIEF DESCRIPTION OF DESIGN CLARIFICATION	AFFECTED DOCUMENT				
			RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
7	In addition to HWMU inspections, RSO performs inspection of UNH tanks once during each 8 hour shift.	Per agreement with OEPA (Letter dated April 28, 1995), RSO will inspect tanks on only one shift.					X 3.0
8	Recycle from EIMCO's will be used to ensure feed tank full at all times	The flow from Pump J-104 to the EIMCO filters will be adjusted to keep the trough full, but not normally overflowing.				X 4.2.1	
9	Initially neutralize to pH ~ 5.5 and allow to stabilize while continuing to agitate.	MgO will be added based on the treatability study as previously discussed. No control exists to stop addition at pH 5.5.				X 3.3	
10	In a November 4, 1994 correspondence with OEPA (DOE-0157-95) a commitment was made on the sequence of processing tanks.	It is currently intended to begin processing with Tank F1-25 as originally planned (Section 2.1.1 of RAWP). Schedule of processing discussed with OEPA in November 1994 is no longer valid as tank leakage program has reduced leaks substantially and key concern is now to process UNH material as rapidly as possible. Freeing up Tank F1-25 to allow parallel processing meets this objective	OEPA Letter				
11	In a November 4, 1994 correspondence with OEPA (DOE-0157-95) weather restrictions on processing UNH were discussed.	Start of filtering has been delayed past winter weather next and completion of processing will occur before winter returns. Therefore, the need for a specific weather plan is considered unnecessary.	X OEPA Letter				
12	The pH system will be used to control the rate and quantity of Magnesium Hydroxide addition.	While the pH system is capable of controlling the rate of Magnesium Hydroxide addition, it is intended that the addition be at a manual rate set on the batch sheets.	X 3.1.1				

II. DESIGN CLARIFICATION

NUMBER	ORIGINAL STATEMENT	BRIEF DESCRIPTION OF DESIGN CLARIFICATION	AFFECTED DOCUMENT				
			RAWP Section	POA Sect.	C.P. Sect.	D.C. Sect.	T.F.C.P. Sect.
13	The project scope stated that nineteen tanks listed in Table 2 of the work plan would be processed using the methods described in the work plan.	Due to its organic content, Tank D1-7 will require a slightly different processing method than the other UNH tanks. D1-7 will require additional treatment prior to neutralization due to its uranium/organic/ water mixture and will be processed after neutralization of the other UNH tanks are completed. Details of the treatment to be employed for the contents of Tank D1-7 will be incorporated into an addendum to the work plan at a future date.	X 1.2				

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THORIUM NITRATE TANK T-2

PROJECT SPECIFIC PLAN

Resubmittal
August 1995

U.S. DEPARTMENT OF ENERGY

Thorium Nitrate Tank T-2
Project Specific Plan - Resubmittal
August 1995

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ATTACHMENTS

A Chem-Nuclear Systems, Inc., Thorium Nitrate Solidification Project Work Plan
B Chem-Nuclear Systems, Inc., Sampling Plan
C Detailed Project Milestones

ACRONYMS AND ABBREVIATIONS

ACA	Amended Consent Agreement
AEDO	Assistant Emergency Duty Officer
ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
BAT	Best Available Technology
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
cfm	cubic feet per minute
CNSI	Chem-Nuclear Systems, Incorporated
DOE	Department of Energy
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
g/l	grams per liter
g/ml	grams per milliliter
HEPA	High-Efficiency Particulate Air
HIC	High Integrity Container
HMI	Hazardous Material Inventory
HWMU	Hazardous Waste Management Unit
LLRW	Low-Level Radioactive Waste
MAR	Material at Risk
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goals
ml	milliliter
N	Normality
NaOH	Sodium Hydroxide
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NO_x	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OU	Operable Unit
pCi/l	pico Curies per liter
PPE	personal protective equipment
ppm	parts per million

PSP	Project Specific Plan
RA	Removal Action
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
SOP	Standard Operating Procedure
SPCC	Spill Prevention Control and Countermeasures
TBC	To-Be-Considered
TCLP	Toxicity Characteristic Leaching Procedure
TNSP	Thorium Nitrate Solidification Project
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound
WAC	Waste Acceptance Criteria
WWTS	Wastewater Treatment System

EXECUTIVE SUMMARY

The Amended Consent Agreement (ACA), as negotiated, requires DOE to submit an annual compendium of existing procedures and documentation for the Low-Level Radioactive Waste (LLRW) and Thorium Management Program, in lieu of a Removal Action Work Plan (RAWP). The Project Specific Plan (PSP) for the Thorium Nitrate Solidification Project (TNSP) supplements the contractor's work plans and will be submitted to fulfill this negotiated ACA requirement. This PSP describes the management of the TNSP as an action under Removal Action No. 9, Removal of Waste Inventories; demonstrates compliance with applicable portions of project management and system design requirements under DOE Orders 4700.1 and 6430.1A; and, provides a point of departure for organizations responsible for final system development, installation, and operation.

The objectives of the TNSP are to safely remove the thorium nitrate waste from Tank T-2, treat the waste for disposal, and decontaminate the tank to meet the substantive clean closure requirements for hazardous waste management units. Tank T-2 became a HWMU June 28, 1994.

Tank T-2 is an 8,000 gallon stainless steel tank, with approximately 6,500 gallons of thorium nitrate solution containing 374 grams per liter (g/l) thorium. It is mounted on a 1'10" thick concrete pad inside a containment area that has 2'3" concrete walls. The containment area is 28'(W) x 45'(L) and has a capacity of approximately 21,000 gallons. The primary threats from the thorium nitrate are the elevated levels of radioactivity, the presence of radon, and the corrosivity of the acid. Due to the time the thorium has been in Tank T-2, it is approaching secular equilibrium with its decay daughters. Tank T-2 is primarily a direct external radiation exposure hazard. Daily inspections and past spill reports show no evidence of leaks from Tank T-2.

Sampling of Tank T-2 occurred in January 1993 and January 1995. The 1993 results indicated that the tank contents exhibited the toxicity characteristics for cadmium and chromium, as well as the corrosivity characteristic. The 1995 sampling results indicated nitrate, plutonium,

thorium, and radium concentrations; that the thorium nitrate solution is homogeneous; and confirmed that there are no fissionable products. The 1995 analyses are sufficient to demonstrate that the TNSP can take place safely, with no potential for a nuclear criticality.

The current plan is to solidify the Tank T-2 thorium nitrate and rinseates in individual batches of approximately 250 gallons, using Chem-Nuclear Systems, Incorporated (CNSI), a Nuclear Regulatory Commission (NRC)-licensed contractor. Tank T-2 will then be decontaminated by rinsing to meet the Ohio Environmental Protection Agency (OEPA) Closure Standards, as specified in the OEPA 1993 Interim Final Closure Plan Review Guidance. Prior to disposal, the waste will be managed in accordance with Fernald Environmental Management Project (FEMP) procedures. The thorium nitrate and rinseate waste will be treated to remove the hazardous characteristics and to meet requirements for disposal at the Nevada Test Site (NTS). Field activities are currently planned to begin September 18, 1995, and be completed December 22, 1995 (Attachment C, Project Schedule Milestones). This schedule is based on encountering no technical or weather delays. If delays occur, the OEPA and U.S. EPA will be informed.

This TNSP will accomplish the clean closure performance standards in OAC 3745-66-11 (40 CFR 265.11) by identifying, isolating, removing, treating hazardous constituents present in Tank T-2, and decontaminating the tank.

1.0 INTRODUCTION

Removal Action (RA) No. 9, Removal of Waste Inventories, was identified in the Amended Consent Agreement (September 1991) to address inventories of thorium and low-level radioactive waste (LLRW) remaining at the Fernald Environmental Management Project (FEMP). LLRW includes wastes containing constituents regulated under the Resource Conservation and Recovery Act (RCRA), as amended, and the Ohio Environmental Protection Agency (OEPA) Hazardous Waste Management Program (references herein to RCRA shall also mean the OEPA Hazardous Waste Management Program). The Amended Consent Agreement, as negotiated, requires DOE to submit an annual compendium of existing procedures and documentation for the LLRW and Thorium Management Program, in lieu of a Removal Action Work Plan (RAWP). Additionally, Project Specific Plans (PSPs) for certain projects, including the Thorium Nitrate Solidification Project (TNSP), involving mixed waste treatment and disposition will be submitted as specified in Removal Action Memorandum Addendum No. 1 (March 10, 1995). The Thorium Nitrate Tank T-2, hazardous waste management unit (HWMU) No. 54, contains LLRW mixed waste and falls within the scope and administration of RA No. 9.

1.1 OBJECTIVES

The objectives of this Thorium Nitrate Tank T-2 PSP are to safely remove the waste from the tank, treat the waste for disposal, and decontaminate the tank to meet the clean closure requirements of the HWMU while maintaining radiation exposures to personnel As Low As Reasonably Achievable (ALARA).

1.2 BACKGROUND

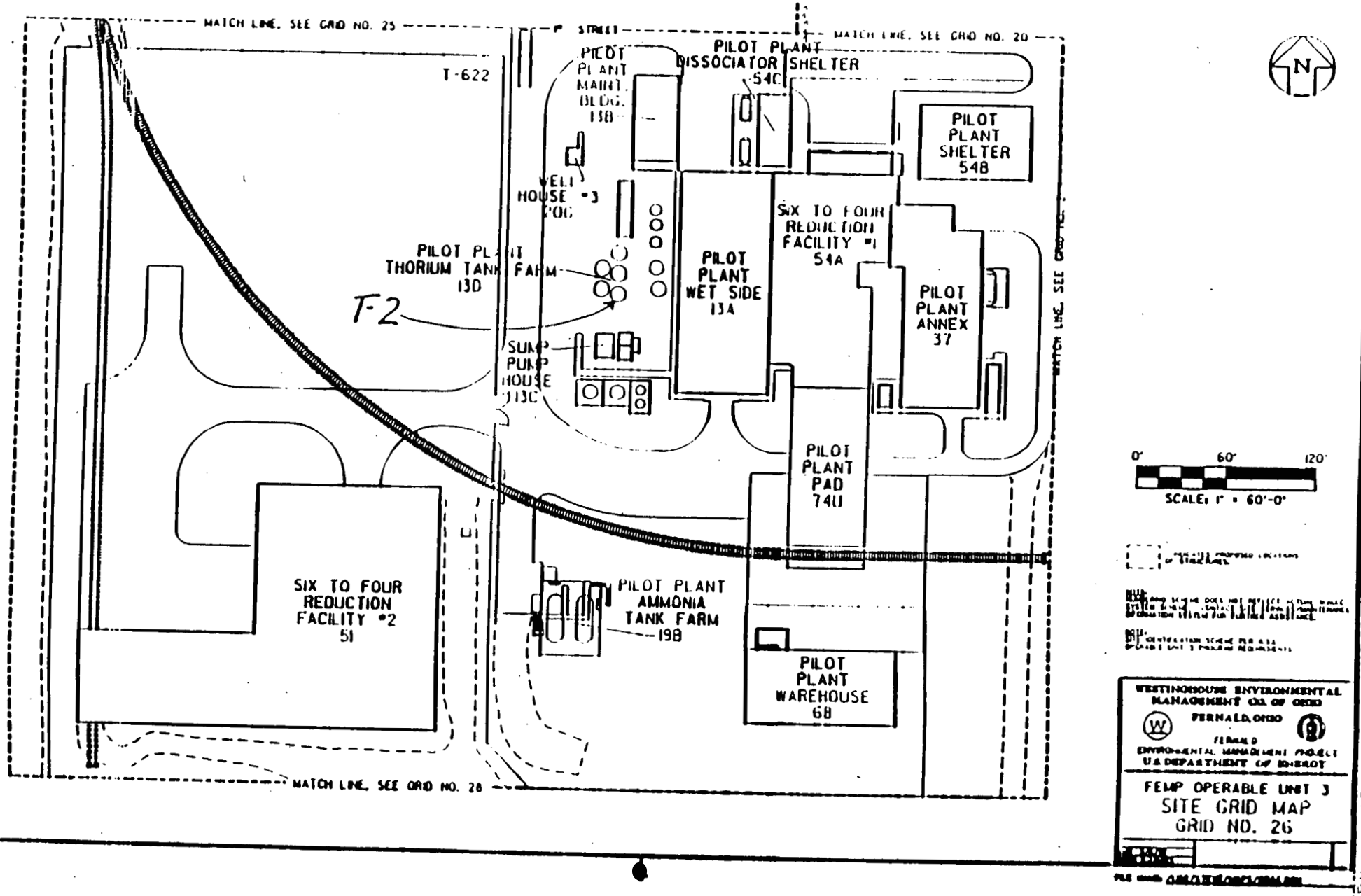
Tank T-2 is located in Operable Unit 3 (OU3) on the west side of the Pilot Plant (Figure 1-1). The thorium nitrate stored in Tank T-2 was received at the FEMP from off-site to be processed into thorium metal. The specific facility that generated the thorium nitrate stored in Tank T-2 cannot be identified from FEMP records. In 1989 it was determined that the thorium nitrate stored in Tank T-2 would not be processed into thorium metal.

Tank T-2 is a flat-bottomed stainless steel, 8,000 gallon tank measuring 10'(D) x 14'(H). Tank T-2 contains approximately 6,500 gallons of thorium nitrate waste containing 374 g/l thorium in 0.7 Normal nitric acid. There is no ancillary equipment, flanges, or piping associated with Tank T-2 as it had previously been isolated. The tank is mounted on a 1'10" thick concrete pad inside a containment area with 2'3" walls. The containment area is 28' (W) x 45' (L) and has a capacity of approximately 21,000 gallons (Figure 1-2). Tanks T-3, T-4, T-5, and Tank T-6 are also located inside this containment area. Access to the inside of Tank T-2 is by four ports on the top (9" diameter each) and a manway (22" diameter). Approximately 6" above the ground, at the base of Tank T-2, is a 6" side discharge. The total height of material in Tank T-2 is approximately 11 feet.

Due to the time the thorium has been in Tank T-2, it is approaching secular equilibrium with its decay daughters (Table 1-1). These decay products increase the dose rate emitted from Tank T-2. The thorium nitrate is suspected to exhibit the toxicity characteristic for chromium (D007), cadmium (D006), and is classified as corrosive (D002) under RCRA. The chromium and cadmium concentrations reported in Table 1-1 may be falsely elevated due to laboratory difficulty in analyzing trace metal in high thorium concentration solutions.

In November 1993, Tank T-2 underwent ultrasonic thickness testing and visual inspection. Although Tank T-2's original shell thickness is not available, test results show that Tank T-2 is structurally sound. Visual examination and review of FEMP spill reports indicate no evidence of leaks from Tank T-2. Tank T-2 is inspected daily. Sampling of Tank T-2 occurred in January 1993 and 1995. The isotopic thorium and RCRA Toxicity Characteristic Leaching Procedure (TCLP) metal data from the January 1993 sampling of Tank T-2 is in Table 1-1. These constituents were not reanalyzed in 1995. In 1995, a 16-ounce surface sample (grab) was collected using a peristaltic pump and screened for volatile organic compounds (VOCs). As anticipated by process knowledge, red oil screens indicated no organics present in Tank T-2. Also, five one-gallon treatability samples and five 16-ounce characterization samples were collected from incremental depths (1', 3.25', 5.5', 7.75', and 10') within the tank contents. The five 16-ounce samples were collected using a peristaltic pump and Tygon tubing and analyzed for total thorium and density, and also confirmed that the tank's contents were homogeneous and

not stratified. A composite sample was prepared from the five depth samples and analyzed for isotopic uranium, isotopic plutonium, isotopic radium (fissionable radionuclides), Normality, pH, and nitrates. Percent acid was calculated from Normality. There is no potential for a nuclear criticality. Analytical results from the two analyses are sufficient to demonstrate that the TNSP can take place in a safe manner.



