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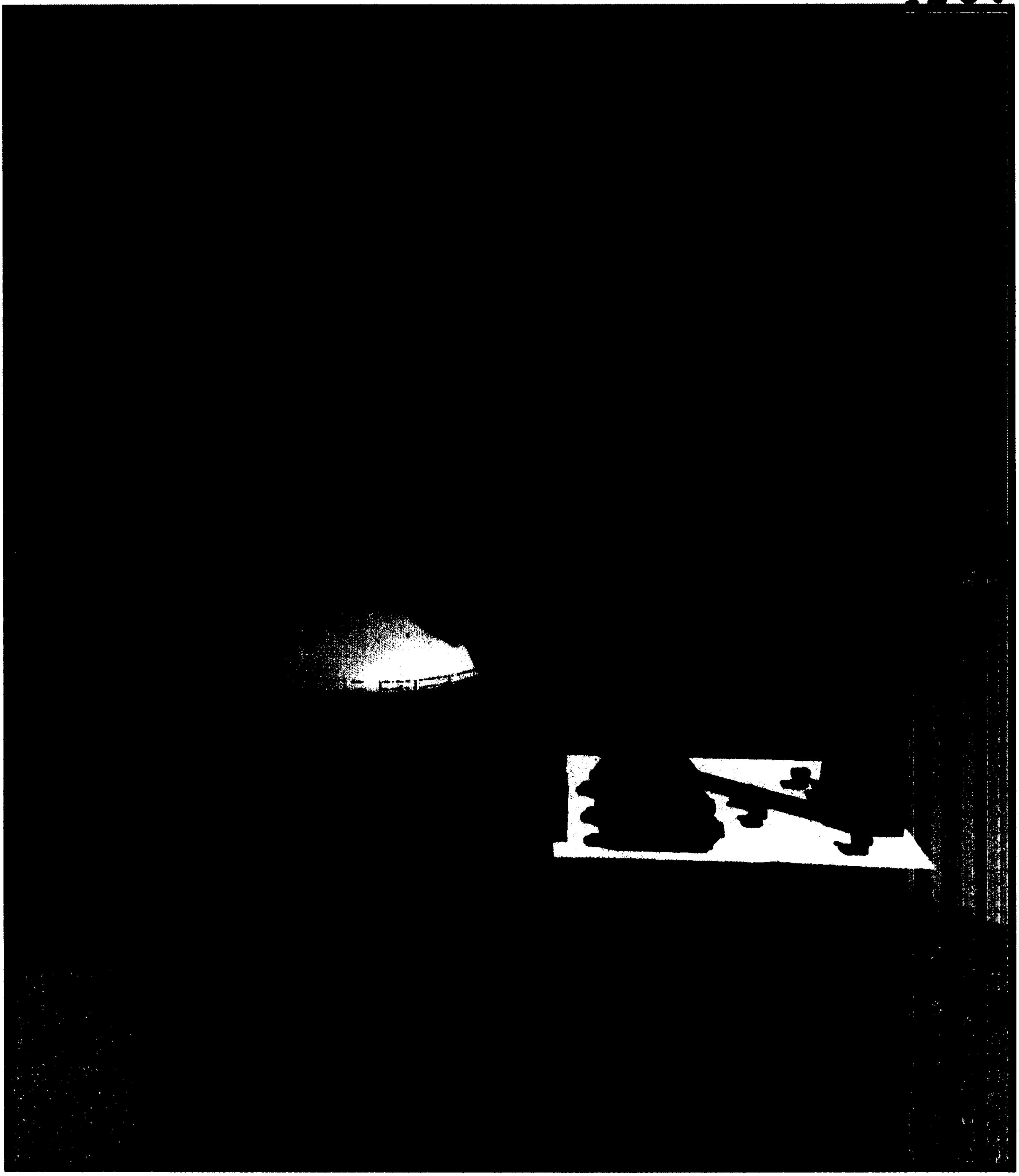

Silo 3 Project - Remedial Design Package
40430-RDP-0001, Revision 0 - May 2002
Fernald Environmental Management Project 000001
Fernald, Ohio

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SILO 3 REMEDIAL DESIGN PACKAGE
40430-RDP-0001, Revision 0

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SILO 3 REMEDIAL DESIGN PACKAGE

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INTRODUCTION

1.0 Purpose

A Remedial Design Package documenting the proposed design for retrieval, chemical stabilization, and offsite disposal of Silo 3 material was submitted to U.S. EPA and OEPA May 19, 2000. The RD Package was approved by U.S. EPA on September 27, 2000. This revised RD Package has been prepared to replace the previous RD Package, and document a the design for the revised path forward for Silo 3 remediation. The package provides a compilation of the necessary substantive information from more detailed engineering, design, and operations documentation in order to provide U.S. EPA, and OEPA with an understanding of the controls incorporated into the revised design to ensure compliance with ARARs and protection of human health and the environment. The basis, prerequisites, and major components of the revised design approach are detailed in the remaining sections of this introduction.

2.0 Background

The Silo 3 Project is a Comprehensive Environmental Response Compensation and Liability Act, as amended (CERCLA) environmental remediation (cleanup) project at the former Feed Materials Production Center (FMPC) now known as the Fernald Environmental Management Project (FEMP). The objectives of the project are removal of waste material stored in Silo 3, packaging of the material, and shipment of the packaged material to an off-site disposal facility for disposal in accordance with the selected remedy for Silo 3.

Silo 3, a component of the FEMP Operable Unit 4 (OU4), contains an estimated 5,088 yd^3 of waste material generated from the operation of the FEMP. The predominant radionuclide of concern identified within the material is Th-230, a radionuclide produced from the natural decay of Uranium-238. The material is classified as 11(e)(2) by-product material under the Atomic Energy Act (AEA) of 1954, as amended, and contains concentrations of several metals above the Resource Conservation and Recovery Act (RCRA) Toxicity Characteristics (TC) limits. Since 40 CFR 261.4(a)(4) excludes byproduct as defined by the AEA from definition as solid waste, the Silo 3 material is excluded from regulation as a hazardous waste under RCRA. For the purposes of this document, references to RCRA include the relevant State of Ohio hazardous waste regulations.

2.1 Silo 3 Description

Silo 3, built in 1952, is a freestanding, pre-stressed concrete, domed silo. It is 80 feet in diameter and about 33 feet above ground level. The floor system is constructed of 17 inches of compacted clay, a 2-inch thick layer of asphaltic concrete, and an 8-inch layer of gravel topped by 4 inches of concrete. Silo 3 does not have an underdrain system. The domed roof tapers from 8 inches thick at the silo walls to 4 inches thick at the apex. The apex is 36 feet high, 33 feet above grade. The walls are 27 feet high from the top of the

foundation. Silo 3 contains increased reinforcing around the dome periphery (ring beam). **4267**
Silo 3 has wire-wrapped pre-stressing using 8-gauge wire drawn to 0.141 inches. Five manways on the dome of Silo 3 have an internal diameter of approximately 20 inches. One manway, on which a dust collector was installed, is centered on the silo dome. Four of the manways, which were used as material inlet ports, are arranged radially, 90 apart, across the dome of Silo 3. There are two additional 24-inch internal diameter manways are located, one at the northern edge and the other at the eastern edge of the silo dome. Also, there are 24 – 2-inch diameter sounding pipes and one – 6-inch diameter vent pipe on the dome. Silo 3 has a total of 46 decant ports, each with a weir and baffle system. There are 23 decant ports located on the east sidewall and 23 decant ports located on the west side wall.

Silo 3 contains "cold" metal oxide waste generated from the operation of FEMP. The raffinates from the solvent extraction process were dewatered using rotary vacuum filters. The filtrate wastes were then processed through evaporators and the concentrates were further processed using either a spray calciner or rotary calciner. From plant start-up through the middle 1950s, a spray calciner processed the concentrates. Approximately 35% of the Silo 3 material is believed to have come from this process. Due to operational difficulties with the spray calciners, a rotary calciner process was implemented. In this process, the evaporator concentrates were transferred to a drum dryer and finally a rotary calciner. The calciner removed residual liquids and converted the metal nitrates to metal oxides.

The resultant fine, powdered metal oxides were transferred to Silo 3, via a pneumatic pipeline, for storage. Placement of these metal oxide wastes into Silo 3 continued until 1957. After that, refinery process wastes were placed in on-site surface impoundments. About 5,088 cubic yards of metal oxide material remains in Silo 3. The predominant radionuclide of concern identified within the material is Thorium-230, a radionuclide produced from the natural decay of Uranium-238. Silo 3 material is classified as 11(e)(2) byproduct material under the AEA, and contains concentrations of several heavy metals including arsenic, chromium, cadmium and selenium. Silo 3 material is exempt from regulation under RCRA, due to its classification as 11(e)(2) byproduct material. The Applicable or Relevant and Appropriate Requirements (ARARs) for Operable Unit apply certain requirements of RCRA to management of Silo 3 Material (see the ARAR Compliance Matrix, RD Package Section 7.1)

In general, based on historical information about the generation of the material, the assumed physical characteristics of the Silo 3 material are:

- Two-thirds of the Silo 3 material is dry, loose, fine powder; located in the upper portion of the silo.
- The remaining third of the Silo 3 material is compacted powder, located towards the middle and bottom of the silo.
- Miscellaneous debris (such as simple hand tools, personal protective equipment (PPE), plastic bags, etc.) may be found within the silo.
- Estimated volume of material in Silo 3 is 5,088 yd^3
- Estimated dry density of the Silo 3 material is 29 - 58 lb/ft^3

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Retrieved material is expected to have a typical bulk density of about 40 – 50 lb/ft^3; however, higher and lower densities may be encountered.

3.0 Basis for Remedial Design

The OU4 Record of Decision (ROD) was signed on December 7, 1994, and identified vitrification as the selected remedy for the Silo 1, 2, and 3 material. The OU4 ROD was modified for Silo 3 through the CERCLA Explanation of Significant Differences (ESD) process. The ESD for Operable unit 4 Silo 3 Remedial Action was approved by U.S. EPA March 27, 1998. The remedy identified in the ESD for treatment and disposal of Silo 3 material is:

- "Treatment, using either a Chemical Stabilization/Solidification or a Polymer-based Encapsulation process to stabilize characteristic metals to meet RCRA Toxicity Characteristic Leaching Procedure (TCLP) limits and attain disposal facility WAC;
- Off-site disposal at either the Nevada Test Site (NTS) or an appropriately-permitted commercial disposal facility; and
- Treatment may take place offsite, so long as "onsite pretreatment, in combination with packaging in accordance with United States Department of Transportation (USDOT) regulations reduces the dispersability of thorium-bearing particulates to produce transportation risk less than 1 x 10^{-6}."

A contract for design, construction, and operation of the Silo 3 remedy defined in the ESD was awarded to Rocky Mountain Remediation Services (RMRS) in December 1998. A Remedial Design Package, based upon the design developed by RMRS, was submitted to U.S. EPA and OEPA May 19, 2000. The RD Package was approved by U.S. EPA on September 27, 2000.

The contract with RMRS was terminated in January 2001 by mutual agreement of RMRS and Fluor Fernald. After termination of the contract with RMRS, the path forward for remediation of Silo 3 was reevaluated, with input from U.S. EPA, OEPA, and stakeholders.

A Proposed Plan (PP) and subsequent Record of Decision (ROD) Amendment to modify the current Silo 3 remedy is being pursued in accordance with the national Oil and Hazardous Substances pollution Contingency plan (NCP) in parallel with design and construction. The intent of the ROD Amendment process will be to modify the remedy to require treatment for heavy metals only if necessary to achieve disposal facility WAC. In addition, the procurement process to place a contract with a PCDF for disposal of Silo 3 material is being initiated in parallel the design and construction process.

A key aspect of the design documented in the enclosed revised RD Package is the flexibility to ensure its ability to be implemented independent of the outcomes of the remedy modification and procurement processes.

The current preferred option is to dispose of the Silo 3 material, without treatment, at an appropriately permitted commercial disposal facility (the design reflected in this revised RD

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Package assumes Envirocare of Utah) through one of two potential paths. The first potential path is to dispose of the untreated Silo 3 material as 11(e)(2) by product material in the 11(e)(2) disposal cell. The chemical and radiological characteristics of untreated Silo 3 material meet the current WAC for the 11(e)(2) cell. In addition to approval of the previously mentioned ROD Amendment, this path requires the Nuclear Regulatory Commission (NRC) to 1) accept that the Silo 3 material is appropriate for disposal in the 11(e)(2) cell, and 2) approve a modification to Envirocare's Engineering Plan to allow bulk placement of the soft-sided disposal containers (described in greater detail in the Transportation & Disposal Plan).