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Pilot Plant

Figure 1-2 Diagram of Tank T-2

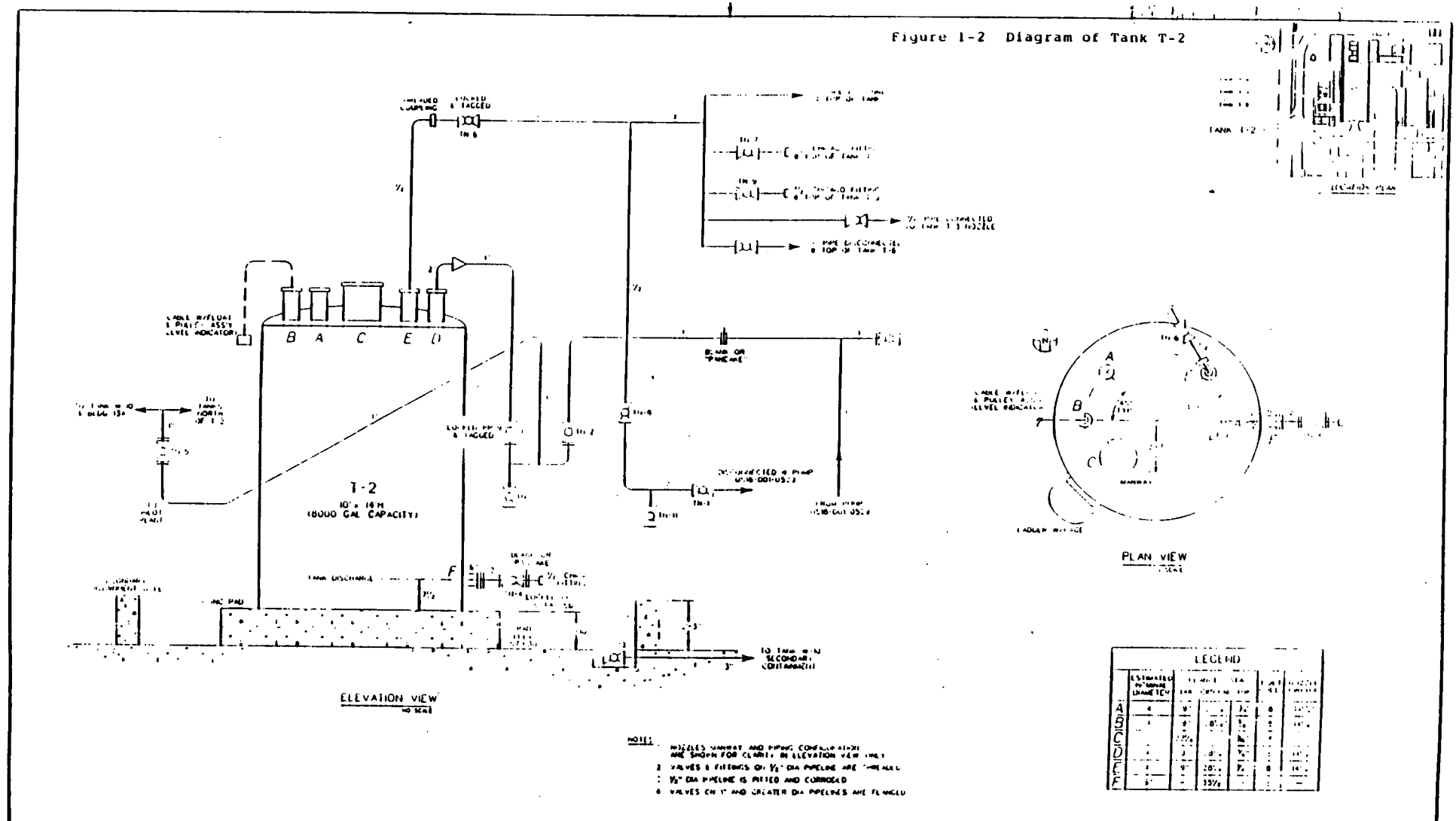

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Table 1-1

Thorium Nitrate Data Summary
Tank T-2 Contents

Chemical Analysis

Analyte	Results	Units	Notes
Matrix			Liquid
pH	<1		
Normality	0.72	N	
% Acid	2.73	w/w	Nitric Acid Basis
Nitrates	463	g/l	Volumetric Method
Density @ 20 C	1.661	g/ml	
Cadmium+	1.42	ppm	Suspect
Chromium+	3.77	ppm	Suspect

Measured Tank T-2 Radioisotopic Inventory

Isotope	Concentration (Lab Analysis)	Units	Tank Inventory (Ci)
Uranium 232	1.30E+04	pCi/l	0.000
Uranium 233	1.40E+06	pCi/l	0.034
Uranium 234	1.40E+06	pCi/l	0.034
Uranium 235	260	pCi/l	0.000
Uranium 236	410	pCi/l	0.000
Uranium 238	4700	pCi/l	0.000
Thorium 232+	4.10E+07	pCi/l	1.010
Thorium 230+	1.05E+07	pCi/l	0.257
Thorium 228+	3.75E+07	pCi/l	0.924
Total Thorium	373.9	g/l	N/A
Plutonium 238	7.10E+06	pCi/l	0.175
Plutonium 239	5.50E+05	pCi/l	0.014
Radium 226	7.20E+04	pCi/l	0.002
Radium 228	3.50E+07	pCi/l	0.862
Potassium 40	<1700	pCi/l	0.000
Cesium 137	<130	pCi/l	0.000
Neptunium 237	<190	pCi/l	0.000
Manganese 54	<140	pCi/l	0.000
Antimony 125	<300	pCi/l	0.000
Cesium 134	<110	pCi/l	0.000
Cobalt 60	<180	pCi/l	0.000
Zinc 65	<330	pCi/l	0.000
Ruthenium 106	<1100	pCi/l	0.000
Barium 133	<130	pCi/l	0.000
Cobalt 57	<67	pCi/l	0.000
Cesium 144	<520	pCi/l	0.000
Measured Activity			3.313

+ Analysis Performed in January 1993
Theoretical Thorium - 232 decay products in the 6500 Gallons in Tank T-2

Decay Daughter	(pCi/l)	Acitivity in T-2 (Ci)
Actinium - 228	3.50E+07	0.862
Radium 224	3.21E+07	0.791
Radon - 220	3.21E+07	0.791
Polonium - 216	3.21E+07	0.791
Lead - 212	3.21E+07	0.791
Bismuth - 212	3.21E+07	0.791
Thallium - 208	1.15E+07	0.283
Polonium - 212	2.06E+07	0.507
Sum of Daughter Activities		5.607

Note: ** Theoretical decay daughter information obtained using "RadDecay 3.01" program. Assuming the thorium nitrate has not been processed for 16 years.

2.0 NEUTRALIZATION AND SOLIDIFICATION PROCESS

2.1 SOLIDIFICATION BENCH-SCALE TESTING

Bench-scale testing of the thorium nitrate was performed in May 1995 by Chem-Nuclear Systems, Inc. (CNSI) to determine a suitable slurry recipe that would stay workable in the mixing equipment, cure to a hard waste product, and pass TCLP. The final waste form was designed to meet the Nevada Test Site (NTS) Waste Acceptance Criteria (WAC). Fernald Environmental Restoration Management Corporation (FERMCO) provided CNSI with two 500 milliliter (ml) composite samples of thorium nitrate from Tank T-2 to complete the bench-scale testing.

Bench-scale testing consisted of adding various types and ratios of solidification additives to 50 ml samples of thorium nitrate. Twelve different mix blends were tested. The parameters monitored were pH, temperature, and density. Testing determined that the T-2 thorium nitrate pH needed to be raised to a minimum of 3.0 to prevent damage to the steel components of the cement mixing system. Once the sample pH was raised to approximately pH 2, monitoring was discontinued. The heat generated by the various neutralization reactions increased temperature in each test by approximately 50-60° F. Solidified samples were sealed and placed in an oven at 150° F for several days of cure. These conditions simulated the expected heat effects in larger masses of actual product. The densities of the test solidification final products ranged from 56.1 lb/ft^3 to 124.1 lb/ft^3.

Based on the bench-scale tests, the optimal mix contained approximately 22 gallons of thorium nitrate, weighing approximately 305 pounds; 18 gallons of 25% sodium hydroxide (NaOH), weighing 190 pounds; and, 190 pounds of the solidification additive (60% Portland cement/40% fly ash). These materials will produce one full 55-gallon drum of solidified waste with a net weight of approximately 685 pounds.

Prior to full scale operations, the bench-scale test "recipe" will be verified in the field to ensure that the field parameters match those found in the laboratory. Approximately 310 drums of

solidified waste will be produced from the TNSP including the equipment decontamination and flush rinse water.

2.2 PROCESS EQUIPMENT

The thorium nitrate and rinseates from Tank T-2 will be solidified, in individual batches of approximately 250 gallons each, by CNSI, a Nuclear Regulatory Commission (NRC)-licensed contractor. Processing will be conducted in accordance with CNSI's NRC license and DOE Orders.

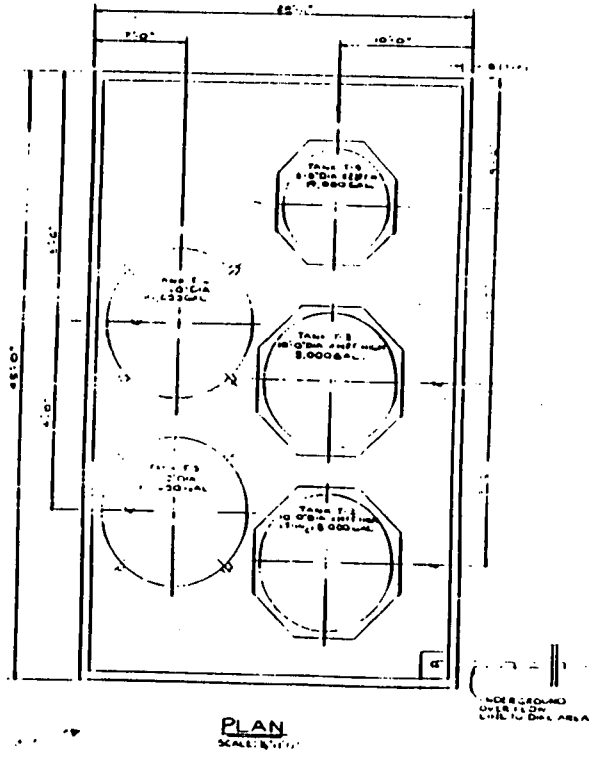
The solidification process tanks and equipment are described in Table 2-1. Transfer components required by the TNSP are within secondary containment that would contain any accidental release to a collection point within existing diked containment areas (Figure 2-1). Figure 2-2 shows the anticipated layout of the equipment at the FEMP. This layout is proposed and may require some modification to accommodate actual field conditions.

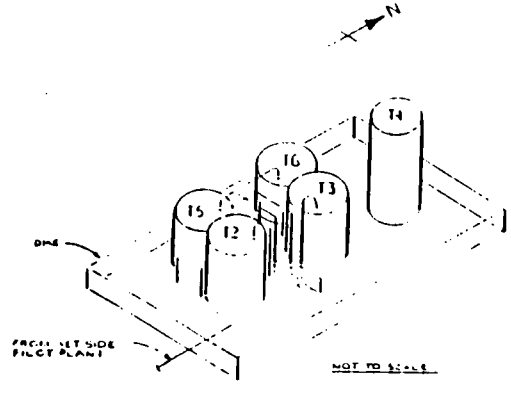
Table 2-1 Primary Thorium Nitrate Solidification Components

Item	Component (quantity)	Notes
1	Neutralization Tank (2)	The neutralization tank is a polyethylene high integrity container (HIC) with a nominal capacity of 600 gallons. The tanks are used to contain and partially neutralize 250 gallon batches of thorium nitrate. Each tank is equipped with a mixer, waste inlet, waste discharge, caustic inlet, temperature probe, level probe, and vent connection.
2	Neutralization Tank Secondary Containment (2)	A stainless steel secondary containment tank with an open top is provided for each HIC. It is slightly larger and has 110% of the nominal capacity of the HIC. The HIC is placed inside the secondary containment so that it "lines" the stainless steel tank.

Item	Component (quantity)	Notes
3	Thorium Nitrate (TN) Transfer Hose	The transfer hose is chemical resistant. Portions of the hoses and connections that are not within secondary containment (i.e., a diked area) will be provided secondary containment by placing the hose within CPVC pipe. The secondary containment will contain spills and sprays and direct them to a contained collection point.
4	TN Transfer Pumps (2)	The waste transfer pumps are 2" air-operated, double-diaphragm pumps. One pump transfers thorium nitrate from Tank T-2 to the neutralization tanks. The other pump transfers neutralized thorium nitrate to drums at the dry chemical mixing station.
5	NaOH Addition Pump (1)	The NaOH addition pump is a centrifugal pump with a variable speed electric drive to control flow rate.
6	Chiller and Pump (1)	A chiller is installed in a recirculation loop with the neutralization tanks to cool neutralized thorium nitrate, if necessary, prior to transferring to the drums.
7	NaOH Bulk Storage Trailer and Transfer Hose (1)	The 25% liquid NaOH will arrive in, and be transferred from, a bulk supply tanker located in a bermed area established near the solidification process area. NaOH is transferred to the batch neutralization tank via the NaOH transfer pump and chemical resistant hose. Hose that is not within the diked area will be run through CPVC to provide secondary containment.
8	Solidification Dry Chemical Transfer System (1)	The dry chemical (P-40) is a blend of 60% portland cement and 40% fly ash. The addition system includes a hopper with an attached enclosed screw conveyor to mitigate dust emissions leading to the drum filler head.
9	Drip Pans (3)	Drip pans will be located beneath the neutralized waste transfer pump, the chiller, and recirculating pump and the valve manifolds to provide adequate secondary containment for this equipment.

Item	Component (quantity)	Notes
10	Drum Mixer Head (1)	The drum mixer head is a drum lid sized platform with a mixer unit, thorium nitrate addition nozzle, P-40 addition nozzle, and exhaust vent. The head is lowered and raised by a hydraulic lift. The mixing blades are disposable and are left in the drum after mixing the waste and solidification chemicals.
11	55-gallon drums	The 55-gallon drum is the final storage and disposal container. The process uses in-container mixing to ensure proper mixing and set-up of the concrete.
12	Exhaust System (1)	A HEPA exhaust system will ventilate the drum filling station tent and drum filler head. The system will provide approximately 60 air changes per hour.
13	Mixing and Drumming Station (1)	A small temporary tent structure is erected over the drum filling area to provide containment of any emissions. The tent is maintained under negative pressure by the HEPA exhaust system and contains vestibules for drum entry/exit and changing PPE. Secondary containment will be provided for the drumming and mixing stations.
14	Conveyor System (1)	A conveyor is used to move empty drums to the filling area and full drums out to the staging area.
15	Flush Tanks (2)	Two tanks will hold process water that will be used to aid in the flushing of process components.
16	Compressed Air Equipment	A cascade breathing air system, consisting of one large manifold and four small manifolds, will be set up within the process control area.
17	Secondary Containment	All process system piping will have secondary containment that will drain into tank or pan containment.





WESTINGHOUSE MATLS. CO. OF OHIO
FERNALD, OHIO
FEED MATERIALS PRODUCTION CENTER
U.S. DEPARTMENT OF ENERGY

PILOT PLANT — OUTSIDE TANK AREA

THORIUM HOLD TANK
RETENTION DIKE
PLAN

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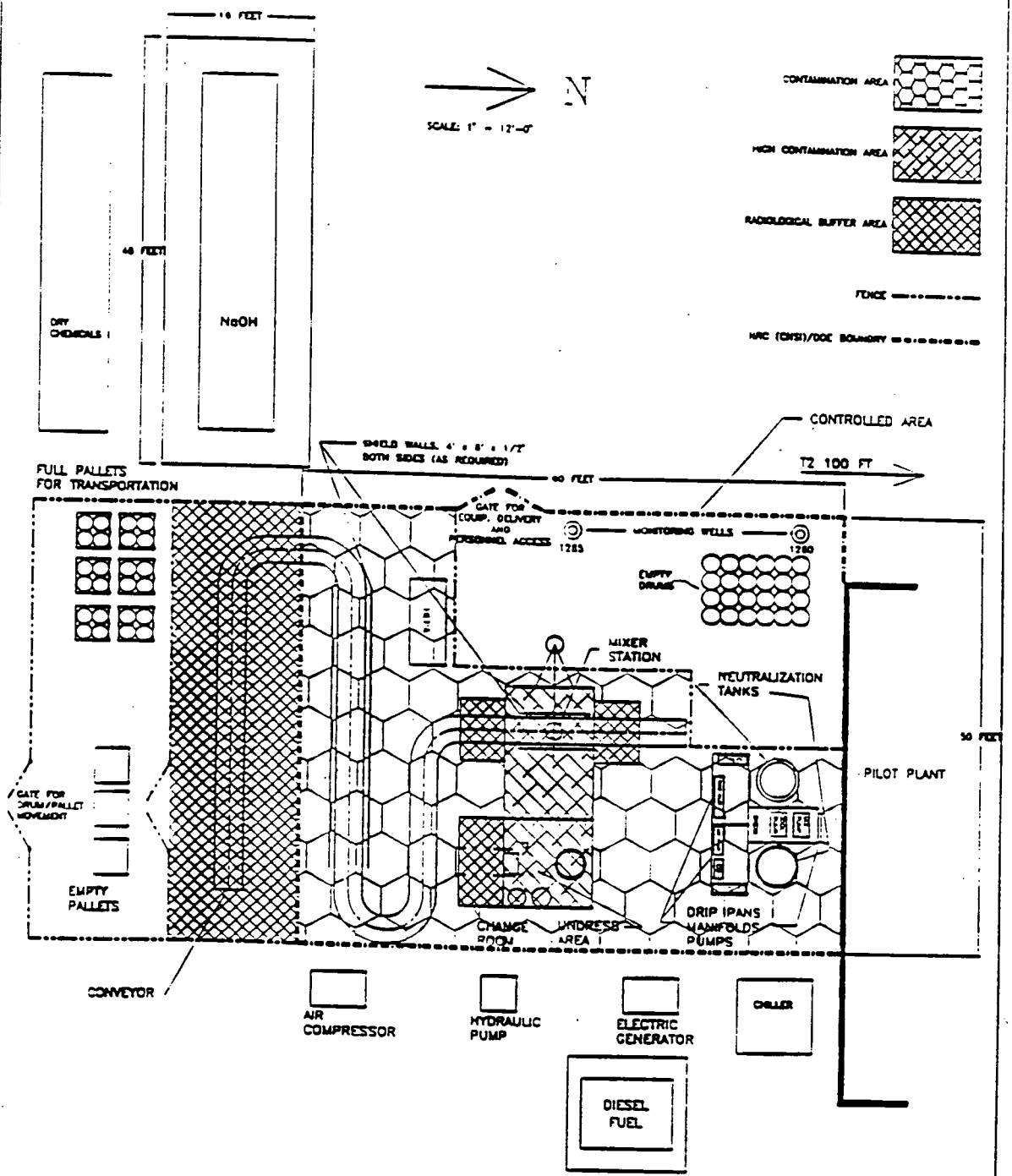
Figure 2-1 Solidification Project Equipment Layout



FERMCO SOLIDIFICATION PROJECT
EQUIPMENT LAYOUT

2.3 PROCESS DESCRIPTION

The thorium nitrate and rinseate from Tank T-2 will be solidified by CNSI, using individual batches of 250 gallons (Figure 2-3). The general process involves six steps:

- Thorium nitrate waste transfer to the batch neutralization tanks.
- Neutralization of the thorium nitrate waste.
- Chilling of the neutralized waste, if necessary.
- Transfer of the neutralized waste to 55-gallon drums.
- Addition and mixing of dry chemicals in a 55-gallon drum.
- Transfer of the drum of solidified waste to a staging area for curing.