If either of the two NRC approvals are not obtained, the untreated Silo 3 material could be placed in the low level waste cell at Envirocare. The current low level waste WAC and Engineering Plan will allow acceptance of the untreated Silo 3 material. Since the Silo 3 material is a byproduct of the beneficiation of uranium ore, it is exempt from regulation as a hazardous waste by the Bevill Amendment to RCRA (40 CFR 261.4(b)(7)), and can therefore be disposed without treatment contingent upon approval of the ROD Amendment.

Again contingent upon approval of the ROD Amendment, the design reflected in this revised RD Package could potentially be implemented with disposal of untreated Silo 3 material at the Nevada Test Site (NTS) in accordance with a recent revision to the NTS WAC. More specifically, contingent upon a site-specific protectiveness demonstration, the presence of metals levels above TC limits in 11(e)(2) does not necessarily preclude disposal of 11(e)(2) material under the current NTS WAC.

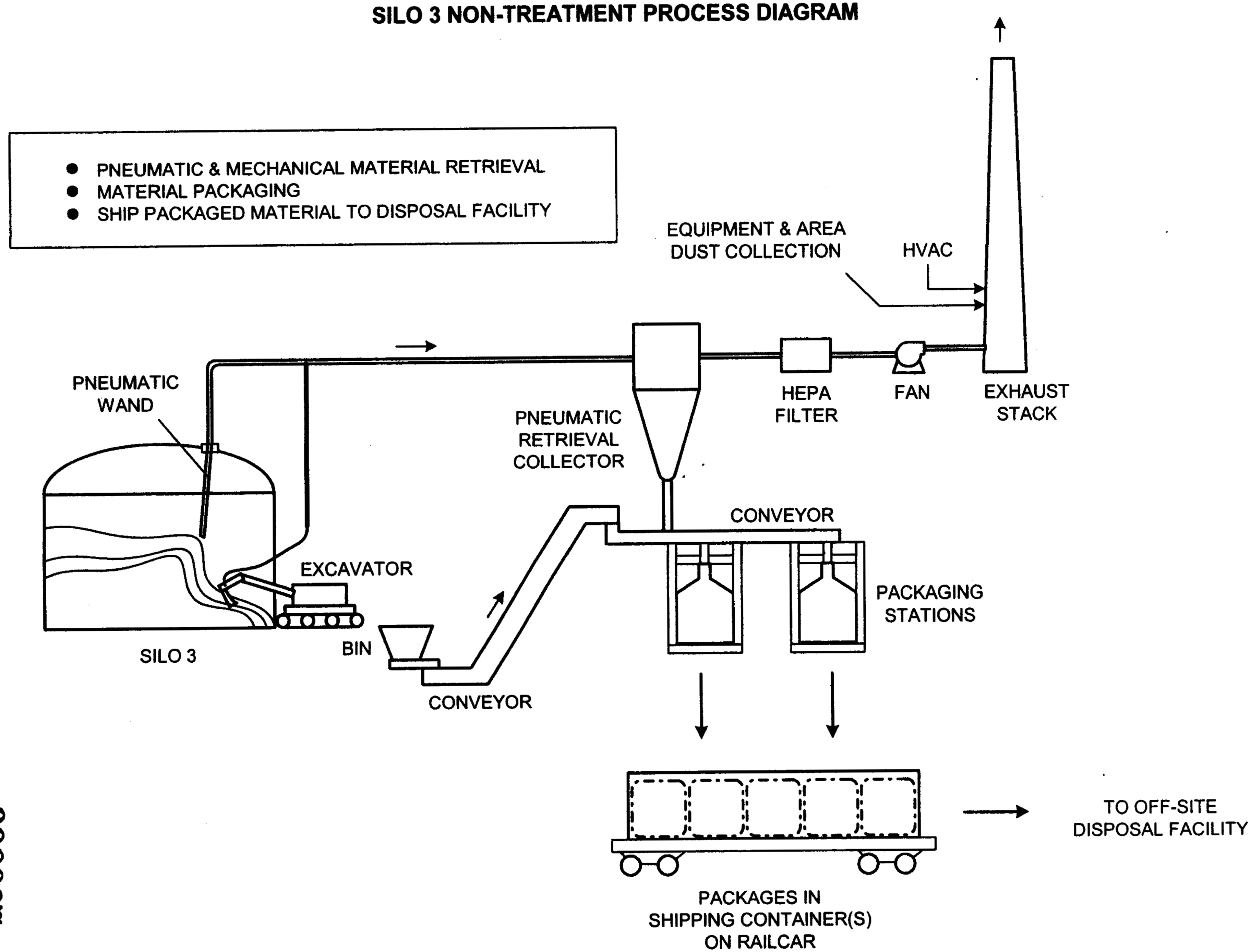
Finally, if treatment for metals is required prior to disposal, the design reflected in this revised RD Package can still be implemented by utilizing offsite treatment in accordance with the current Silo 3 remedy.

The path forward used as a basis for the design reflected in this revised Silo 3 Remedial Design Package is:

- Modification of the current Silo 3 remedy, in accordance with the NCP, to require treatment only if required to meet disposal facility WAC ;
- Pneumatic (vacuum) retrieval of Silo 3 material via silo manways on the silo dome;
- Cutting an opening in the silo sidewall for at-grade access by mechanical equipment;
- Vacuum and/or mechanical retrieval of Silo 3 material using remotely controlled mechanical excavation equipment;
- Packaging of Silo 3 material for transportation to an off-site disposal facility; and
- Transportation, by rail, of packaged Silo 3 material to a permitted commercial disposal facility.
- Any treatment required to meet the WAC of the PCDF, and the requirements of the selected remedy for Silo 3, will be performed at the PCDF and is outside the scope of the design documented in this RD Package.

The design documented in this RD package is summarized in Figure 1.

FIGURE 1
SILO 3 NON-TREATMENT PROCESS DIAGRAM



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PROCESS DESCRIPTION FOR THE SILO 3 PROJECT

Document No. 40430-RP-0003
April 30, 2002
Revision D

FERNALD
Environmental Management Project

Fernald Project Number 40430

Revision	A	B	C	D	
Date	01/11/02	03/15/02	04/11/02	04/30/02	
Prepared By	J.T. Nelson	J.T. Nelson	J.T. Nelson	J.T. Nelson J. T. Nelson	
Checked By	K.D. Rickett	K.D. Rickett	K.D. Rickett	K.D. Rickett K.D. Rickett	
Reviewed By	R. L. Hicks	R. L. Hicks	R. L. Hicks	R. L. Hicks R L Hicks	
Approved By	R. G. Lenyk	R. G. Lenyk	R. G. Lenyk	R. G. Lenyk R G Lenyk	

Revision Sheet

Revision	Date	Pages Affected	Reason for Revision
A	01/11/02	All	Issued for Review
B	03/15/02	All	Issued for Review
C	04/11/02	All	Issued for Review
D	04/30/02	All	Issued for EPA Review

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94X-3900-F-01428	F0001	Material Balance Table	Rev. B
94X-3900-F-01429	F0002	Material Retrieval and Feed Systems	Rev. C
94X-3900-F-01431	F0003	Process Vent and Packaging Systems	Rev. C
94X-3900-F-01430	F0004	Water and Wastewater Systems	Rev. C
94X-3900-F-01432	F0005	Plant, Instrument, and Breathing Air Systems	Rev. B

Piping & Instrument Diagrams:

94X-3900-N-01381	N0001	Piping, Valves, and Miscellaneous	Rev. C
94X-3900-N-01382	N0002	Instrumentation	Rev. C
94X-3900-N-01383	N0003	Equipment and Miscellaneous	Rev. C
94X-3900-N-01433	N0100	Mechanical Retrieval System	Rev. C
94X-3900-N-01434	N0101	Pneumatic Retrieval System	Rev. C
94X-3900-N-01435	N0102	Feed System	Rev. C
94X-3900-N-01436	N0103	Bulk Bag Packaging Line A	Rev. C
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General Arrangement Drawings:

94X-3900-M-01461	M0001	General Arrangement Plot Plan	Rev. B.
94X-3900-M-01463	M0002	General Arrangement East Elevation	Rev. B.
94X-3900-M-01464	M0003	General Arrangement 1st Floor Plan	Rev. B.
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94X-3900-M-01467	M0007	General Arrangement Section A	Rev. B.
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94X-3900-M-01470	M0010	General Arrangement Section D	Rev. B.

ACRONYMS

A&RS	Access and Retrieval Strategy
AWWT	Advanced Wastewater Treatment
BAS	Breathing Air Station
BFP	backflow preventer
CEM	Continuous Emissions Monitor
CO	carbon monoxide
FEMP	Fernald Environmental Management Project
HEPA	high efficiency particulate air
HVAC	heating, ventilation, and air conditioning
P&ID	Piping and Instrument Diagram
PFD	Process Flow Diagram
PVS	Process Vent System
RBDF	Retrieval Bin Discharge Feeder
SAR	supplied-air respirator
ULPA	ultra low penetrating air
UNID	unique identifier
VWMS	Vacuum Wand Management System

1.0 INTRODUCTION

This Process Description describes the process systems and equipment for the Silo 3 Project at the U.S. Department of Energy (DOE) Fernald Environmental Management Project (FEMP) site. As part of the remediation of Operable Unit 4 at the FEMP, approximately 5,100 yd^3 of byproduct metal oxide materials stored in Silo 3 will be removed, packaged, and transported to an off-site facility for treatment and/or disposal.

A separate document, "Access and Retrieval Strategy for the Silo 3 Project" (FEMP 2002a) (A&RS) describes the strategy and equipment used to remove material from Silo 3.

This Process Description describes the following activities:

- Transfer of Silo 3 material from pneumatic and mechanical retrieval systems to the Process Building;
- Packaging of material in containers; and
- Shipping material off site for treatment and/or disposal.

This document provides descriptions of the Silo 3 Project processes and equipment. The systems addressed in this Process Description are shown in Table 1-1.

To meet as low as reasonably achievable guidelines regarding radiation, the systems and equipment used to handle Silo 3 material have features (i.e., containment and ventilation) to reduce exposure of personnel to both the Silo 3 material and to radon (FEMP 2002b).

Table 1-1: Silo 3 System Numbers and Names

System No.	System Name
10	Pneumatic Retrieval System
11	Mechanical Retrieval System
19	Process Vent System
25	Container Management System
40	Plant and Instrument Air System
41	Breathing Air System
50	Process Water System
51	Domestic Water System
62	Wastewater System
70	Supply Air System
71	Exhaust Air System
77	Miscellaneous HVAC
84	Sampling System

HVAC = heating, ventilation, and air conditioning

2.0 MATERIAL TRANSFER SYSTEMS

Material is retrieved from Silo 3 by two systems: pneumatic (Phase 1) and mechanical (Phase 2). The specific retrieval equipment and procedures are described in the A&RS. In general, the pneumatic system is operated first, and continues to operate until it is no longer effective, but at a minimum, until the silo wall can be safely breached to enable mechanical retrieval. Pneumatic retrieval will continue until it is no longer practicable due to inaccessibility by the Vacuum Wand Management System (VWMS) and/or lack of flowability of the material.

This section of the Process Description addresses the transfer of Silo 3 material from each of the retrieval systems to the Process Building.

2.1 PNEUMATIC RETRIEVAL SYSTEM (SYSTEM 10)

The following Process Flow Diagram (PFD) and Piping and Instrument Diagrams (P&IDs) illustrate the Pneumatic Retrieval System:

94X-3900-F-01429	F0002	Material Retrieval and Feed Systems	Rev. C
94X-3900-N-01434	N0101	Pneumatic Retrieval System	Rev. C
94X-3900-N-02369	N0111	Access and Retrieval System	Rev. C

The Pneumatic Retrieval System comprises the following equipment:

- *ENC-10-5020A-E: Vacuum Wand Management Systems A through E*
- *DCL-10-5002: Pneumatic Retrieval Collector*
- *FLT-10-5005: Cartridge Filter*
- *FLT-10-5004: HEPA Filter*
- *BLR-10-5006: Pneumatic Retrieval Blower*
- FLT-10-5070: Supply HEPA Filter
- FDR-10-5104: Pneumatic Retrieval Collector Discharge Feeder
- ROF-10-5108: Primary Rotary Feeder
- ROF-10-5110: Secondary Rotary Feeder
- FDR-10-5102: Feed Conveyor
- BLR-10-5008: Auxiliary Vacuum Blower (see Section 5.6)

(Note: Italics denote pieces of equipment that are not addressed in this document, since they are included in the A&RS.)

In addition to its primary function of removing and transferring Silo 3 material (as discussed in the A&RS), the Pneumatic Retrieval System is also used as a vacuum utility system for: (1) removal of fines from Fines Collection Bins A and B (see Section 4.4.2); and (2) removal of fines from overfilled bags in the Container Management System (see Section 3.3).