Before completing full scale neutralization and solidification of the thorium nitrate, process control samples will be collected to ensure proper scale up. After the first batch of thorium nitrate has been transferred to one of the neutralization tanks, a sample of the liquid will be collected from a sample port on the tank. Slightly varying quantities of NaOH and solidification chemicals will be added to the samples to confirm and/or refine the chemical quantities established during bench-scale testing prior to full scale processing. This process will be completed every ten batches and before the rinseate is processed. The chemical quantities determined during this process control procedure will be used during actual solidification operations. Quantities described in this document are based on the bench-scale test and may vary during operations.

The major components of the solidification process are included in Table 2-1. Process control documents include a Work Plan, Sampling Plan, and Project Control Plan which contain the procedural, testing, sampling, monitoring, control, and data recording requirements.

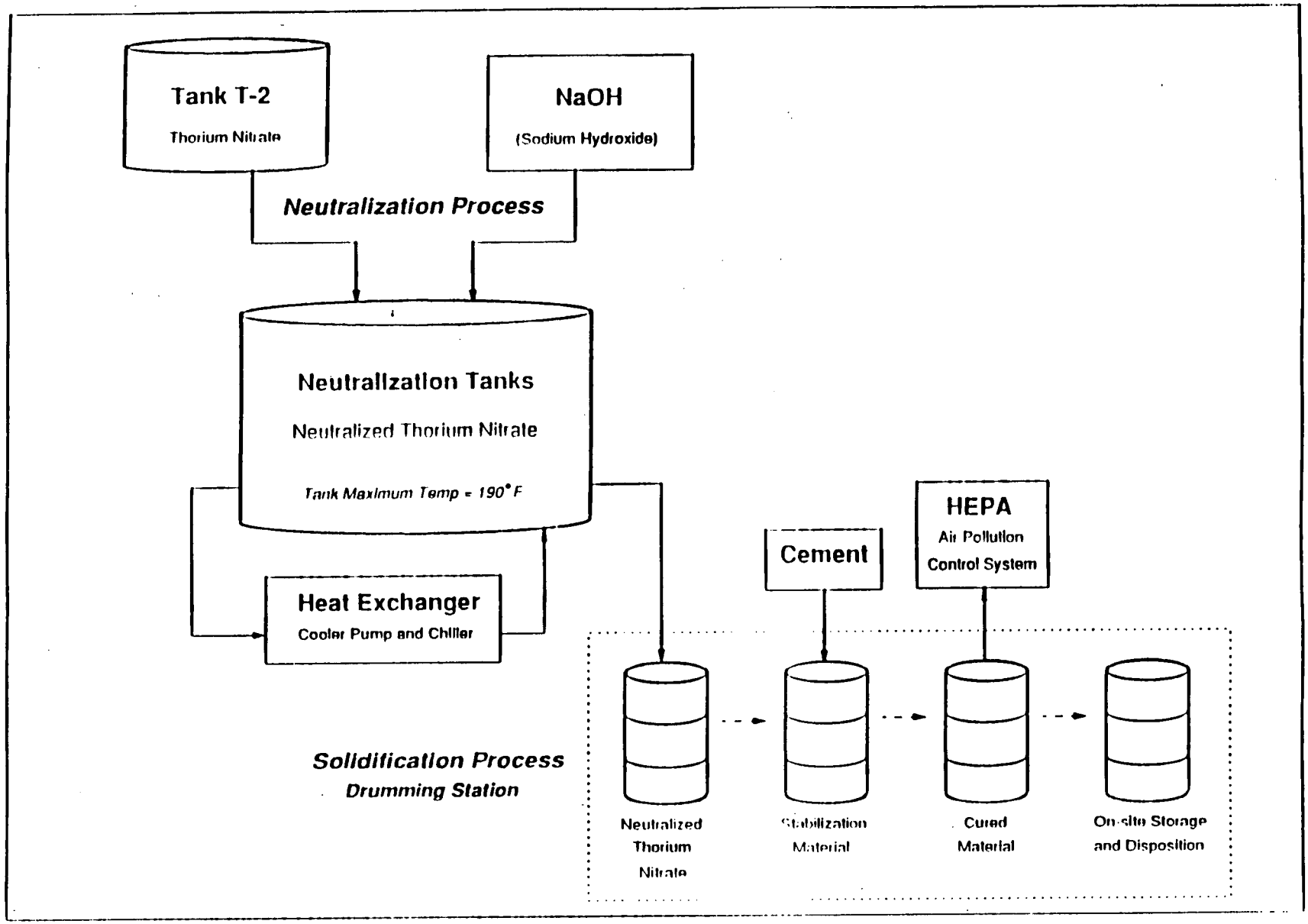


Figure 2-3 Thorium Nitrate - Neutralization and Solidification Process Schematic

2.3.1 Thorium Nitrate Transfer, Neutralization, and Chilling

The process equipment was pressure tested at the CNSI facility. All equipment that will contact thorium nitrate during this project is new and has been evaluated for compatibility with thorium nitrate. The equipment will be set up at FERMCO and water will be processed through the system to test for leaks. After the leak test has been completed, a system Readiness Assessment will be conducted prior to beginning thorium nitrate processing.

Approximately 250 gallons of thorium nitrate will be pumped from Tank T-2 to one of the neutralization tanks in the CNSI processing area. Before transfer, Tank T-2 will be recirculated approximately 30 minutes per 1,000 gallons of liquid remaining in Tank T-2 to ensure homogeneity. With the mixer operating, approximately 200 gallons of 25% NaOH are added to the neutralization tank to raise the pH above 3. A pH of 3 ensures there will be no damage to downstream process equipment. The NaOH addition pump has a variable speed drive to control the flow rate. If the pH is not greater than 3, the process is stopped the evaluate the problem. If the solution temperature during neutralization becomes greater than 110° F, the solution will be recirculated through a chiller until the temperature is less than 110° F.

2.3.2 Transfer of Neutralized Thorium Nitrate to the Drumming Station

A 55-gallon drum is placed in the drumming station and fitted with a drum fill head. The partially neutralized thorium nitrate, at a temperature less than 110° F, is transferred via chemical resistant hose and variable speed pump to the drum. The drumming station is enclosed by a temporary tent structure and maintained at a negative pressure by a HEPA exhaust system.

2.3.3 Addition and Mixing of Solidification Dry Chemicals

The fill head contains a mixing unit, dry chemical inlet, waste inlet, and ventilation outlet, which is connected to the HEPA exhaust system. The mixing unit is attached to a disposal shaft and mixing blades that will remain in the drum with the solidified material for disposal. With the mixer and ventilation system operating, approximately 190 pounds of dry chemicals are added

to the drum. The dry chemicals are supplied by an enclosed screw conveyor from a dry chemical hopper. The contents of the drum are mixed continuously during the addition of the dry chemicals and for a predetermined period after the dry chemical addition is complete. After mixing is complete, the drum fill head is removed and a curing lid is installed on the drum. The curing lid contains a probe to monitor the heat of the reaction. The filled drum is manually moved along the conveyor to the staging area where the slurried waste is allowed to cure. Another empty drum is manually moved along the conveyor and positioned under the fill head and the process is repeated until all thorium nitrate waste in the batch is mixed.

2.3.4 Transfer of Drums to the Staging Area

A curing lid will be placed on the drum when the fill head is removed. The curing lid consists of a modified shipping lid with a charcoal filtered vent to release the heat of the exothermic curing reaction. The filled drums of slurried waste are pushed along a conveyor to a staging area to cure for approximately 12 hours. The drums are weighed and then moved to an interim staging area and palletized. The drums will remain in this area for approximately three days (until the exothermic reaction has peaked), permanent shipping lids are installed, and the drums are moved to a longer term storage area.

2.3.5 Process System Decontamination

The neutralization and solidification process tank system will be decontaminated by flushing the system with water. The system flushing will ensure that there is no hold up material (thorium nitrate or neutralized thorium nitrate) remaining in the system. The system will be radiologically elevated to determine if the process piping and equipment may be used for other projects within the controlled area. The flush and rinse water will be managed through the system and solidified. Decontamination of Tank T-2 is addressed in Section 4.4.

2.3.6 Solidification Process Summary

Approximately 22 gallons of thorium nitrate weighing approximately 305 pounds, 18 gallons of

NaOH weighing 190 pounds, and 190 pounds of the solidification additive (60% Portland cement/40% fly ash) are required to produce one full 55-gallon drum of solidified waste with a net weight of less than 685 pounds. Drums will not be filled completely and the actual quantities will be slightly smaller for the field process. Approximately 310 total drums of solidified waste will be produced from the thorium nitrate and the associated rinse waters.

Prior to shipment off-site the solidified waste in drums (which will have tamper indicating devices) will be evaluated to determine whether the addition of absorbent material is appropriate.

2.4 PROCESS CONTROLS AND PARAMETERS

Both the neutralization and solidification reactions generate heat. With agitation and increase in temperature due to neutralization, there is a potential for generation of NO_x and the liberation of radon in solution with thorium nitrate. Process knowledge and laboratory testing has shown that NO_x generation due to heating is minimal below a solution temperature of 160° F. Minor heating and mixing will drive radon from solution during neutralization. The neutralization tanks (HICs) can contain a solution temperature of up to 190° F without damage. The temperature controls are discussed in Section 2.4.2. The minimal heat generated during cement curing will not damage the metal drums.

2.4.1 Maximum Thorium Nitrate Temperature

Bench-scale neutralization and solidification reactions resulted in a heat rise of approximately 25° F during neutralization and 25° F during solidification. For the full scale process, the initial thorium nitrate temperature and maximum temperature rise will depend on the weather conditions. The initial temperature is expected to be less than 75° F, the average daily temperature in Cincinnati during the anticipated processing time. The maximum heat rise during neutralization and solidification are anticipated to be slightly higher than the bench-scale processing because bench-scale tests were performed in a small container in a climate controlled lab. No localized heating or vigorous reactions were observed during the bench-scale tests when the thorium nitrate was rapidly neutralized.

Conservative temperature rise values of 40° F, 150% of the bench-scale test results, are estimated for both the neutralization and solidification reactions. Assuming a maximum initial temperature of 75° F, the temperature of the thorium nitrate after neutralization will be a maximum of 115° F, which is below the neutralization tank maximum rated temperature and the NO_x generation temperature limit. However, if the temperature exceeds 110° F the neutralized material will be chilled.

2.4.2 Temperature Control

A temperature limit of 110° F in the neutralization tanks prior to transfer to the 55-gallon drums has been set to ensure consistent operational performance. Temperature instrumentation will be installed on each tank. Due to mixing temperature gradients in the tanks should not occur. The final temperature of the thorium nitrate after neutralization may be less than 110° F, depending on the weather conditions. If the temperature exceeds 110° F, it will be cooled by recirculation through a chiller.

2.4.3 Neutralization Exhaust Ventilation

Mixing the thorium nitrate may produce NO_x and radon. NO_x has historically been generated during agitation of strong acid solutions and mixing will drive radon out of solution. NO_x generation will be minimal because of the low acid concentration and solution temperature. Radon is a decay product that will be present throughout the process, but emissions will be reduced as the waste solidifies. Radon will be released from the solution when thorium nitrate is transferred, agitated, or neutralized. It is anticipated that radon will also be generated during the neutralization because of the associated temperature and pH rise.

To reduce emissions to the environment and exposure to workers ALARA, the exhaust vents on the neutralization tanks are connected to a nozzle on Tank T-2. There is an activated charcoal filter on the pressure release vent line prior to atmospheric discharge. The tanks are sealed to minimize leakage around installed instrumentation and components. Air is exchanged among the head spaces of the tanks and any that is exhausted will pass through the charcoal filter,

trapping the radon. When processing is complete the charcoal filter can be allowed to set closed for 28 days (approximately seven times the longest radon isotope half-life). Radiological surveys and analytical results identified radon as the primary radiological constituent of concern, based on its concentration and its potential risk.

2.4.4 Solidification Exhaust Ventilation

A HEPA exhaust system provides negative pressure in the drum filling structure and exhausts the drum filling head. The HEPA filters will remove airborne particulate that may be generated during the mixing of the solidification additives. The HEPA exhaust system is capable of approximately 2,000 cubic feet per minute (cfm), approximately 60 air changes per hour for an area this size and will reduce the build-up of contaminants in the drum filling station. The air change rate is greater than the accepted rate of seven changes per hour for asbestos and is considered more than adequate for the process.

2.4.5 Backup Systems

If there is a threat of a neutralization tank failure, the process system design allows the thorium nitrate to be pumped to the other neutralization tank, if it is not currently in use, or the material may be pumped back into Tank T-2.

The secondary containment has the capacity to contain the full volume of the neutralization tanks in the event of high level indicator failure. In the event of a temperature instrument failure and high heat generation, the stainless steel encasing tank will support the neutralization tank.

3.0 HEALTH AND SAFETY

3.1 HAZARDOUS MATERIAL IDENTIFICATION

The hazardous materials involved in the process are thorium nitrate, solidification additive, and NaOH. Table 3-1, Hazardous Material Inventory (HMI) lists the hazardous materials and the maximum quantities present in the process. The following sections identify hazards associated with the materials.

Table 3-1 Hazardous Material Inventory

Hazardous Material	Quantity	Notes
Thorium Nitrate	6,500 gallons	T-2 inventory decreases as the process progresses.
Sodium Hydroxide	52,000 lbs 25% NaOH	Supplied by bulk trailer near process area.
Solidification Additive	57,000 lbs 60/40 (Portland cement/fly ash)	Supplied by bulk hopper near process area.

3.1.1 Thorium Nitrate

Thorium nitrate is a radiological and toxicological hazard. It is both an internal and external radiation hazard. Aerosols of thorium nitrate are a serious respiratory and mucous membrane hazard due to the nitric acid and internal radiation dose. Skin contact is a potential internal exposure pathway because of the acid effects on the skin. Serious burns are possible upon skin, eye, or mucous membrane contact. There is no potential for criticality because the total fissile material inventory in the tank is less than one gram.

3.1.1.1 Direct Radiation

The dose rate on contact with Tank T-2 is 35 millirem per hour (mrem/hr). The direct dose

rates on contact with the solidification process components, drummed waste, and for the spill scenario identified in the Hazard Categorization are bounded by the Tank T-2 dose rate. The dose rates and controls to maintain worker exposures ALARA will be included in the ALARA Plan and Review. The equipment layout in Figure 2-2 has been configured in accordance with the ALARA Plan and Review as an engineering control to reduce operator radiological exposures.

Radon

Radon is present in the thorium nitrate. Chronic radon exposure has been linked to an increase in lung disease. Radon is primarily an alpha emitter presenting an internal radiation exposure hazard. Workers will have respiratory protection and continuous exhaust ventilation, as required, to prevent inhalation of radon. The radon present in the thorium nitrate is composed of Radon-220 and Radon-222, with half-lives of less 56 seconds and 3.8 days, respectively.

NO_x Gas

NO_x gas is primarily an inhalation hazard and reacts with water to form nitric acid. NO_x can cause eye and mucous membrane irritation. There is a potential for generating NO_x during mixing or heating of strong nitric acid solutions. Since the thorium nitrate has a low concentration of acid and low maximum temperature during neutralization, minimal generation of NO_x is anticipated.

3.1.2 Sodium Hydroxide

A 25% solution of sodium hydroxide is used to raise the pH of thorium nitrate prior to solidification. Sodium hydroxide is a skin, eye, and mucous membrane irritant with the potential for causing serious burns with prolonged exposure.

3.1.3 Solidification Additive

The solidification additive is a premixed blend of approximately 60% Portland cement and 40%

fly ash. It is supplied in bulk and is transferred to a hopper. An enclosed screw conveyor transfers the material from the hopper to the process area.

3.2 HAZARDOUS CHEMICAL INTERACTIONS

A hazardous chemical interactions matrix was not prepared because of the limited number of reagents associated with the process. The National Fire Protection Association (NFPA) Manual of Hazardous Chemical Reactions and the Material Safety Data Sheets (MSDS) were used to determine if there were any hazardous reactions. The only potential hazardous interaction was an explosion hazard associated with mixing concentrated nitric acid with concentrated NaOH in a closed vessel. All vessels involved in the process are vented to prevent an explosion caused by an increase in pressure. Water can also react with either reagent to generate heat, but water is only used to rinse the tanks and there is no significant heat rise anticipated. Both the nitric acid constituent and the NaOH are relatively dilute and a significant heat rise from dilution or neutralization is not a hazard. There are no adverse reactions or potential for hazardous runaway reactions identified for the process.

3.3 COMPRESSED BREATHING AIR

CNSI will supply compressed air equipment to power air driven solidification components. Breathing air will be supplied from a breathing air truck.

3.4 RADIOLOGICAL PROTECTION

Radiological protection is addressed by the combination of the FERMCO Site Radiological Control Program and the CNSI Project Operational Radiological Control Plan. Additional radiologically controlled areas will be constructed within the FEMP process controlled area. CNSI's Operational Radiological Control Plan is specific to the processing area and incorporates applicable NRC and DOE radiological control requirements. The CNSI Plan addresses activities within the project processing boundary and implements the more restrictive of the NRC and DOE requirements to ensure compliance with both the DOE and NRC requirements. The site

radiological control program addresses the remainder of the activities outside the processing boundaries.

Protection from radiological hazards is accomplished by the use of shielding and other engineered controls, monitoring of the workers and work area, and the use of PPE. The Operational Radiological Control Plan contains the ALARA Review of the dose rates for each major task. Based on the ALARA analysis, the appropriate shielding will be determined and installed. The controls are administered through the Solidification Project Health and Safety Plan and FERMCO work permits. At least one Radiation Control Technician and Industrial Hygiene Technician will be available at all times during processing.

3.5 ALARA REVIEW

It is FERMCO policy to maintain occupational exposures to radiological and chemical hazards ALARA. An ALARA review was performed on the dose estimates for each major task. The review concluded that the expected dose for the TNSP is ALARA and no additional design or operational modifications are necessary. Shielding and ventilation were designed into the system at the conceptual phase and the ALARA review considered these controls along with the administrative controls associated with the process. The average total dose to the project worker is expected to be less than 100 mrem with the highest total dose less than 300 mrem.

3.6 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) will be worn as required by the applicable FERMCO Work Permit. The Work Permit PPE requirements consider both the Radiological Control and Industrial Hygiene requirements with the more stringent applied for the task.

3.7 SHIELDING

Shield walls will be erected in locations determined in the ALARA review. Shielding will be erected on each side of the drum filling station. Similar shielding will be erected along each side

of the conveyor where the drums are staged to cure.

4.0 WASTE MANAGEMENT

4.1 SAMPLING AND ANALYSIS

Sampling and analysis was performed for material characterization, bench-scale testing, and waste acceptance. Bench-scale testing was performed to determine the recipe that would produce a waste that remains workable during processing and cures to a RCRA nonhazardous waste. Waste acceptance testing was performed on the bench-scale solidified waste indicating that the process will not produce a RCRA hazardous waste. Further testing of the waste will be conducted during the solidification operations to ensure that the final product is consistent with the bench-scale results and meets the requirements for disposal at the NTS. Wastes generated from the process will be characterized in accordance with Site Standard Operating Procedure (SSOP)-0002. Samples of the solidified material will be collected from each thorium nitrate batch to verify that the solidified material is a nonhazardous waste.

4.1.1 WASTE ACCEPTANCE TESTING

Samples of the solidified material generated during the bench-scale testing were analyzed by using the TCLP to verify the solidified waste would not be RCRA hazardous waste and would be below the Universal Treatment Standards.

4.1.2 IN-PROCESS SAMPLING AND ANALYSIS

A sample from the first batch will be taken and mixed with the solidification additives to verify that the recipe is correct prior to solidification. This process will be repeated every tenth batch to verify the recipe remains correct. The pH of the neutralized thorium nitrate will be verified to have a pH above 3 prior to transfer to the drums. TCLP samples will be collected from each batch and analyzed to verify the final waste product is not a RCRA hazardous waste. The samples will be collected using pellet trays. The sampling procedure is provided in Attachment B.

4.1.3 DECONTAMINATION VERIFICATION RINSEATE SAMPLES

The Tank T-2 sample of rinse water will be collected after each decontamination effort, as described in the CNSI Sampling Plan, Attachment B. To ensure that a representative sample is obtained, it will be taken from a valve installed in the Tank T-2 recirculation line. The sample will be collected during recirculation of the rinseate in the tank.

Rinse water samples will be analyzed in the field for pH using SW-846, Method 9040. If the final decontamination rinseate field analysis shows that the rinse water pH is above 2. A sample will be sent to a laboratory for analysis as described in Section 4.4.

The process system will be flushed prior to dismantlement. The material will be managed as debris. Plans are currently being considered to reuse this system to the maximum extent possible to solidify other thorium contaminated liquids. Components that cannot be reused will be flushed in accordance with the work plan and managed as debris. Separate plans will be prepared if other treatment options are feasible. If not feasible, the system will be dismantled.

4.2 THORIUM CEMENT

Approximately 310 drums of solidified material will be produced from thorium nitrate. Approximately 40 drums of solidified material will be generated from processing of the rinseate water. The drums will be staged in an on-site storage area until they can be shipped to a disposal facility. Sampling and analysis plans have been prepared and will be implemented to verify the waste meets off-site disposal criteria.

4.3 INCIDENTAL WASTE

There will be no significant liquid waste stream, because rinse water will be solidified. Equipment used in the thorium nitrate solidification process that is not economically feasible to decontaminate and reuse, will be disposed of consistent with FEMP site procedures. Waste, such as, PPE, secondary containments, hoses, and other wastes generated throughout the

operations of the TNSP will be disposed of consistent with FEMP Site procedures.

4.4 DECONTAMINATION OF TANK T-2

After all the thorium nitrate is removed, Tank T-2 and its ancillary piping, which is only internal, will be decontaminated by rinsing with water to meet OEPA Closure Standards. OEPA 1993 Interim Final Closure Plan Review Guidance specifies that in order to achieve clean closure of a HWMU, hazardous waste residues will be removed to the maximum extent practicable and the following rinseate standards met:

(1) Fifteen times the public drinking water maximum contaminant level (MCL) for hazardous constituents as promulgated in 40 CFR 141.11 and OAC 3745-81-11 for inorganics;

(2) If an MCL is not available for a particular contaminant, then fifteen times the maximum contaminant level goal (MCLG) as promulgated in 40 CFR 141.50 shall be used as the clean standard. If the MCLG is zero, fifteen times the contaminant's practical quantitation limit in ground water will be used; or,

(3) If the product of fifteen times the MCL or MCLG exceeds 1 mg/l or if neither an MCL or MCLG is available for a particular contaminant, 1 mg/l shall be used as the clean standard.

The clean level for chromium is 1 part per million (ppm) and .075 ppm for cadmium. RCRA considers a pH of greater than 2 and less than or 12.5 noncorrosive for RCRA compliance (40 CFR 261.22(1)). Decontamination will be confirmed when analytical results of a sample from the decontamination waters indicate that these standards have been met. If analyses of the rinseate samples do not meet the standards for pH, cadmium, or chromium then additional rinsing will take place or an alternative decontamination procedures will be pursued.

Thorium nitrate is identified as being very soluble in cold water by the Handbook of Chemistry and Physics, Physical Constants of Inorganic Compounds (64th Edition, page B-149). A water

spray head will be inserted into the tank, and the entire inner surface of the tank will be rinsed with approximately 250 gallons of water. The rinse will be pumped from the tank to the neutralization tanks. This process will be repeated as necessary and a rinse sample will be taken to confirm that pH and RCRA metals have been removed and that the rinse water meets closure requirements. This rinse water will be processed through the CNSI equipment for solidification. No rinse water will be discharged to the FEMP Wastewater Treatment System (WWTS).

4.5 WASTE STREAMS AND SOURCES

Table 4-1 lists specific waste streams and their sources. The preliminary classification of all waste streams is nonhazardous, regulated, radiologically-contaminated material. The waste will be sampled to verify that the waste does not exhibit characteristics of hazardous waste. Periodic surveillances will be performed by Waste Program's Quality Assurance and managed in compliance with NVO-325, the NTS/FERMCO waste acceptance criteria, and evaluated to verify the waste sent to NTS is within the waste acceptance criteria and the FEMP application to NTS.

Table 4-1: Tank T-2 Waste Streams and Sources

Material	Source	Estimated Waste Volumes (cubic feet)	Disposition
Solidified Thorium Nitrate Acid	Tank T-2	2,294	NTS
Residues	Tank T-2 "heel" that is not pumped out	0	NTS
Tank	After the decontamination rinse, the tank will be removed as part of the CRU3 D&D process as part of the IROD.	0	NTS or on-site management

Tank Float	Inside Tank T-2	11.4	NTS or on-site management
Storm Water Run-off	Generated from precipitation. is collected. sampled. and treated through the FEMP WWTS.	0	Discharged in accordance with NPDES
Personnel Protective Equipment	Generated as part of the worker protection effort and managed as part of the FERMCO procedures.	300	NTS
Decontamination Water	Generated from the decontamination of equipment and tank. will be collected and solidified.	296	NTS
Air Pollution Control Equipment	Generated from the HEPA filters. activated carbon system. and other air pollution control activities.	164	NTS
Treatment Process Piping. Pumps. and Hoses	Decontaminate. if possible according to the PSP.	6,150	NTS or on-site management

4.6 SYSTEM DISMANTLEMENT

After clean closure of Tank T-2 has been verified and the clean rinseates solidified, the treatment system will be flushed and disassembled. Each component of the system will be flushed with water prior to disconnection. The cam lock hose fittings are equipped with internal valves, which seal the end of the hose during connection to prevent the release of liquid in the hose. The majority of the draining process is accomplished by disconnecting the hoses and "walking" the hose toward the process drum to drain the liquid into the drum. After draining, the hoses

and equipment are capped/plugged. The liquid in the drum is solidified as necessary during the draining process. The neutralization tanks will also be emptied and liquid residuals from the flushing process solidified. No free liquids are allowed for disposal, thus absorbent material will be added to waste containers if necessary.

4.7 WASTE MINIMIZATION

Numerous techniques to manage/minimize waste generated during the performance of the TNSP will be employed. The primary waste minimization techniques will be proper planning, waste segregation, and minimizing the amount of water used for decontamination including: a system design that minimized the length of piping/hose runs; minimized temporary pipe/hose connections; and selection of equipment with a minimum of potential leak points. Materials of construction selected for equipment are compatible with the fluid handled by the equipment. To the extent practical packaged materials will be unpacked prior to being transported into the controlled area. Every effort will be made to minimize the quantity of flush water used. Project personnel are trained in the methods/techniques to minimize unnecessary waste generation.

4.8 EMERGENCY PREPAREDNESS

FERMCO is responsible for off-normal occurrences and associated emergency action. Site emergency preparedness and spill response procedures will be followed in the event of a release or spill. In the event of an off-normal event or spill, FERMCO will take appropriate actions, with the input of CNSI, as directed by the Emergency Duty Officer (AEDO). As with all Department of Energy (DOE) facilities, security at the FEMP is strict. The entire FEMP processing area, which includes the TNSP area, is surrounded by chain link fencing and monitored by on-site security personnel. All employees and visitors enter through one of several guarded entrances into the administration and processing area.

CNSI personnel will be trained in the appropriate portions of the FEMP Emergency Plan, Hazardous Materials Spill Cleanup, the Spill Prevention Control and Countermeasures (SPCC) Plan, and Spill Incident Reporting and Cleanup.

4.9 ENVIRONMENTAL COMPLIANCE AND SPILL RESPONSE

The TNSP will accomplish the clean closure performance standards listed in OAC 3745-66-11 (40 CFR 265.11) by identifying, isolating, removing hazardous constituents present in Tank T-2, and decontaminating the tank.

The thorium nitrate treatment processing will be conducted in a fully enclosed system as described in Section 2. Tank T-2 is within secondary containment and secondary containment will be provided for the neutralization/solidification system. This removal action will not generate any run-off to surface water. Spill prevention and control measures will be employed during all project specific removal action operations, in accordance with FEMP procedures and the SPCC plan. Work areas will be prepared by spreading impermeable liners, and/or using diking to contain spills. Catch pans and basins will be used, as appropriate, for control and containment of decontamination solutions. Hoses are equipped with internal valves to prevent leakage during disconnection. Thorium nitrate treatment equipment and materials, that are not fully decontaminated will be containerized and managed as hazardous, radioactive, or mixed wastes.

No decontamination wastes from the TNSP will be processed through the FEMP WWTS. Decontamination wastes will be solidified and managed as low-level radioactive material. Collected stormwater will be managed through the Plant 8 WWTS.

4.10 APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS

Table 4-2 of this section identifies the Applicable or Relevant and Appropriate Requirements (ARARs) for this removal action. As a Comprehensive Environmental Response Compensation and Liability Act (CERCLA) removal action, the exemption from procedural requirements to obtain Federal, State, or local permits is applicable. This exemption is identified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300.400(e)), a To-Be-Considered (TBC) ARAR. Table 4-2 includes:

- Identification of permits that would otherwise be required:

- Identification of the standards, requirements, criteria, or limitations that would have to be met to obtain each permit; and,

- An explanation of how the response action will meet the standards, requirements, criteria, or limitations identified above.

In accordance with 40 CFR 300.400(g), CERCLA response actions must be consistent with all ARARs, including OEPA and U.S. EPA requirements for HWMU closures, corrective actions, and post-closure. Pursuant to the Amended Consent Agreement, the FEMP will:

- Characterize chemical and radiological contamination at the FEMP and establish site cleanup objectives.

- Conduct necessary short-term response actions to eliminate or minimize immediate threats to human health and environment.

- Implement any necessary long-term monitoring and surveillance of the facility and surrounding environment.

Representatives of the DOE and FERMCO will conduct inspections during the performance of this project to ensure that the actions performed are conducted consistent with the discussions in the PSP. The inspections will ensure that the equipment from Tank T-2 is properly cleaned and decontaminated and that all wastes resulting from this removal action are properly stored, labeled, and characterized.

Upon completion of the TNSP, a final report will be submitted to DOE, U.S. EPA, and OEPA describing how the removal action was completed and the objectives of the action met.

TABLE 4-2

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
40 CFR PART 61 - National Emission Standard for Hazardous Air Pollutants - (NESHAPS) (OAC 3745-17-07)	SUBPART H - SECTION 61.92. emissions of radionuclides (except radon-222 and radon-220) to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr. Pursuant to 40 CFR 61.07 and 61.96(b), an application for approval does not have to 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. Continuous emission monitoring is required under 40 CFR 61.93 (b) for stacks and vents which have the potential, under normal operating conditions, without benefit any emission control devices, to release radionuclides in sufficient quantity to cause an effective dose equivalent of 0.1 mrem/year or greater to any member of the public.	The dose resulting from the FEMP is reported to U.S. EPA on an annual basis. Emissions from this removal action will not result in the annual standard being exceeded. Radionuclide emissions from the TNSP are not expected to cause an EDE 0.1 mrem/year or above to any member of the public.
National Pollution Discharge Elimination System (NPDES) Permit - OEPA NPDES Permit No. 00000 4*DD (OAC 3745-33-05)	FEMP wastewater discharges must not cause a violation of effluent limits or loading rate at NPDES permitted outfalls. Discharges must also be conducted in accordance with the terms and conditions of the permit. This includes notification requirements under 40 CFR 122.42 for Clean Water Act (CWA) Section 307 toxic pollutants and State water quality standards established under OAC 3745-1.	The TNSP will meet limits imposed by the current NPDES permit. After review of the analytical data, stormwater associated with the proposed project will be treated at Plant 8 and the BDN Facility to ensure compliance with effluent limits and loading rates at NPDES permitted outfalls #4605 (BDN-ETS) and #4001 (MH-175) and applicable water quality standards.
Atomic Energy Act (10 CFR 835 (no OEPA equivalent)	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 Project Specific Health and Safety Plan.