Descriptions of each piece of equipment are provided in the following sections.

2.1.1 Supply High Efficiency Particulate Air Filter (FLT-10-5070)

Ventilation air for Silo 3 enters the silo through the Supply High Efficiency Particulate Air (HEPA) Filter (FLT-10-5070) located outside the Process Building. This filter is a precautionary measure to prevent backflow of contaminated dust into the atmosphere, and is used primarily during Phase 1. The filter also supplies sweep air to the Fines Collection Bins (see Section 4.4.2).

2.1.2 Pneumatic Retrieval Collector Discharge Feeder (FDR-10-5104)

The Pneumatic Retrieval Collector Discharge Feeder is a variable-speed screw conveyor that receives Silo 3 material from the collector's wedge-shaped hopper and transports the material to the Feed Conveyor. The feeder uses a variable-pitch screw to ensure material pickup along the entire length of the hopper.

2.1.3 Primary and Secondary Rotary Feeders (ROF-10-5108 and ROF-10-5110)

The Primary and Secondary Rotary Feeders serve as the transfer points between the Pneumatic Retrieval Collector Discharge Feeder and the Feed Conveyor. They act as airlocks between the collector's relatively high vacuum and the Feed Conveyor, which is at ambient pressure.

2.1.4 Feed Conveyor (FDR-10-5102)

The Feed Conveyor receives Silo 3 material from: the Pneumatic Transfer System (via the Secondary Rotary Feeder); and the Mechanical Transfer System via the Inclined Conveyor (see Section 2.2.2).

The conveyor discharges material to both Package Loading Stands (see Section 3.3).

2.2 MECHANICAL RETRIEVAL SYSTEM (SYSTEM 11)

The following PFD and P&ID illustrate the Mechanical Retrieval System:

94X-3900-F-01429	F0002	Material Retrieval and Feed Systems	Rev. C
94X-3900-N-01433	N0100	Mechanical Retrieval System	Rev. C

The Mechanical Retrieval System comprises the following equipment:

- *EXC-11-5050: Excavator*
- HBN-11-5054: Retrieval Bin
- EAR-11-5052: Retrieval Bin Hood
- FDR-11-5106: Retrieval Bin Discharge Feeder
- DFC-11-5056: Inclined Conveyor
- FDR-11-5100: Transfer Conveyor

(Note: Italics denote pieces of equipment that are not addressed in this document, since they are included in the A&RS.)

Descriptions of each piece of equipment are provided in the following sections.

2.2.1 Retrieval Bin and Associated Equipment

Retrieval Bin (HBN-11-5054)

The Retrieval Bin is a rectangular bin located just to the east of the Silo 3 opening. The bin is below grade and has steep sides that allow it to be used as both a chute and a hopper. The bin is covered by grating, which reduces the amount of debris that may drop into the Retrieval Bin Discharge Feeder.

Retrieval Bin Hood (EAR-11-5052)

The Retrieval Bin Hood collects and exhausts air from the Excavator Room using a sweeping action across the Retrieval Bin; air is exhausted to the Process Vent System (PVS) (see Section 4.2.3). The hood is normally operated only during mechanical retrieval operations (Phase 2).

Retrieval Bin Discharge Feeder (FDR-11-5106)

The Retrieval Bin Discharge Feeder (RBDF) is a screw conveyor located beneath the Retrieval Bin. It consists of two 12-in.-diameter, variable-pitch, variable shaft diameter)[1], and variable-speed screws. The feeder delivers Silo 3 material to the Inclined Conveyor (see Section 2.2.3).

The RBDF is a variable-speed conveyor. As such, during Phase 2, it controls the flow rate of material from retrieval to packaging. All downstream conveyors are single-speed, and are designed to operate at capacities equal to or greater than the maximum capacity of the RBDF. Accordingly, these conveyors will often be operated in a "less than fully loaded" condition due to downturns of the RBDF. All conveyors and motors are designed to operate under these conditions.

2.2.2 Inclined Conveyor (DFC-11-5056)

The Inclined Conveyor is a pocketed, sidewall, belt conveyor that receives Silo 3 material from the Retrieval Bin Discharge Feeder. It then transports material upward at a 70-degree angle from horizontal. The conveyor discharges by gravity into a horizontal screw conveyor (Transfer Conveyor, FDR-11-5100; see Section 2.2.3). The Inclined Conveyor is a heavy-duty, carbon-steel unit that is enclosed for dust control. The conveyor uses a flexible corrugated sidewall belt. A cleated belt (in conjunction with a mating top belt) is used to prevent fallback of material during vertical transfer.

The conveyor is vented to the PVS (see Section 4.2.4).

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[1]The variable-pitch and variable shaft diameter features ensure material pickup along the entire length of the Retrieval Bin.

2.2.3 Transfer Conveyor (FDR-11-5100)

The Transfer Conveyor receives Silo 3 material from the Inclined Conveyor (see Section 2.2.2) and transfers it to the Feed Conveyor (FDR-10-5102; see Section 2.1.4). Constraints resulting from the east-west locations of key pieces of equipment create the need for the Transfer Conveyor.

3.0 CONTAINER MANAGEMENT SYSTEM (SYSTEMS 25 AND 84)

(Note: Portions of Section 3.0 are detailed in the specification for Container Management and Packaging System [FEMP 2002e].)

The following PFD and P&IDs illustrate the Container Management and Sampling Systems:

94X-3900-F-01431	F0003	Process Vent and Packaging Systems	Rev. C
94X-3900-N-01436	N0103	Bulk Bag Packaging Line A	Rev. C
94X-3900-N-01437	N0104	Bulk Bag Packaging Line B	Rev. C

The Container Management System allows personnel in the Process Building to perform the following functions:

1. Collect samples of Silo 3 material discharged from the Feed Conveyor (FDR-10-5102)[2];
2. Prepare bags and frames for filling;
3. Dispense Silo 3 material into bags;
4. Perform swipe sampling and labeling of bags;
5. Convey filled bags into the Cargo Container Bay for loading; and
6. Load bags into cargo containers.

The following sections describe the equipment and activities necessary to perform these functions.

3.1 CONTAINER MANAGEMENT EQUIPMENT

The Container Management System comprises the following equipment:

3.1.1 Container Management and Packaging Systems A&B (SKD-25-5250A&B)

- PKU-25-5270A&B: Package Loading Stands A&B.
- RCV-25-5274A&B: Intermediate Packaging Conveyors A&B
- RCV-25-5278A&B: Package Staging Conveyors A&B
- RCV-25-5282A&B: Airlock Conveyors A&B
- RCV-25-5288A&B: Off-Loading Conveyors A&B

3.1.2 Other Transport Equipment

- BRC-25-5280: Bridge Crane
- Cargo containers
- Heavy-duty forklift
- Loading crane
- Rail cars and/or trucks

[2]The sampling function falls under System 84 (Sampling System).

3.1.3 Miscellaneous Equipment

- SSS-84-5252A&B: Packaging Samplers A&B
- EAR-25-5290A&B: Packaging Station Exhaust Hoods A&B
- RDR-05-5918 and –5920: Roll-up Doors 007B and 007C, resp. (fabric)
- RDR-05-5912 and –5914: Roll-up Doors 007E and 007F, resp. (steel)

3.2 PRELIMINARY ACTIVITIES

In preparation for bag-filling operations, the following materials are delivered to the Bagging Room from the Cargo Container Bay:

- 3-yd^3 outer bags;
- 3-yd^3 inner liners;
- Loading frames;
- Pallets; and
- Miscellaneous supplies for sampling, bag closing, bag labeling, cleaning, etc.

Once adequate materials are on hand, the following steps are taken:

1. Inspect bags, pallets, and loading frames. Use swipe sampling to verify that contamination of these items is below acceptable levels .
2. Place a pallet on the Intermediate Packaging Conveyor, and place a loading frame on the pallet.
3. Place an outer bag with inner liner in the loading frame.
4. Move the entire assembly onto the Package Loading Stand. Each of the two Package Loading Stands is a semiautomated system with loading spouts; loading stands; components to allow elevating, lowering, and vibrating of bags; weighing scales; and motorized roller conveyors for transporting the filled bags away from the station.
5. Lower the loading spout and attach the inner liner to the spout. The loading spout is equipped with a sealing mechanism to seal the interior of the inner liner to the exterior of the loading spout; this minimizes the possibility of material release to the Packaging Area atmosphere.
6. Inflate the inner liner using the pre-inflator. (To improve the stability of filled bags, a pre-inflator blower supplies air to remove wrinkles and folds from the liner before filling.)

3.3 FILLING OPERATIONS

Once the steps in Section 3.2 are completed for a given packaging station, the following actions are performed:

1. Open the appropriate discharge valve on the Feed Conveyor.

2. Allow Silo 3 material to flow by gravity through the loading spout and into the bag. Bags are filled evenly, consolidating materials at the corners to assure a flat bottom. A densification system, consisting of a thumper table, is used to assist in filling.
3. Activate the deaerator vent line to remove air from the bags as they are being filled; displaced air is vented to the PVS (see Section 4.2.5).
4. When the bag is full (FEMP 2002c), close the appropriate discharge valve on the Feed Conveyor.

3.4 SAMPLING OPERATIONS

Silo 3 material is sampled just above the loading spout. In-line composite sampling of selected batches is performed using an automatic thief sampling device (i.e., SSS-84-5252A&B, Packaging Samplers A&B), which is repeatedly inserted into the line as solids are flowing.

Samples are withdrawn and deposited into sample containers. The sampler is deactivated as soon as the bag is full. Samples are analyzed for compliance with the treatment/ disposal facility's waste acceptance criteria. FEMP has developed a Sampling and Analysis Plan (FEMP 2002d).

3.5 BAG-CLOSING OPERATIONS

After the bag is filled and the inner liner is deaerated, the following actions are performed:

1. Heat-seal and cut the neck of the inner liner.
2. Detach the inner liner from the loading spout.
3. Raise the loading spout.
4. Transport the bag assembly (i.e., bag, bag frame, and pallet) away from the Package Loading Stand and onto the Intermediate Packaging Conveyor.
5. Position the outer bag flaps and fasten the straps.
6. Disassemble the loading frame and remove it from the bag.

3.6 BAG SURVEYING, DECONTAMINATION, AND LABELING OPERATIONS

After the bag is filled and closed, the bag assembly is moved to the Package Staging Conveyor, where swipe sampling is performed on the top and all four sides. Any surface not passing the swipe test is manually cleaned in place and resampled until it passes the test. Bags are then labeled with the following information:

- Date
- Time of day
- Unique bag identifier (UNID)
- Weight (net and gross)

As analytical results become available (see Section 3.4), this information is either added to the label, or filed electronically by the bag's UNID. Labeled bags are then transported to the Cargo Container Bay via the following steps (for Packaging Line A):

1. Verify that Roll-up Door 007E (RDR-05-5912) is closed, and open Roll-up Door 007B (RDR-05-5918).
2. Activate Package Staging Conveyor A (RCV-25-5278A) and Airlock Conveyor A (RCV-25-5282A) to move bag into airlock. Limit switches automatically deactivate the conveyors once the bag is in place.
3. Close Roll-up Door 007B (RDR-05-5918) and open Roll-up Door 007E (RDR-05-5912).
4. Activate Airlock Conveyor A (RCV-25-5282A) and Off-Loading Conveyor A (RCV-25-5288A) to move bag into Cargo Container Bay. Limit switches automatically deactivate the conveyors once the bag is in place.

3.7 BAG TRANSPORT OPERATIONS

From the Container Management and Packaging System, the bags are transferred into open-top cargo containers by the Bridge Crane (BRC-25-5280) and lifting frame assembly, which picks up the bags by their straps, transports them to the cargo container, and sets them in place.

The pallets, which will be either plastic or metal construction, are returned to the Packaging Area for reuse. This is accomplished either by reversing the appropriate conveyors or by a portable cart.

Once a cargo container is loaded with bags, a heavy-duty forklift is used to transport it to a staging area, where either a crane or forklift places the cargo containers on either a rail car or a truck.

The material is then transported by either rail or truck to an off-site facility for treatment and/or disposal.