TABLE 4-2

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

'ermit That Would 3e Required	Permit Requirements (ARARs)	Compliance Plan
ıir Pollution Control)AC 3745)	PERMITS TO INSTALL - OAC 3745-31-05 (A): 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 to control emissions. PERMITS TO OPERATE - OAC 3745-35-02 (C) - The solidification equipment must be operated in compliance with applicable air pollution control law; must be constructed, located or installed in compliance with the Terms and Conditions of a Permit To Install; and must not violate National Emission Standards for Hazardous Air Pollutants adopted by the Administrator of the EPA.	The thorium nitrate tank will not interfere with the attainment or maintenance of any applicable air quality standards or cause a violation of any applicable laws. Best Available Technology (BAT) will be implemented to control emissions. The tank will be operated in compliance with applicable air pollution control laws and will not violate National Emissions Standards for Hazardous Air Pollutants.
ıte Drinking Water ct (42 USC 300G; L 93-523)	National Primary Drinking Water Regulations (40 CFR 141)	Compliance will be demonstrated by sitewide environmental monitoring, including air, soil, and groundwater. Reports summarizing the sitewide monitoring results will be submitted to the EPA. Surface water discharges will be in accordance with the site NPDES permit and are not expected to impact groundwater. Engineering controls and best management practices will be used to mitigate the potential discharge of contaminated wastewater to the underlying aquifer. The FEMP will ensure groundwater is not adversely impacted through continued monitoring under its existing Groundwater Monitoring Program.
	National Revised Primary Drinking Water Regulations (40 CFR 141.60 through 141.63)	
	Ohio Drinking Water Regulations (OAC 3745-81-11 through 15 and 3745-81-16)	
	Public Water System Primary Contaminant Control (OAC 3745-81-12)	
:posure to the Public	Radiation Dose Limit (40 CFR 192.02(b))	The TNSP will be designed and operated to minimize the releases of radionuclides. Compliance will be demonstrated by sitewide environmental monitoring, including air, soil, and groundwater. Reports summarizing the sitewide monitoring results will be submitted to the EPA.
	Radiation Dose Limit (Drinking Water Pathway) (10 CFR 834)	

TABLE 4-2

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
Resource Conservation and Recovery Act (As Amended)	Hazardous Waste Determinations (OAC 3745-52-11) (40 CFR 262.11)	The waste to be neutralized has been characterized as corrosive and contains elevated levels of chromium and cadmium. Wastes generated from the process will be characterized in accordance with site procedure SSOP-0002. Samples of the solidified material will be collected from each thorium nitrate batch to verify that the solidified material is a nonhazardous waste.
	Interim Status: Treatment, Storage, and Disposal General Facility Standards (OAC 3745-65-13 through 16) (40 CFR 265.13 through 265.16)	The TNSP will operate in accordance with RCRA regulations. Existing site security measures will be used. Inspections will be conducted in accordance with site procedures. Personnel will be trained in accordance with FEMP requirements.
	Interim Status: Treatment, Storage and Disposal Facility 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 TNSP. The existing FEMP site-wide internal communications/alarm system will be used. Portable fire extinguishers and spill control equipment will be placed at accessible locations to assist in emergency response. The site's Emergency Response Team will be available, with assistance from local and state personnel, for responding to emergency situations.
	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 release associated with the TNSP. FERMCO is responsible for off-normal occurrences and associated emergency action. Site emergency preparedness and spill response procedures will be followed in the event of a release or spill. In the event of an off-normal event or spill, FERMCO will take appropriate actions, with the input of CNSI, as directed by the Emergency Duty Officer (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. Containers of hazardous waste will be managed and inspected in accordance with regulatory requirements. Secondary containment will be provided in the drumming stations and staging areas. The containers will be compatible with the stabilized material and will remain closed during storage.

TABLE 4-2

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)

Permit That Would Be Required	Permit Requirements (ARARs)	Compliance Plan
	Tank Systems (OAC 3745-66-91 through 3745-66-99) (40 CFR 265.190 through 265.199)	As required for removal actions, regulatory requirements for Tank T-2 have been met to the extent practicable. Test results from ultrasonic thickness testing conducted in November 1993 show that it is structurally sound. The tank is secured from receiving additional materials. The waste is compatible with tank construction materials and will not cause failure of the system. Secondary containment is provided for Tank T-2. Daily visual inspections of the tank system will be conducted and documented.
	Closure Performance Standards (OAC 3745-66-11, 3745-66-14) (40 CFR 265.111, 265.114)	Decontamination of the tank system will be conducted to meet closure performance standards.
	Land Disposal Restrictions (OAC 3745-59) (40 CFR 268)	All materials removed from the FEMP will be managed in compliance with applicable provisions of RCRA and other Federal and State requirements, including the U.S. EPA's Off-Site Rule, which was effective October 22, 1993.
Operational - Worker Protection & Training (29 CFR 1904 & 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 the Project Health and Safety Plan and the FEMP Health and Safety Plan.
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.	This removal action will be conducted in accordance with NEPA. The results of the NEPA evaluation for this project include no environment impacts as this project will be conducted aboveground.
DOE Orders	To Be Considered	All project design activities shall be implemented according to the DOE procedures.

Thorium Nitrate Tank T-2
Project Specific Plan
July 1995

ATTACHMENT A
CHEM-NUCLEAR SYSTEMS, INCORPORATED
PROJECT WORK PLAN

Thorium Nitrate Tank T-2
Project Specific Plan
July 1995

CHEM-NUCLEAR SYSTEMS, INCORPORATED
FERMCO (TN) SOLIDIFICATION PROJECT WORK PLAN
(SUBCONTRACT # 95 SL003934)

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1.0 SCOPE

1.1 Purpose

The purpose of this plan is to provide positive control of the solidification operations performed by Chem-Nuclear Systems, Inc. (CNSI) while contracted by Fernald Environmental Restoration Management Corporation (FERMCO) at the US Department of Energy Fernald facility (DOE-Fernald).

1.2 Applicability

This plan applies to all CNSI, FERMCO, Fernald Atomic Trades and Labor Council (FAT&LC) and sub-contractor personnel directly involved with the solidification of Thorium Nitrate (TN) at DOE-Fernald.

2.0 REFERENCES

2.1 Nuclear Regulatory Commission (NRC) License 39-23004-01 as amended

2.2 NVO-325 (Rev. 1), Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, June 1992

2.3 Statement of Work for the FEMP Waste Solidification Project

2.4 CNSI Procedure CN-AD-033, "Field Project Administration and Control"

2.5 CNSI Plan PL-CNSI-95-003, "FERMCO Solidification Project Health and Safety Plan"

2.6 CNSI Plan PL-CNSI-95-004, "FERMCO Solidification Project Operational Radiological Control Plan"

2.7 CNSI Plan PL-CNSI-95-005, "FERMCO Solidification Project Process Control Program"

2.8 CNSI Procedure CN-AD-002, "Document Storage and Control"

2.9 State of South Carolina Radioactive Material License 287-02, as amended

2.10 CNSI Plan PL-CNSI-95-002, "FERMCO Solidification Project Quality Assurance Plan"

2.11 Waste Solidification Project, Thorium Nitrate Solidification Sampling Plan*.

2.12 CNSI FERMCO TN Solidification P.& I.D. C-313-D-2606 Rev. 2.

3.0 REQUIREMENTS

3.1 Prerequisites

3.1.1 Verify the 14 day notice required by Reference 2.1 for use has been made to the NRC.

3.1.2 Verify this plan has been approved by FERMCO, United States Environmental Protection Agency (USEPA), Ohio Environmental Protection Agency (OEPA) and CNSI.

3.1.3 Verify that a work package has been initiated for the individual waste processing location in accordance with Reference 2.3 prior to commencing work at that location.

3.1.4 Verify FERMCO has issued CNSI written permission to commence actual solidification operations.

3.1.5 Verify radiological controls are in place in accordance with Reference 2.6.

3.1.6 Verify personnel involved in the solidification operation have completed site specific training in accordance with Reference 2.3, 2.5, 2.6, 2.10 and FERMCO access requirements.

3.1.7 Verify the CNSI Radiological Controls Supervisor (RCS) is on-site for any operation involving contaminated material.

3.1.8 Verify that a CNSI authorized user of radioactive material for this project is on-site for processing operations.

3.1.9 Verify the specific waste processing location has been set-up in accordance with this plan.

3.1.10 FERMCO verify that valve TN-10, Tank T-2 side discharge valve, is shut and tagged/ locked out.

3.2 Tools, Materials, Equipment

CNSI will provide the tools, material and equipment necessary to perform the required work. CNSI shall provide (however, not limited to) the following:

3.2.1 Office trailer

3.2.2 Diesel-Electric generator with fuel storage tank to power the office trailer and electric solidification equipment.

3.2.3 Air compressor for the air driven solidification components.

3.2.4 Tanks to be used for the neutralization of the waste streams.

3.2.5 Drum mixer for the solidification of the waste streams.

3.2.6 55 gal drum mixer blade inserts for stabilization of the lower part of the mixer blades.

3.2.7 Hoses, pumps, valves, mating connections and gaskets required for transfer of the waste streams from FERMCO tanks to the neutralization tanks and from the neutralization tanks to the drum mixer.

3.2.8 Equipment/instrumentation required to administer and control the neutralization process.

3.2.9 Chiller/Heat Exchanger to cool neutralized liquid prior to solidification.

3.2.10 Equipment for the storage and delivery of neutralization and solidification chemicals.

3.2.11 Chemicals and reagents required for the solidification of the waste streams.

3.2.12 Secondary containment for all equipment.

3.2.13 Material to construct process shield wall inside the process tent.

NOTE: ANY SECONDARY CONTAINMENT WHICH CONSISTS OF BERMS AND A HERCULITE TYPE MATERIAL LINER WILL HAVE A GEO-FABRIC UNDERLAYMENT SUCH AS DUPONT TREDIRA.

3.2.14 Drum curing lids fitted with vent and temperature monitoring connections.

3.2.15 Process tent to inclose the drumming area where waste and dry chemicals are added to the process drums.

3.2.16 Ventilation equipment, filters and instrumentation required to control atmospheric emissions.

3.2.17 Chemicals and equipment required to perform PCP testing in accordance with Reference 2.7.

3.2.18 Fork truck to stage/ move equipment and drums.

3.2.19 Carbon canister filter for tank T-2 passive vent.

3.2.20 Flush tanks for fresh water flush of equipment.

3.3 Precautions and Limits

3.3.1 Extreme care shall be exercised to ensure that the individual radionuclide quantities specified in Reference 2.1 are not exceeded. The CNSI Radiological Control Supervisor will have the responsibility of ensuring compliance.

3.3.2 Neutralization and solidification involve chemical reactions and the generation of heat. All personnel involved in the solidification process shall exercise extreme caution and comply with all safety requirements specified in Reference 2.5.

3.3.3 Waste streams will not be added to the drum mixer until the pH is ≥ 3.

3.3.4 Secondary containment will be in place prior to any processing operation which has the capability of an uncontrolled liquid release to the environment.

3.4 Acceptance Criteria

Processed waste will be deemed acceptable when the waste is solidified and complies with the requirements of Reference 2.2. Specifically, CNSI will ensure the following:

3.4.1 The waste shall not exhibit any characteristics of, or be listed as, hazardous waste as identified in Title 40 CFR

261 and will be acceptable for disposal in accordance with 40 CFR 268 and NVO 325.

3.4.2 The waste shall be a uniform, dry, freestanding monolith that contains as little free liquids as is reasonably achievable but in no case shall the liquid equal or exceed 0.5 percent by volume of the external waste container.

3.5 Project Organization

The CNSI project organization chart is provided in Appendix D

3.5.1 Project Manager

The CNSI Project Manager (PM) will be the point of contact for FERMCO concerning the solidification project. The PM will have the authority to function on CNSI's behalf in contractual matters and will maintain oversight of the project without becoming directly involved (except in emergency situations) in day to day operations. The PM will interface with FERMCO management and will be responsible for tracking and reporting project cost, schedule and deviation. The PM will report directly to the CNSI Manager of Special Projects.

3.5.2 Radiological Control Supervisor

The CNSI Radiological Control Supervisor (RCS) will be responsible for insuring the implementation of the requirements stated in Reference 2.5 and 2.6. The RCS will coordinate activities with FERMCO Safety and Health and Radiological Control personnel to ensure compliance with CNSI's Radiological Control Program and FERMCO's Radiological Control requirements, following the more restrictive requirements when they differ. The RCS will report to the PM on all project matters while maintaining a direct tie to the CNSI Corporate Health Physicist on all radiological control matters.

3.5.3 Operations Supervisor

The CNSI Operations Supervisor (OS) will be the lead solidification technician responsible for the day to day direction of solidification operations. The OS will directly control operations within CNSI's processing area and will interface with the appropriate FERMCO personnel to direct operations outside of CNSI's process area. The OS reports directly to the CNSI PM.

3.5.4 Quality Assurance Supervisor

The Quality Assurance Supervisor (QAS) will provide quality assurance oversight during CNSI project operations and will interface with FERMCO QA. The QAS will ensure CNSI operations comply with Reference 2.10 and all applicable contractual requirements. The QAS will report directly to the PM on all project matters while still maintaining a direct tie to CNSI Director of Quality Assurance.

3.6 CNSI/ FERMCO Operational Responsibilities

3.6.1 FERMCO Operational Responsibilities

3.6.1.1 Operation of the TN transfer pump and associated valves for waste transfer, TN tank recirculation, and rinsing operations.

3.6.1.2 Monitoring the TN transfer pump during recirculation of tank T-2.

3.6.1.3 Filling flush tank #1 with fresh water as necessary during initial system fill and flushing operations.

3.6.1.4 Staging empty drums on the conveyor.

3.6.1.5 Installing mixing blade assemblies in empty drums.

3.6.1.6 Loading dry chemicals in the hopper.

3.6.1.7 Assisting the CNSI operator in removing and placing the drum fillhead and installing the chain binders on the fillhead/ drum assembly.

3.6.1.8 Installing/ removing drum curing lids.

3.6.1.9 Installing drum shipping lids.

3.6.1.10 Moving processed drums along the conveyor.

3.6.1.11 Transferring processed drums to the FERMCO curing area.

3.6.1.12 Decontamination operations as necessary.

3.6.1.13 Tank T-2 sampling operations.

3.6.2 CNSI operational Responsibilities

3.6.2.1 Operation of all CNSI equipment and sampling operations within the NRC controlled area.

3.6.2.2 Operation of NaOH transfer including flush tank #2.

4.0 DETAILED PROCEDURE

4.1 Equipment Set-up

4.1.1 FERMCO will mobilize and assemble equipment at the TN task work zone area under CNSI direction. Appendix A provides a typical equipment layout. The actual layout will be determined by CNSI depending on the size and shape of the available space at the solidification site.

4.1.2 FERMCO will complete the connection and final positioning of all hoses, pumps, tanks, secondary containment and other equipment required for the transfer, neutralization and solidification of the Thorium Nitrate waste under CNSI direction.

NOTE: ANY EQUIPMENT WHICH, IF COMPROMISED, COULD RESULT IN THE UNCONTROLLED RELEASE OF CONTAMINATED LIQUID REQUIRES SECONDARY CONTAINMENT. PROPER USE OF BAGGING, WRAPPING, TROUGHS, GLOVE BAGS/BOXES, DRIP TRAYS AND BERMS ARE ACCEPTABLE.

4.1.3 Verify that the process tank adapters for waste transfer, recirculation, flushing and venting are installed and connected.

4.1.4 Perform a final hand over hand walkdown to verify system set-up and flow path per reference 2.12.

NOTE: AT THIS TIME ALL SYSTEM VALVES SHOULD BE CLOSED.

4.1.5 Verify all system valves closed.

4.2 Leak Test

NOTE: FRESH WATER FOR THIS TEST IS SUPPLIED FROM THE FLUSH TANK. FILL THE FLUSH TANK DURING THIS TEST AS NECESSARY.

4.2.1 Position system valves in accordance with Appendix E, Starting Lineup for Leak Test".

4.2.2 Start the TN transfer pump at minimum speed.

NOTE: **OBSERVE LIQUID TRANSFER SYSTEM FOR LEAKS DURING THIS FILL PROCEDURE. IF ANY LEAKS ARE OBSERVED STOP THE TN TRANSFER PUMP. REPAIR THE LEAK PRIOR TO PROCEEDING WITH STEP 4.2.3.**

4.2.3 Observe neutralization tank #1 inlet. Shut valve WS-5 when water issues.

4.2.4 Observe neutralization tank #2 inlet. Shut valve WS-6 when water issues.

4.2.5 Observe neutralization tank #1 outlet. Shut valve WS-8 when water issues.

4.2.6 Observe neutralization tank #2 outlet. Shut valve WS-9 when water issues.

4.2.7 Open WS-20 and observe the neutralized waste inlet to the drum mixer. Close valve WS-20 when water issues. Stop the TN transfer pump.

4.2.8 Inspect all hoses, fittings, connections and equipment for leaks. Repair all leaks prior to proceeding.

4.2.9 Raise system pressure to 20 psi by jogging the TN transfer pump. Hold this pressure for fifteen minutes.

NOTE: **INSPECT SYSTEM FOR LEAKS DURING THE FIFTEEN MINUTE HOLD. IF LEAKS ARE DETECTED PERFORM STEPS 4.2.10 AND 4.2.11, REPAIR THE LEAK(S) AND RESUME TEST FROM STEP 4.2.9.**

NOTE: **CNSI AND FERMCO QA REPRESENTATIVES SHALL WITNESS THIS TEST.**

4.2.10 Open valve WS-5 to relieve system pressure.

4.2.11 Close WS-5 when system pressure reaches zero as indicated on system pressure gages, PI-1, PI-2 and PI-3

4.2.12 Return system to pre-test status by closing all valves opened in step 4.2.1.

4.2.13 Add 20 gallons of fresh water to flush tank # 2.

4.2.14 Start the NaOH addition pump at minimum speed.

4.2.15 Stop the NaOH addition pump when fresh water issues from the NaOH inlet to the neutralization tanks.

4.2.16 Close CA-2

4.2.17 Close CA-3

4.2.18 Raise system pressure to 20 psi by jogging the NaOH addition pump. Hold this pressure for fifteen minutes.

NOTE: **INSPECT SYSTEM FOR LEAKS DURING THE FIFTEEN MINUTE HOLD. IF LEAKS ARE DETECTED PERFORM STEPS 4.2.19 AND 4.2.20, REPAIR THE LEAK(S) AND RESUME TEST FROM STEP 4.2.18.**

NOTE: **CNSI AND FERMCO QA REPRESENTATIVES SHALL WITNESS THIS TEST.**

4.2.19 Open valve CA-2 to relieve system pressure.

4.2.20 Close CA-2 when system pressure reaches zero.

4.2.21 Return system to pre-test status by closing all valves opened in step 4.2.1.

4.3 <u>TN Tank Recirculation</u>

4.3.1 Verify all system valves are closed.

4.3.2 Open valve WS-3.

4.3.3 Open valve WS-4.

4.3.4 Open valve WS-2.

4.3.5 Open valve BP-9.

4.3.6 Start the TN transfer pump to establish recirculation flow.

CAUTION: **TN TANK RECIRCULATION PATH WILL REMAIN LINED UP UNTIL THE LAST BATCH HAS BEEN TRANSFERRED**

TO THE NEUTRALIZATION TANKS. THE TN TANK RECIRCULATION PATH SHOULD BE INSPECTED DURING RECIRCULATION FOR LEAKS AND THE TN TRANSFER PUMP STOPPED IF ANY ARE DETECTED.

4.3.7 Stop or start the TN transfer pump as necessary to secure or establish TN tank recirculation.

4.3.8 When TN tank is no longer needed or not possible due to loss of pump suction.

4.3.8.1 Stop the TN transfer pump.

4.3.8.2 Close valve WS-4.

4.3.8.3 Close valve BP-9.

4.4 Waste Transfer

CAUTION: DO NOT PROCEED WITH THIS SECTION IF EITHER NEUTRALIZATION TANK IS BEING RECIRCULATED. STOP NEUTRALIZATION TANK RECIRCULATION IN ACCORDANCE WITH SECTIONS 4.5.13 THRU 4.5.16 PRIOR TO PROCEEDING WITH THIS SECTION.

NOTE: THE TRANSFER, NEUTRALIZATION AND SOLIDIFICATION OF WASTE SHALL BE DOCUMENTED USING THE BATCH SOLIDIFICATION DATA SHEETS IN APPENDIX B.

CAUTION: PRIOR TO TRANSFERRING WASTE FROM THE PROCESS TANK TO THE NEUTRALIZATION TANK, VERIFY THE TRANSFER WILL BE IN COMPLIANCE WITH REFERENCE 2.1.

4.4.1 Verify that the process tank (T2) is being recirculated and has been recirculated at least one-half hour for every 1000 gallons liquid waste in the tank. This step is not applicable when transferring tank rinsate water.

4.4.2 Open valve WS-1.

4.4.3 Open valve WS-15.

4.4.4 Open valve WS-5,(IF FILLING TANK # 1) or valve WS-6.(IF FILLING TANK # 2)

4.4.5 Close valve BP-9. This will divert recirculation flow to fill the selected neutralization tank.

NOTE: IF PUMP SUCTION IS LOST AT ANY TIME DURING THE TRANSFER STOP THE TN TRANSFER PUMP AND PERFORM STEPS 4.4.8 THRU 4.4.10.

4.4.6 Monitor neutralization tank level indicator, (L1 for tank 1 and L2 for tank 2), and slow the transfer flow rate as the required level is approached by reducing pump speed.

4.4.7 Stop the transfer pump when the neutralization tank contains the required amount of waste liquid per the solidification worksheet (Reference 2.7).

NOTE: EXECUTION OF THE RADIOACTIVE MATERIAL TRANSFER RECORD WILL OCCUR AT THIS POINT IN ACCORDANCE WITH SECTION 6.

4.4.8 Close valve WS-5, (TANK #1) or valve WS-6 (TANK #2).

4.4.9 Close valve WS-15.

4.4.10 Close valve WS-1.

NOTE: IF PUMP SUCTION WAS LOST DURING THE TRANSFER SKIP STEPS 4.4.11 THRU 4.4.13 AND PERFORM STEPS 4.3.8.

4.4.11 Open valve BP-9 to establish recirculation flow path.

4.4.12 Start the TN transfer pump to establish TN tank recirculation.

4.4.13 Repeat steps 4.4.1 through 4.4.12 for additional transfers.

4.5 Neutralization Tank Recirculation

4.5.1 Verify the neutralization tank contains the required amount of waste liquid per the solidification worksheet (Reference 2.7).

4.5.2 Verify that the neutralization tank instrumentation (temperature and pH) are in place and have been calibrated within the past year.

4.5.3 Open or verify open valve WS-8 (FOR TANK #1) or WS-9 (FOR TANK #2).

4.5.4 Open valve WS-11 (FOR TANK #1) or WS-10 (FOR TANK #2).

4.5.5 Open or verify open valve WS-21.

4.5.6 Open or verify open valve WS-12.

4.5.7 Open or verify open valve WS-13.

4.5.8 Open valve BP-1.

4.5.9 Open or verify open valve BP-2.

4.5.10 Open valve WS-5 (FOR TANK #1) or valve WS-6 (FOR TANK #2).

4.5.11 Start the cooler pump to establish neutralization tank recirculation.

4.5.12 If temperature is > 110 °F start the chiller and establish chilled water flow through the cooler. Stop the chiller and chilled water flow when temperature is < 110 °F.

NOTE: **IF A PCP SAMPLE IS REQUIRED PER REFERENCE 2.7, OBTAIN A SAMPLE IN ACCORDANCE WITH REFERENCE 2.11 AT THIS TIME.**

4.5.13 When recirculation is complete stop the cooler pump.

4.5.14 Close valve WS-5 (TANK #1) or valve WS-6 (TANK #2).

4.5.15 Close valve BP-1.

4.5.16 Close valve WS-11 (TANK #1) or valve WS-10 (TANK #2).

4.6 Neutralization

4.6.1 Establish neutralization tank recirculation as per step 4.5.

4.6.2 Observe the installed pH meter and compare the reading to existing pH data on the waste stream. If significantly different stop and investigate.

4.6.3 Energize the neutralization tank agitator.

CAUTION: ADDITION OF STRONG BASES TO STRONG ACIDS MAY CAUSE RAPID TEMPERATURE INCREASES. DURING PERFORMANCE OF THE FOLLOWING STEPS, CARE MUST BE TAKEN TO CONTROL TEMPERATURE INCREASE DURING NaOH ADDITION.

4.6.4 Open valve CA-1.

4.6.5 Open valve CA-2 (TANK #1) or valve CA-3 (TANK #2).

4.6.6 Start the NaOH addition pump at minimum speed. Slowly add 25% NaOH while observing temperature and pH. Liquid temperature in the neutralization tank shall not exceed 190 °F.

4.6.7 Operate the chiller/ cooler as necessary for temperature control.

4.6.8 Stop the NaOH addition pump if temperature reaches 180 °F.

4.6.9 Restart the NaOH addition pump when the temperature decreases to 170 °.

4.6.10 Stop the NaOH addition pump when the precalculated amount of caustic, per the solidification worksheet of reference 2.7, has been added.

4.6.11 Continue agitation of the liquid in the neutralization tank for a minimum of 15 minutes.

4.6.12 Verify liquid in the neutralization tank has a pH ≥ 3.

CAUTION: IF pH IS < 3.0 OBTAIN ANOTHER SAMPLE FOR ADDITIONAL PCP TESTING. DO NOT PROCESS FROM THIS TANK UNTIL THE PROBLEM HAS BEEN EVALUATED AND RESOLVED.

4.6.13 Maintain recirculation flow until the temperature is below 110 °F.

4.6.14 Stop neutralization tank recirculation as per steps 4.5.13 thru 4.5.16.

4.6.15 Close valve CA-2 (TANK #1) or valve CA-3 (TANK #2).

4.6.16 Close valve CA-1.

4.7 Solidification

NOTE: PRIOR TO COMMENCING THIS SECTION ENSURE THAT A SATISFACTORY PROCESS CONTROL PROGRAM (PCP) SAMPLE HAS BEEN COMPLETED IN ACCORDANCE WITH REFERENCE 2.7.

CAUTION: DO NOT PROCEED WITH THIS SECTION UNLESS THE TEMPERATURE OF THE WASTE TO BE SOLIDIFIED IS LESS THAN 110 °F.

4.7.1 Verify that the drum fillhead is installed, the process tent ventilation HEPA is in operation and that the operators inside the process tent are ready to receive waste.

4.7.2 Verify that sufficient waste drums are staged to contain the entire batch of processed waste and that the first drum is positioned between the shield walls.

4.7.3 Verify that sufficient dry solidification chemicals are available to support solidification.

NOTE: SUFFICIENT DRY SOLIDIFICATION CHEMICALS CONSIST OF THE PRECALCULATED AMOUNT PER THE PCP PLUS AN ADDITIONAL 25% AS A SAFETY MARGIN.

4.7.4 Open valve WS-17 (TANK #1) or valve WS-16 (TANK #2).

4.7.5 Open or verify open valve WS-22.

4.7.6 Open or verify open valve WS-18.

4.7.7 Open valve WS-19.

4.7.8 Partially open WS-20.

4.7.9 Start the mixer transfer pump.

4.7.10 Transfer the waste liquid to the drum mixer until the desired level is achieved in the drum.

4.7.11 Stop the mixer transfer pump.

4.7.12 Close valve WS-20.

4.7.13 Start the drum mixer blades and establish a rotation of approximately 30 rpm.

NOTE: ADJUST THE SPEED OF THE MIXER BLADES AS NECESSARY FOR PROPER MIXING.

4.7.14 Based on the solidification worksheet completed in accordance with Reference 2.7, transfer the precalculated quantity (±10%) of dry solidification chemicals to the drum mixer.

4.7.15 Continue mixer rotation until the solution has been thoroughly mixed. The CNSI solidification technician will determine when the proper consistency has been obtained based on operating experience.

4.7.16 Stop the mixer blades and lift the drum fillhead.

4.7.17 If directed by FERMCO collect a sample from the completed drum in accordance with Reference 2.11 for TCLP testing.

4.7.18 Install the fillhead on the next process drum.

4.7.19 Install a curing lid on the finished drum.

4.7.20 If additional drums are to be processed repeat steps 4.7.8 thru 4.7.19.

4.7.21 Close valve WS-19.

4.7.22 Close valve WS-17 (TANK #1) or valve WS-16 (TANK #2).

4.8 Curing

4.8.1 Move the filled/ capped drum to the end of the conveyor.

NOTE: EXECUTE THE RADIOACTIVE MATERIAL TRANSFER RECORD IN ACCORDANCE WITH SECTION 6 PRIOR TO REMOVING THE FULL WASTE DRUMS FROM THE CNSI PROCESS AREA.

4.8.2 Processed drums may be transferred to FERMCO for final curing as necessary.

4.8.3 Final drum inspection should take place after 72 hours of cure time. A satisfactory end product for this inspection is a uniform, dry, freestanding monolith that resists penetration when probed with a 1" dowel.

NOTE: **FINAL ACCEPTANCE WILL NOT TAKE PLACE UNTIL TCLP RESULTS HAVE BEEN RECEIVED.**

4.8.4 FERMCO will document final inspection for each drum by filling out the appropriate section of the form in Appendix B.

4.8.5 FERMCO will replace the curing lid with a standard shipping lid after final inspection and return the curing lid to the process tent for reuse.

4.8.6 Using a fork truck, FERMCO will Transfer the waste drums to a location designated by FERMCO for storage and shipment preparation.

4.9 Tank Closure

4.9.1 TN Tank Flush

4.9.1.1 Lineup FERMCO provided service water to the CNSI provided TN tank flush nozzle.

4.9.1.2 FERMCO establish flow to the flush nozzle by opening FW-1.

4.9.1.3 FERMCO stop flow after transferring approximately 250 gallons of fresh water, as observed on the installed flow meter, by closing FW-1.

4.9.1.4 Establish TN tank recirculation in accordance with section 4.3.

4.9.1.5 FERMCO obtain a Sample from the TN tank rinsate in accordance with reference 2.11.

4.9.1.6 FERMCO analyze the sample.

4.9.1.7 Transfer the rinsates to the neutralization tanks in accordance with sections 4.4.

4.9.1.8 Start neutralization tank recirculation in accordance with section 4.5 and obtain a sample for PCP testing.

4.9.1.9 Stop neutralization tank recirculation in accordance with section 4.5.13.thru 4.5.16.

4.9.1.10 Solidify the rinsates in accordance with section 4.7.

4.9.1.11 If the results of the analysis meet the requirements for closure proceed to section 4.10. Otherwise repeat steps 4.9.1.1 through 4.9.1.10.

4.10 CNSI Equipment Flush

4.10.1 Fill flush tank #1 with fresh water. Add fresh water to the tank as necessary throughout this flush procedure.

4.10.2 Close all system valves.

4.10.3 Position system valves in accordance with Appendix E "Starting Lineup for System Flush".

4.10.4 Start the TN transfer pump. This will start fresh water flow from the flush tank to the neutralization tanks through WS-5 and WS-6.

4.10.5 Stop the TN transfer pump after transferring approximately 35 gallons of fresh water.

4.10.6 Close WS-5 and WS-6.

4.10.7 Open WS-8 and WS-9.

4.10.8 Start the TN transfer pump and the mixer pump. This will start fresh water flow from the flush tank to the neutralization tank through the bypass line, mixer pump and WS-8 and WS-9.

4.10.9 Stop the TN transfer pump and the mixer pump after transferring approximately 10 gallons of fresh water.

4.10.10 Close WS-14.

4.10.11 Open WS-13.

4.10.12 Start the TN transfer pump and the cooler pump. This will start fresh water flow from the flush tank

to the neutralization tanks through the cooler, cooler pump and WS-8 and WS-9.

4.10.13 Stop the TN transfer pump and the cooler pump after transferring approximately 20 gallons of fresh water.

4.10.14 Close WS-8 and WS-9.

4.10.15 Add 20 gallons of fresh water to flush tank #2.

4.10.16 Open SW-3, CA-2 and CA-3.

4.10.17 Start the NaOH addition pump.

4.10.18 Stop the NaOH pump after adding the contents of the flush tank.

4.10.19 Close SW-3, CA-2 and CA-3.

NOTE: **AT THIS TIME ALL LINES, VALVES, MANIFOLDS,PUMPS, AND EQUIPMENT HAVE BEEN FLUSHED.**

4.10.20 Close the following valves.

WS-15
BP-3
BP-4
BP-7
BP-8
WS-16
WS-17

4.10.21 Open the following valves.

WS-21
WS-12
WS-6
WS-8

4.10.22 Start the cooler pump. This will start transfer from neutralization tank #1 to neutralization tank # 2.

4.10.23 Stop the cooler pump after the entire contents of neutralization tank #1 have been transferred to neutralization tank #2.

NOTE: AT THIS TIME ALL FLUSH WATER HAS BEEN TRANSFERRED TO NEUTRALIZATION TANK #2.

4.10.24 Open WS-9.

4.10.25 Close the following valves:

WS-8
WS-10
WS-11
WS-21
WS-12
WS-13
WS-6
BP-1
BP-2

4.10.26 Solidify the contents of neutralization tank #2 in accordance with section 4.7.

5.0 Equipment Demobilization

NOTE: IF EQUIPMENT IS BEING RELOCATED FROM ONE PROCESS AREA TO ANOTHER, THE STEPS IN WHICH MATERIAL IS TURNED OVER TO FERMCO WILL NOT APPLY.