4.0 PROCESS VENT SYSTEM (SYSTEM 19)

4.1 INTRODUCTION

The following PFD and P&IDs illustrate the Process Vent System:

94X-3900-F-01431	F0003	Process Vent and Packaging Systems	Rev. C
94X-3900-N-01439	N0106	Process Vent System, Sheet 1 of 2	Rev. C
94X-3900-N-01440	N0107	Process Vent System, Sheet 1 of 2	Rev. C

The PVS is a collection and filtration system for process vent streams from the Silo 3 Project. These streams are associated with the retrieval and containerization of Silo 3 material and are potentially contaminated with radon and/or dust. The major process components being vented are located within the Silo 3 Excavator Room and in the Packaging Area. Filters and exhaust fans are located outside the Process Building. The streams collected by the PVS pass through filter housings that contain 35 percent and 90 percent "roughing" filters, HEPA filters, and ultra low penetration air (ULPA) units. These streams are routed to the Exhaust Stack, where they are isokinetically sampled and discharged to the atmosphere.

The PVS is designed to:

- Remove radon and particulate-laden air from the various system components;
- Reduce radon and particulate concentrations in processing areas; and
- Detect and measure releases to the atmosphere.

Contaminated gases and dust are drawn through the PVS by redundant centrifugal fans (FAN-19-5206A&B). The fans and associated ductwork are designed to maintain appropriate vacuum levels in the silo and processing equipment. Automatic dampers allow for changeover of PVS process trains; manual dampers are provided for system isolation and balancing.

The fans are located downstream of the Process HEPA filters to maintain an induced draft in the process sources.

The total design airflow for the PVS is approximately 5,500 standard cubic ft per minute (scfm). Gases from the following sources are transferred to the PVS:

- Silo 3;
- Vacuum Wand Management Systems A-E (ENC-10-5020A-E) (Phase 1 only);
- Excavator Room Hood (EAR-11-5053);
- Retrieval Bin Hood (EAR-11-5052);
- Inclined Conveyor (DFC-11-5056); and
- Packaging Station Exhaust Hoods A&B (EAR-25-5290A&B).

Each of these sources is described in detail in Section 4.2.

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4.2 PROCESS VENT SYSTEM SOURCES

During Phase 1, when the Pneumatic Retrieval System is operational, the PVS does not receive exhaust air from the silo. An exception to this is when spoolpieces are being added to the VWMS. In addition, exhaust air from the Excavator is "clean" since there has been no intrusion into the silo, and no dust is being generated by mechanical activities associated with mechanical retrieval. Air from the Excavator Room is exhausted to the PVS only to maintain desired pressure-containment boundaries between the room and the Process Building.

As a result, PVS solids loading during Phase 1 is much lower (essentially negligible) than during Phase 2.

4.2.1 Silo 3

During Phase 1 operations, air associated with pneumatic retrieval operations is pulled through both the Supply HEPA Filter and the VWMS containment box (see A&RS, Section 3.2), where it enters the silo through the manway on which the box is located.

Ventilation air from Silo 3 is exhausted to the PVS during mechanical retrieval (Phase 2); VWMS maintenance, manipulation, and extension activities (Phase 1); and nonoperational periods (i.e., evenings, weekends, and other system downtimes). During pneumatic retrieval (Phase 1), exhaust air from Silo 3 to the PVS is sporadic.

During Phase 2 operations, ventilation air for Silo 3 enters the silo from the Excavator Room (see Section 4.2.3), and is exhausted to the PVS.

Manual dampers control the flow of air from Silo 3.

4.2.2 Vacuum Wand Management Systems A-E (ENC-10-5020 A-E)

During Phase 1, air is exhausted from one of the five VWMSs to allow extension of the wands while maintaining a negative pressure within the containment, and thus minimizing the spread of contamination during wand extensions and maintenance activities.

Exhaust ports are located on the VWMSs, which are connected to the Silo 3 exhaust duct. Exhaust air is withdrawn from the operating VWMS during Phase 1 off-hours. Manual dampers control the flow of air from the operating VWMS.

4.2.3 Excavator Room Hood (EAR-11-5053)

The Excavator Room Hood is elevated and positioned near the silo wall opening, and is connected to the PVS. It is used to limit contamination transfer during silo intrusion by capturing both saw cuttings and Silo 3 dust generated during the cutting of the Silo 3 wall to prepare for mechanical retrieval operations (see A&RS, Section 5.2). The hood can be used to transfer most of the exhaust air associated with pressure boundary management in the Excavator Room during Phase 1. A manual damper controls the flow of air from the Excavator Room Hood.

4.2.4 Retrieval Bin (HBN-11-5054) and Retrieval Bin Discharge Feeder (FDR-11-5106)

Air from both the Retrieval Bin and the Retrieval Bin Discharge Feeder is swept across the bin opening; this air is captured by the Retrieval Bin Hood (EAR-11-5052), which exhausts the air to the PVS. The hood is operated only during mechanical retrieval operations (Phase 2). A manual damper controls the flow of air from the Retrieval Bin Hood.

4.2.5 Inclined Conveyor (DFC-11-5056)

The Inclined Conveyor is contained within an enclosure that is exhausted to the PVS through rigid connections on both the top (head section) and the bottom (tail section) of the enclosure. The exhaust port on the upper portion of the Inclined Conveyor is operational during both Phase 1 and Phase 2. During Phase 1, air withdrawn from the upper exhaust port by the PVS serves to maintain a slight negative pressure on the downstream conveyors. During Phase 2, the PVS withdraws air through both the upper and lower exhaust ports to both maintain dust suppression and a pressure boundary within the Inclined Conveyor enclosure. Manual dampers control the flow of air from the conveyor.

4.2.6 Container Management System

Sweep air associated with the two Package Loading Stands is captured by Package Station A&B Exhaust Hoods (EAR-25-5290A&B). The hoods are located in positions that allow the sweep air being pulled across the bulk bags to migrate away from Operations personnel. Displacement air associated with bulk-bag filling is expelled from the loading spouts into the individual exhaust hoods. In addition, air from the bag deaeration systems is expelled into the hoods and/or the PVS ducting. The hoods are in operation during both pneumatic and mechanical retrieval operations. Manual dampers control the flow of air from the hoods.

4.3 PROCESS VENT SYSTEM EQUIPMENT

The PVS comprises the following equipment:

- DCL-19-5202A&B: Process Vent Dust Collectors A&B
- HBN-19-5205A&B: Fines Collection Bins A&B
- FLT-19- 5204A&B: Process HEPA Filters A&B
- FAN-19-5206A&B: Process Exhaust Fans A&B
- STK-19-5209: Exhaust Stack
- CEM-19-5208: Continuous Emissions Monitor

4.4 PROCESS VENT SYSTEM OPERATION

4.4.1 Process Vent Dust Collectors (DCL-19-5202 A&B)

Ventilation air from each of the sources listed in Section 4.2 is combined into a common duct header, which flows to Process Vent Dust Collector A. The dust collector acts as a primary filter, thus reducing HEPA loading. To prevent shutdown of the PVS, an additional dust collector (Process Vent Dust Collector B) is included as a standby. Each of the dust collectors is designed for approximately 6,000 scfm at a pressure rating of approximately 1 psig vacuum. Both dust collectors are supplied with support legs, access ladders and platforms, pneumatic cleaning systems, and clean-air plenums. Fines are discharged from the dust collectors through normally-open valves, and collect in the Fines Collection Bins.