NOTE: EQUIPMENT BREAKDOWN AND CLEAN-UP MAY OCCUR IN ANY ORDER PROVIDED IT DOES NOT IMPACT PRODUCTION.

NOTE: ANY EQUIPMENT WHICH CANNOT BE DECONTAMINATED TO ACCEPTABLE LIMITS IN ACCORDANCE WITH REFERENCE 2.9 MAY BE TURNED OVER TO FERMCO AS RADWASTE AFTER DISCUSSION WITH AND CONCURRENCE OF FERMCO PROJECT MANAGER.

NOTE: CNSI WILL DISCONNECT AND DRAIN ALL HOSE/ EQUIPMENT. FERMCO WILL ASSIST IN DECONTAMINATION AND PACKAGING.

5.1 Equipment Draining/ Breakdown

Equipment draining and breakdown involves disconnecting hoses, flanges etc. and draining remaining liquid from the hoses and

connected equipment. The majority of the draining process is accomplished by disconnecting hoses and "walking" the hose towards the process drum to drain the liquid into the drum. After draining the hoses and equipment are capped/ plugged. The liquid in the drum is solidified as necessary during the draining process.

CAUTION: **EXERCISE CARE WHEN DISCONNECTING HOSES/ EQUIPMENT TO PREVENT THE RELEASE OF LIQUID. BAGS, ABSORBENT MATERIAL OR OTHER SUITABLE MEANS SHALL BE USED WHEN DISCONNECTING HOSE/ EQUIPMENT TO CONTAIN INCIDENTAL RELEASE OF LIQUID.**

5.1.1 TN tank waste outlet to WS-4.

5.1.2 WS-3 to TN transfer pump valve manifold.

5.1.3 TN tank recirculation line to BP-9.

5.1.4 TN transfer pump discharge to valve manifold.

5.1.5 TN transfer pump suction to valve manifold.

5.1.6 TN transfer pump valve manifold to WS-15.

5.1.7 Neutralization tank #1 waste inlet to WS-5.

5.1.8 Neutralization tank #2 waste inlet to WS-6.

5.1.9 BP-1 to BP-2.

5.1.10 Neutralization tank #1 suction to WS-8.

5.1.11 Neutralization tank #2 suction to WS-9.

5.1.12 WS-16 & 17 to WS-22.

5.1.13 WS-10 & 11 to WS-21.

5.1.14 Mixer pump suction to valve manifold.

5.1.15 Mixer pump discharge to valve manifold.

5.1.16 Cooler pump suction to valve manifold.

5.1.17 Cooler pump discharge to valve manifold.

5.1.18 WS-12 to WS-13.

5.1.19 WS-18 to cooler outlet.

5.1.20 Cooler outlet to WS-19.

5.1.21 Ventilation lines from the TN tank to the neutralization tanks.

5.1.22 NaOH addition lines from the NaOH tanker and flush tank #2 to the neutralization tanks.

5.2 Neutralization Tanks

5.2.1 Remove the fillheads from the neutralization tanks and decontaminate to the extent practical.

5.2.2 Package the fillheads and turn over to FERMCO as contaminated equipment.

5.2.3 Inspect neutralization tank internals to ensure loose and free standing material has been removed. Remove any loose or free standing material from the tanks.

5.2.4 Replace the neutralization tanks shipping lid and decontaminate the exterior of the tank if necessary.

5.2.5 The neutralization tanks will be turned over to FERMCO as contaminated equipment.

5.3 Remaining Equipment

5.3.1 The HEPA system will be decontaminated to the extent practical and then packaged for return to CNSI as contaminated equipment.

5.3.2 The conveyor will be decontaminated for free release or to the extent practical. If the conveyor cannot be free released it will be packaged for return to CNSI as contaminated equipment.

5.3.3 Any remaining equipment or material not specifically mentioned will be decontaminated for free release or packaged per FERMCO direction as radwaste for FERMCO disposition.

6.0 RADIOACTIVE MATERIAL CONTROL

The RCS shall be responsible for the control of radioactive material within the CNSI process area and shall have direct control over all radioactive material license transfers.

TRANSFER TO CNSI LICENSE

6.1 The RCS will initiate and maintain a Radioactive Material Control Log (RAM Log) throughout the project. The RAM Log will track the transfer of material to and from Reference 2.1 along with the applicable dates, times, isotopes, quantities and current inventory.

6.2 Prior to transferring a batch of waste liquid from the process tank (FERMCO) to the neutralization tank (CNSI), FERMCO will provide the RCS with a completed DOE Form 741 and Radioactive Material Transfer Record (Appendix C).

6.3 The RCS shall verify the material to be transferred will not violate the provisions of Reference 2.1 and if not, enter the information in the RAM Log. The batch can be adjusted so that the transfer will not violate the provisions of Reference 2.1.

6.4 The RCS will authorize the transfer and direct the OS to transfer the waste liquid.

TRANSFER FROM CNSI LICENSE

6.5 The OS will inform the RCS when CNSI is ready to transfer the processed waste drums to FERMCO.

6.6 The RCS will complete a DOE Form 741 and Radioactive Material Transfer Record and provide the completed forms to the appropriate FERMCO personnel.

6.7 FERMCO will provide the RCS with authorization to transfer the waste.

6.8 The RCS will direct the OS to transfer the waste to FERMCO.

6.9 The RCS will update the RAM Log to reflect the transfer.

7.0 RECORDS/REPORTS/NOTIFICATION

7.1 Project records will be maintained in accordance with Reference 2.5.

7.2 Radioactive material transfer records shall be maintained in accordance with the requirements of Reference 2.1.

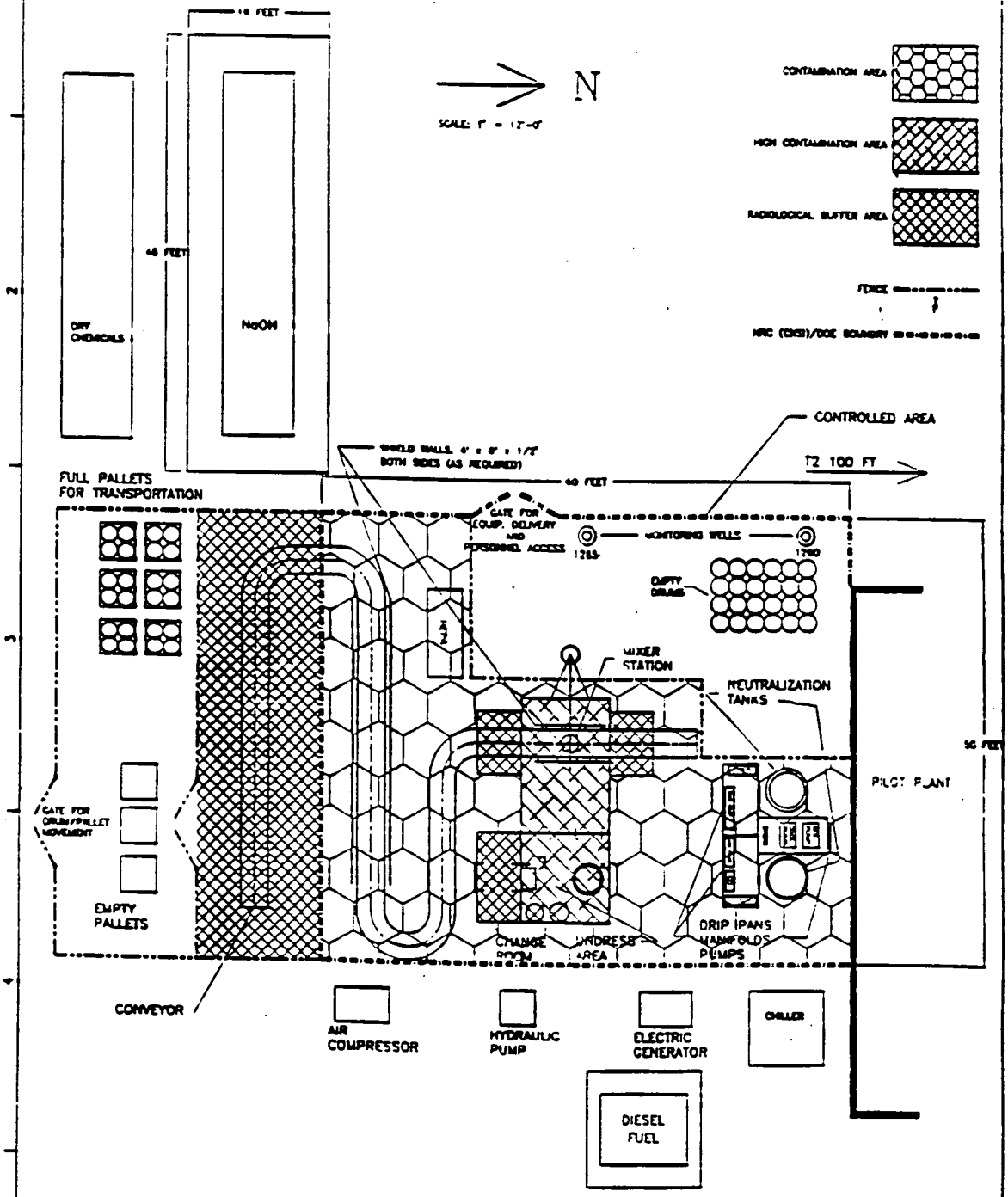
7.3 CNSI Regulatory Affairs will be responsible for the reporting requirements associated with Reference 2.1.

7.4 The project manager will be responsible for completing and submitting reports and/or notifications as required by Reference 2.3, 2.4 and as directed.

APPENDIX A

TYPICAL PROCESS AREA LAYOUT

(1 PAGE)



FERMCO SOLIDIFICATION PROJECT
EQUIPMENT LAYOUT

APPENDIX B

BATCH SOLIDIFICATION DATA SHEET

(3 PAGE)

BATCH SOLIDIFICATION DATA SHEET

BATCH NUMBER_____

Process Tank Number:_____ Date waste transferred:_____

Neutralization Tank Number:_____ Date neutralized:_____

Quantity 25% NaOH added:_____ Final pH:_____ Time:_____

Check pH after 15 minutes:_____

Verify satisfactory PCP performed for this waste stream:_____

Solidification chemicals:

	Calculated per PCP formula	Amount on-hand
T32A (if req'd)	_____ lbs	_____ lbs
P-cement	_____ lbs	_____ lbs

25% safety margin of required solidification chemicals on-hand? _____

Sufficient waste drums pre-staged to receive batch? _____

REMARKS:

ATCH NO.:_____ PCP DATE:_____ LINER NO.:_____

/ASTE ADDITION:

ATE:_____ TIME START:_____ TIME FINISH:_____ GALLONS:_____ WEIGHT:_____

iOH ADDITION:

ATE:_____TEMP.:_____TIME START:_____TIME FINISH:_____ TEMP.:_____

ALLONS:_____ WEIGHT:_____

DATE	DRUM #	BINDER ADDITION		TEMP.	TIME CAPPED	FINAL INSPECTION				
		START	STOP			DATE	TIME	RESULTS	SIGNATURE	REMARKS

EMARKS:

000109

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ATCH NO.

DATE	DRUM #	BINDER ADDITION		TEMP.	TIME CAPPED	FINAL INSPECTION				
		START	STOP			DATE	TIME	RESULTS	SIGNATURE	REMARKS

REMARKS:

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APPENDIX C

RADIOACTIVE MATERIAL TRANSFER RECORD

(2 PAGES)

RADIOACTIVE MATERIAL TRANSFER RECORD

) TRANSFERRED FROM:
FERMCO
WILLEY RD
FERNALD, OH

(4) TRANSFERRED TO:
CHEM-NUCLEAR SYSTEMS, INC.
WILLEY RD
FERNALD, OH

) RADIOACTIVE MATERIAL LICENSE NUMBER:
NONE (DEPT. OF ENERGY)

(5) RADIOACTIVE MATERIAL LICENSE NUMBER:
39-23004-01 (NRC)

) TRANSFER DATE:

(6) RECORD NO:

(7) Item Number	(8) Radio-nuclide(s)	(9) Activity per nuclide (mCi)	(10) Total Activity per item (mCi)	(11) Physical Form	(12) Chemical Form

(13) Comments:

IMPORTANT: "This is to certify that the above-named materials are properly classified, described and ready for transfer to CNSI License Number 39-23004-01.

Signature:

Company: FERMCO Date/Time:

This is to certify that the above-named material has been evaluated against, and found to be in compliance with, the requirements of NRC License Number 39-23004-01 and found to be in compliance. Permission to transfer the above-named material is here-by granted.

Signature:

Company: CHEM-NUCLEAR SYSTEMS, INC. Date/Time:

RADIOACTIVE SHIPMENT RECORD FORM

NSFERRED TO:
FERMCO
Willey Rd
Fernald, OH

Page ___ of ___

(3) Record Number: _____

(4) Date of Transfer: _____

(5) TRANSFERRED FROM:
Chem-Nuclear Systems, Inc.
Willey Rd
Fernald, OH

(6) Radioactive Material License Number
39-23004-01 (NRC)

Radioactive Material License Number
NONE (DEPT. OF ENERGY)

(8) Item Number	(9) Radionuclide	(10) Activity per Radionuclide (mCi)	(11) Activity per Item (mCi)	(12) Physical Form	(13) Chemical Form	(13) Container Cu. Ft.

Comments _____

RTANT: "This is to certify that the above-named materials have been properly
bed and processed and are being returned to FERMCO (DOE) from CNSI's NRC
es Number 39-23004-01.

ture _____

Name Chem-Nuclear Systems, Inc. Date/Time: _____

This is to certify receipt of the above-named material.

Signature _____

Company FERMCO Date/Time: _____

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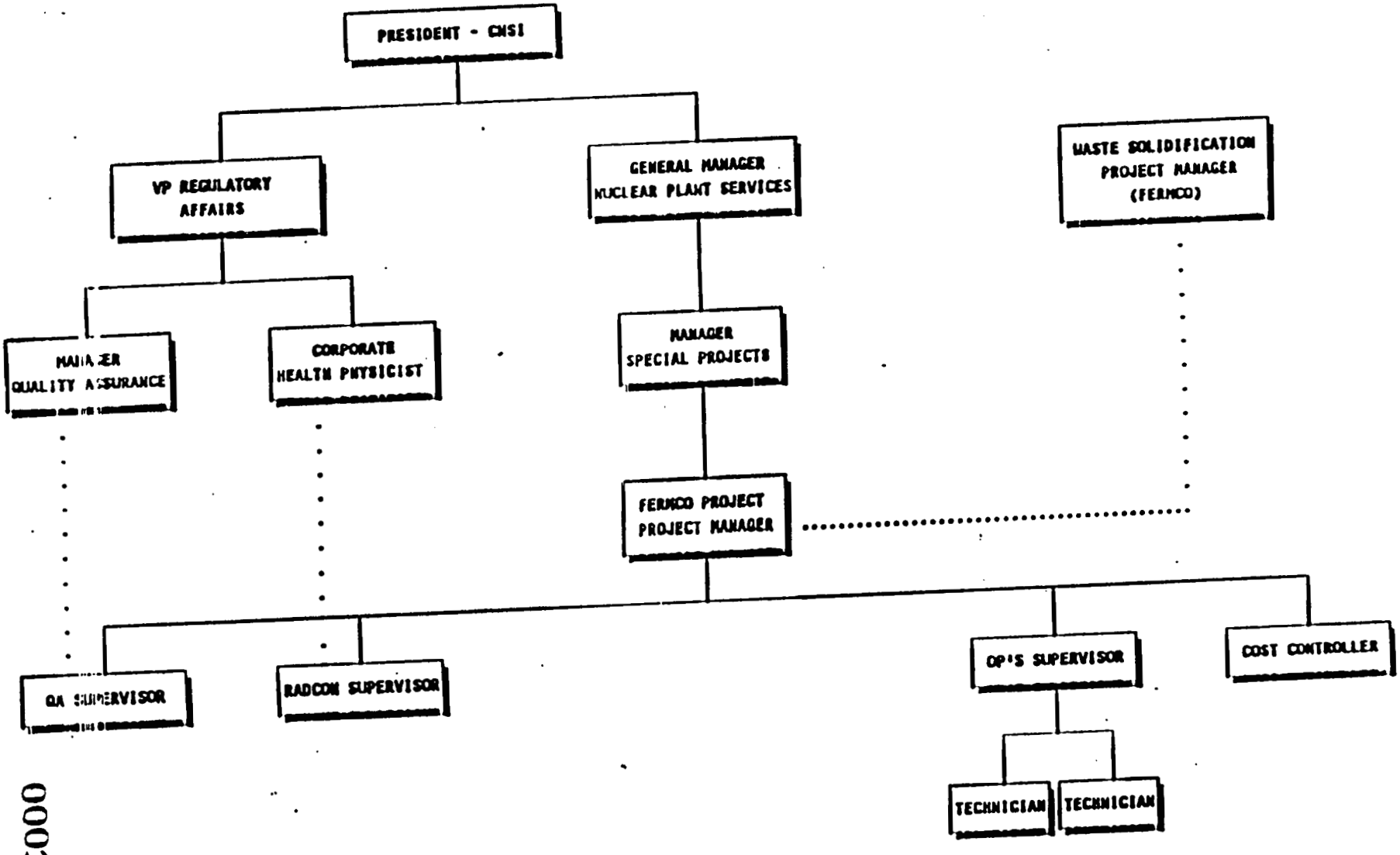
APPENDIX D

CNSI PROJECT ORGANIZATION CHART

(1 PAGE)

ORGANIZATION CHART
for the
CNSI SOLIDIFICATION PROJECT



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APPENDIX E

VALVE LINEUP SHEETS

(3 PAGES)

TN WASTE SOLIDIFICATION PROJECT
VALVE LINEUP SHEET

STARTING LINEUP FOR LEAK TEST

VALVE #	DESIRED POSITION	VERIFIED		VALVE #	DESIRED POSITION	VERIFIED	
		CNSI				CNSI	
SW-1	OPEN			WS-16	OPEN		
WS-4	CLOSED			WS-17	OPEN		
WS-3	OPEN			WS-21	OPEN		
WS-2	OPEN			WS-12	OPEN		
WS-1	OPEN			WS-13	OPEN		
BP-5	CLOSED			WS-14	OPEN		
BP-6	CLOSED			BP-2	OPEN		
BP-9	CLOSED			BP-3	OPEN		
WS-15	OPEN			BP-4	OPEN		
WS-5	OPEN			BP-7	OPEN		
WS-6	OPEN			BP-8	OPEN		
S-1	OPEN			WS-18	OPEN		
S-2	CLOSED			WS-22	OPEN		
BP-1	OPEN			WS-19	OPEN		
WS-8	OPEN			WS-20	CLOSED		
WS-9	OPEN			SW-3	CLOSED		
WS-10	OPEN			CA-1	CLOSED		
WS-11	OPEN			CA-2	CLOSED		
S-3	OPEN			CA-3	CLOSED		
S-4	CLOSED						

REMARKS:

TN WASTE SOLIDIFICATION PROJECT
VALVE LINEUP SHEET

STARTING LINEUP FOR SYSTEM FLUSH

VALVE #	DESIRED POSITION	VERIFIED		VALVE #	DESIRED POSITION	VERIFIED	
		CNSI				CNSI	
SW-1	OPEN			WS-16	OPEN		
WS-4	CLOSED			WS-17	OPEN		
WS-3	OPEN			WS-21	CLOSED		
WS-2	OPEN			WS-12	CLOSED		
WS-1	OPEN			WS-13	CLOSED		
BP-5	CLOSED			WS-14	OPEN		
BP-6	CLOSED			BP-2	OPEN		
BP-9	CLOSED			BP-3	OPEN		
WS-15	OPEN			BP-4	OPEN		
WS-5	OPEN			BP-7	OPEN		
WS-6	OPEN			BP-8	OPEN		
S-1	OPEN			WS-18	CLOSED		
S-2	CLOSED			WS-22	CLOSED		
BP-1	OPEN			WS-19	CLOSED		
WS-8	CLOSED			WS-20	CLOSED		
WS-9	CLOSED			SW-3	CLOSED		
WS-10	OPEN			CA-1	CLOSED		
WS-11	OPEN			CA-2	CLOSED		
S-3	OPEN			CA-3	CLOSED		
S-4	CLOSED						

REMARKS:

TN WASTE SOLIDIFICATION PROJECT
VALVE LINEUP SHEET

SUPPLEMENTAL VALVE LINEUP SHEET

VALVE #	DESIRED POSITION	VERIFIED		VALVE #	DESIRED POSITION	VERIFIED	
		CNSI				CNSI	
SW-1				WS-16			
WS-4				WS-17			
WS-3				WS-21			
WS-2				WS-12			
WS-1				WS-13			
BP-5				WS-14			
BP-6				BP-2			
BP-9				BP-3			
WS-15				BP-4			
WS-5				BP-7			
WS-6				BP-8			
S-1				WS-18			
S-2				WS-22			
BP-1				WS-19			
WS-8				WS-20			
WS-9				SW-3			
WS-10				CA-1			
WS-11				CA-2			
S-3				CA-3			
S-4							

REMARKS:

Thorium Nitrate Tank T-2
Project Specific Plan
July 1995

ATTACHMENT B
CHEM-NUCLEAR SYSTEMS, INCORPORATED
SAMPLING PLAN

TABLE OF CONTENTS

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1.0 Scope

1.1 Purpose

This document provides the sampling methods and practices that Chem Nuclear Systems Inc. (CNSI) will employ to verify satisfactory process performance during solidification of Thorium Nitrate (TN) waste at the Fernald Environmental Restoration Management Co. (FERMCO) site in Fernald Ohio.

1.2 Applicability

This project sampling plan is applicable to all CNSI and FERMCO personnel involved in the solidification of TN waste.

2.0 References

2.1 CNSI Procedure, PL-CNSI-95-005 "FERMCO Solidification Project Process Control Program"

2.2 NVO-325 (Rev. 1) Nevada Test Site Waste Acceptance Criteria, Certification and Transfer Requirements, June 1992.

2.3 Standard Operating Procedure (SOP) FSF-3361, "Completion of Request for Analyses/ Chain-of-Custody Records"

3.0 RESPONSIBILITIES

3.1 Project Manager

The Project Manager (PM) will be responsible for overall project direction including resource allocation, scheduling, integration, and reporting. The Project Manager will be FERMCO's point for all matters concerning CNSI's performance including contractual matters, health and safety issues, operational problems to name a few. The PM will maintain oversight of CNSI activities on the project without becoming directly involved with routine operations. The Project Manager for this project will be Ron Versailles.

3.2 Radiological Control Supervisor

The Radiological Control Supervisor (RCS) will be responsible for all radiological aspects of operations within the CNSI/ NRC boundary. The RCS will also be responsible for insuring that possession limits of CNSI's field license are not exceeded during waste transfer and process operations. The Radiological Control Supervisor for this project will be Scott Johnson.

3.3 Quality Control Supervisor

The Quality Control Supervisor (QCS) will be responsible for implementing all aspects of the project specific QA plan.

3.4 Operations Supervisor

The Operations Supervisor (OS) will be the lead technician on site and is responsible for the supervision and direction of operations at the job site.

4.0 General

There are three types of samples that will be taken during the FERMCO TN solidification project, liquid samples from CNSI neutralization tanks,liquid samples from FERMCO tank T-2 and samples taken from process drums after addition of dry chemicals and thorough mixing has occurred.

NOTE: ALL STEPS IN THIS PROCEDURE WILL BE PERFORMED BY CNSI PERSONNEL WITH THE EXCEPTION OF TANK T-2 SAMPLING IN SECTION 7.0.

5.0 Neutralization Tank Sampling

Samples from the neutralization tanks are used to perform Process Control Program (PCP) testing in accordance with Reference 2.1. In addition to PCP testing, other samples may be obtained from these tanks for additional analysis if required. (eg. other analysis might be required to verify pH in the neutralization tank etc).

5.1 PCP Sampling

PCP sampling is conducted prior to beginning full scale processing. The PCP sample is taken from the CNSI neutralization tanks and is used to verify and fine tune the formulas developed during initial bench scale treatability study testing. This test provides assurance that full scale processing will yield the same results as accomplished during TN treatability study testing.

5.1.2 PCP Sample Frequency

An initial PCP sample will be taken from the first batch. If the results of this sample meet the acceptance criteria of Reference 2.1 full scale processing will begin. Processing will continue until the tenth batch, at which time another PCP sample will be taken prior to proceeding with full scale processing.

Note: FULL SCALE PROCESSING WILL NOT BEGIN UNTIL A SUCCESSFUL PCP SAMPLE HAS

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BEEN COMPLETED IN ACCORDANCE WITH REFERENCE 2.1.

5.1.3 PCP Sample Numbering

PCP samples will be numbered as follows:

Tank # - Batch # - PCP - ###

For example, sample number T2-001-PCP-001 is a PCP sample from the first batch from tank T2 numbered 001. Other samples from this batch will be numbered 002, 003 etc.

5.1.4 PCP Sample Procedure

All PCP samples will be taken and analyzed by CNSI personnel.

CAUTION: REFER TO REFERENCE 2.1 FOR HEALTH AND SAFETY REQUIREMENTS PRIOR TO EXTRACTING A SAMPLE FROM CNSI NEUTRALIZATION TANKS.

5.1.4.1 Verify that sample metering valve S-2 is closed.

5.1.4.2 Remove the drip cap from the end of the sample line and position a pre-numbered sample container so that the sample line is close to the bottom of the container to minimize splashing.

5.1.4.3 Open valve S-1, then carefully open sample metering valve S-2 to obtain a steady flow of waste into the sample container.

5.1.4.4 Close valve S-2 when the required quantity of waste has been transferred to the sample container.

5.1.4.5 Cap the sample container and close valve S-1.

5.1.4.6 Replace the drip cap on the end of the sample line.

5.1.4.7 Log this sample on the form provided in Appendix A.

NOTE: AFTER COMPLETION OF PCP ANALYSIS THE CURED SAMPLE MAY BE TURNED OVER TO

FERMCO FOLLOWING THE REQUIREMENTS FOR SAMPLE CHAIN-OF-CUSTODY IN REFERENCE 2.3.

NOTE: SMALL QUANTITIES (< 1L) OF UNUSED LIQUID SAMPLE MAY BE POURED INTO PROCESS DRUMS OF THE SAME BATCH PRIOR TO ADDITION OF DRY CHEMICALS.

5.2 Supplemental Sampling

Supplemental samples will be drawn for analysis of rinsates and non-routine analysis. An example of non-routine sampling would be to check the pH of the waste after the addition of Sodium Hydroxide (NaOH).

5.2.2 Supplemental Sample Frequency

There is no established frequency for this sample type.

5.2.3 Supplemental Sample Numbering

Supplemental samples will be numbered as follows:

Tank # - Batch # - Supplemental - ###

For example sample number T2-001-pH-001 is a sample from the first batch from tank T2, for pH, numbered 001. Supplemental samples from this batch will be numbered 002, 003 etc.

5.2.4 Supplemental Sample Procedure

CAUTION: REFER TO REFERENCE 2.1 FOR HEALTH AND SAFETY REQUIREMENTS PRIOR TO DRAWING A SAMPLE FROM CNSI NEUTRALIZATION TANKS.

5.2.4.1 Number the sample container in accordance with section 5.2.3.

5.2.4.2 Verify that metering valve S-2 closed.

5.2.4.3 Remove the drip cap from the end of the sample line and position sample container so that the sample line is close to the bottom of the container to minimize splashing.

5.2.4.4 Open S-1, then carefully open sample metering

valve S-2 to obtain a steady flow of waste into the sample container.

5.2.4.5 Close valve S-2 when the required quantity of waste has been transferred to the sample container.

5.2.4.6 Cap the sample container and close valve S-1.

5.2.4.7 Replace the drip cap on the end of the sample line.

5.2.4.8 Log this sample on the form provided in Appendix A.

NOTE: **IF SAMPLE IS REQUESTED BY FERMCO, TRANSFER THE SAMPLE TO FERMCO FOLLOWING THE CHAIN-OF-CUSTODY REQUIREMENTS OF REFERENCE 2.3.**

NOTE: **SMALL QUANTITIES (<1L) OF UNUSED LIQUID SAMPLE MAY BE POURED INTO PROCESS DRUMS OF THE SAME BATCH PRIOR TO ADDITION OF DRY CHEMICALS.**

6.0 Process Drum Sampling

Samples obtained from process drums are used to verify that the final waste product meets all the requirements of Reference 2.2. These samples will be turned over to FERMCO for TCLP analysis upon final cure.

6.1 Verification Sampling

Verification sampling is conducted after completion of full scale processing. These samples are dip samples taken from the process drum after addition of all solidification agents and completion of mixing cycle. The sample is collected in pellet trays provided by FERMCO.

6.1.2 Verification Sample Frequency

As a minimum, one verification sample will be analyzed for each batch. The specific drums to be sampled for each batch will be determined by FERMCO.

6.1.3 Verification Sample Numbering

NOTE: **FERMCO will provide drum labels and sample container labels to CNSI. CNSI will identify the batch No., sample No. and drum No. on the**

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form in Appendix A.

Verification samples will be numbered as follows:

Tank # - Batch # - FERMCO - ###

For example sample number T2-001-FERMCO-001 is a Verification sample from the first batch from tank T2 numbered 001. Other samples from this batch will be numbered 002, 003 etc.

6.1.4 Verification Sample Procedure

Verification sampling is accomplished by dipping into the completed process drum to collect the sample and then spreading the sample onto a pellet tray. The sample is dipped after the CNSI fillhead has been removed and prior to installing the curing lid. Samples taken for verification will be dipped by CNSI personnel.

6.1.4.1 Obtain a prelabeled sample kit (plastic bag) containing a pellet mold, disposable spreader and teflon sheet.

6.1.4.2 Remove the teflon sheet from the bag and place on a flat surface.

6.1.4.3 Place the pellet mold on top of the teflon sheet.

6.1.4.4 Don an additional set of rubber gloves.

6.1.4.5 Using a clean sample spreader remove a sample of thorium concrete mixture from the drum.

6.1.4.6 Carefully spread the mixture over the sample mold (pellet tray) filling all of the holes.

6.1.4.7 Remove excess material from the mold and dispose of the material and spreader in the drum.

6.1.4.5 Place the mold and teflon sheet in the labeled plastic bag and place on top of the drum after installation of the drum curing lid.

6.1.4.6 Remove and properly dispose of the outer pair of gloves donned in step 6.1.4.1.

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6.1.4.5 Log the sample on the form provided in

7.0 Tank T-2 Sampling

Samples obtained from tank T-2 will be used to analyze rinsates to insure compliance with Ohio EPA "Closure Plan Review Guidance for RCRA Facilities, Interim Final, September 1, 1993".

7.1 T-2 Sample Frequency

Tank T-2 will be sampled during tank closure operations. Samples will be taken and analyzed after each flushing operation. Other samples may be taken from tank T-2 as necessary during the course of this project.

7.2 Tank T-2 sample numbering

Tank T-2 samples will be numbered as follows:

Tank # - Batch # - Rinsate - ###

For example, sample number T2-001-Rinsate-001 is the first sample from the first flush of tank T-2. Other samples from this flush will be numbered 002,003 etc.

7.3 T-2 Sample Procedure

All T-2 samples will be taken and analyzed by FERMCO personnel.

CAUTION: REFER TO REFERENCE 2.1 FOR HEALTH AND SAFETY REQUIREMENTS PRIOR TO DRAWING A SAMPLE FROM CNSI NEUTRALIZATION TANKS.

NOTE: RINSATE SAMPLES FROM TANK T-2 WILL REQUIRE TWO 1 LITER GLASS SAMPLE CONTAINERS AND ONE 4 OZ. SAMPLE CONTAINER.

7.3.1 Verify that sample metering valve S-4 is closed.

7.3.2 Remove the drip cap from the end of the sample line and position a pre-numbered sample container so that the sample line is close to the bottom of the container to minimize splashing.

5.3.3 Open valve S-3, then carefully open sample metering valve S-4 to obtain a steady flow of waste into the sample container.

5.3.4 Close valve S-4 when the required quantity of waste has been transferred to the sample container.

5.3.5 Cap the sample container and close valve S-3.

5.3.6 Replace the drip cap on the end of the sample line.

5.3.7 Log this sample on the form provided in Appendix A.

8.0 Sample Custody

After each sample is taken a chain-of-custody form will be initiated in accordance with Reference 2.3 and documented on the sample log in Appendix A. This log will track all samples from the time they are taken until turned over to FERMCO.

APPENDIX A
(1 Page)

SAMPLE LOG

SAMPLE IDENTIFICATION				DATE SAMPLED	ANALYSIS OR MOLD #	DRUM #	REASON FOR SAMPLE (ie. Routine etc.)	TECH INIT.
TANK #	BATCH	TYPE	#					

REMARKS:

000131

71112

ATTACHMENT C

THORIUM NITRATE SOLIDIFICATION PROJECT MILESTONES

MILESTONES	Completion Date
Commence Field Activities	August 14, 1995
Commence Solidification	September 18, 1995
Verify clean closure of T-2	December 22, 1995
Submit Completion Documentation	February 22, 1995
Waste Shipment Operations Complete	June 28, 1996 [1]

[1] The waste shipment completion date is a goal that cannot be finalized nor committed to at this time. Before the waste can be shipped, the Nevada Test Site must conduct an audit of the waste characterization and approve the shipment of this waste to NTS under the FEMP application. The date is based upon the NTS conducting audits semi-annually at the FEMP.

This schedule is based on encountering no technical or weather delays. If delays occur, the OEPA and U.S. EPA will be informed.