4.4.2 Fines Collection Bins A&B (HBN-19-5205A&B)

The Fines Collection Bins are located at the bottoms of the Process Vent Dust Collectors. They provide accumulation capacity for dust-collector fines and the means to transfer fines to the Pneumatic Retrieval System (see Section 2.1). At a predetermined level of fines in a given bin, the following steps are performed. (Note: These steps are for DCL-19-5202A and HBN-19-5205A, but also apply to DCL-19-5202B and HBN-19-5205B.):

1. Close fines discharge valve from DCL-19-5202A.
2. Start up Auxiliary Vacuum Blower (if Pneumatic Retrieval System is not already operating) (see Section 5.6).
3. Open line to the Supply HEPA Filter.
4. Empty HBN-19-5205A by opening line to the inlet side of the Pneumatic Retrieval Collector (DCL-10-5002).
5. After a predetermined time, close both the line to the Supply HEPA Filter and the line to the Pneumatic Retrieval Collector and open the fines discharge valve on DCL-19-5202A.

The Fines Collection Bins and all associated piping and valves are rated for the increased vacuum exerted by the Pneumatic Retrieval System.

4.4.3 Process HEPA Filters (FLT-19-5204A&B)

Air exiting the dust collectors enters a single duct that is connected to redundant Process HEPA Filters. These units include: "roughing" filters (35 and 90 percent); HEPA filters; ULPA filters; in-place test sections; and transition pieces. Filter housings for the HEPA/ULPA filters are stainless steel, side access, "bag-in/bag-out" housings[3] with in-place test sections. Only one filter train is operated at a time, allowing filter changeouts for the off-line unit.

4.4.4 Process Exhaust Fans (FAN-19-5206A&B)

After exiting the Process HEPA Filter, the filtered air stream enters one of two Process Exhaust Fans for discharge through the Exhaust Stack. The fans are single-stage centrifugal fans. Each of the fans is rated at approximately 6,000 scfm at 30 in. water gauge total static head.

[3]The "bag-in/bag-out" feature minimizes the potential of releases during filter changes.

4.4.5 Exhaust Stack (STK-19-5209) and Isokinetic Stack Monitor (CEM-19-5208)

The PVS includes a carbon-steel stack. The maximum airflow through the stack is approximately 10,900 scfm, with 5,500 scfm coming from the PVS. The stack has connections for the PVS process duct, the Pneumatic Retrieval System duct (see Section 2.1), and the Exhaust Air System duct (see Section 5.1.3).

A Continuous Emissions Monitor (CEM) (CEM-19-5208) samples and analyzes the exhaust air. At an elevation approximately 70 ft above grade, a sampling rake is inserted into the stack and is attached to a sampling line. The sample travels through the line down to the CEM, where radon is continuously measured. The air is also filtered, and an alpha-sensitive detector near the filter paper gives real-time indications of the concentrations of alpha-emitting particulates in the stack air. On a periodic basis, samples of the filter paper are taken to a fixed-base laboratory for confirmatory analyses of both radionuclides and heavy metals.

Exhaust air from the CEM travels back to the sampling-rake location and is reinjected into the stack.

In the event that an out-of-parameter condition is detected, an alarm is annunciated and appropriate action is taken, such as switching the HEPA filters or shutting down the PVS entirely.

Sampling ports for manual sampling are provided above the sampling rake ports. These ports are used periodically to obtain a representative sample of the air stream for compliance purposes.

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5.0 SUPPORT SYSTEMS

5.1 HEATING, VENTILATION, AND AIR CONDITIONING

This section addresses both the Supply Air System (System 70) and the Exhaust Air System (System 71). It also discusses the heating, ventilation, and air conditioning (HVAC) systems for the Silo Enclosure and the Cargo Container Bay (Miscellaneous HVAC system, System 77), the trailers, and the CEM Building.

The current HVAC flow diagrams illustrate Systems 70, 71, and 77.

5.1.1 Rooms and Areas Serviced by HVAC Systems

In cascade systems, air is channeled from one room/area to another in a set sequence. For a radiological facility such as Silo 3 and related buildings, supply air flows from "clean" to "dirty" rooms/areas.

Room/area names and numbers, and their relationships to the cascade system, are provided in **Table 5-1**.

Table 5-1: Silo 3 Rooms/Areas, and Related HVAC Information

Room/Area Number	Room/Area Name	Occupancy Status	Part of Cascade System (Yes/No)
001	Entry Corridor	Not regularly	Yes
002	Corridor	Yes	Yes
003	Airlock/Doff	Not regularly	Yes
004	Packaging Area	Yes	Yes
005	Storage Area	No	No
006	Wastewater Tank Area	No	No
007	Airlock	Not regularly	Yes
008	Excavator Service Room	No	Yes
009	Excavator Room	No	Yes
010	Silo Enclosure	Yes (during Phase 1)	No
011	Cargo Container Bay	Yes	No

5.1.1.1 Process Building

The Process Building is heated and cooled via a push-pull cascade ventilation system (see Section 5.1.2). Occupied areas are maintained between 68 and 72°F. Unoccupied areas are maintained below 103°F; minimum temperatures, if any, vary with the room or area.

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5.1.1.2 Silo Enclosure

Silo 3 is completely enclosed by a fabric structure; design details are provided in the A&RS, Section 5.1. Air is supplied to the enclosure through four louver/dampers equipped with roughing filters. Because of its classification as a Radiological Buffer Area, exhaust air from the Silo Enclosure is not HEPA-filtered, but is directed to the atmosphere by the Silo Enclosure Exhaust Fan (FAN-77-5780). There are no provisions for heating the Silo Enclosure.

5.1.1.3 Cargo Container Bay

The Cargo Container Bay is ventilated by a dedicated air-handling unit with roughing filters (Air Handling Unit, Cargo Container Bay; AHU-77-5737). Exhaust air is directed to the atmosphere by three roof-mounted exhaust fans (Cargo Container Bay Exhaust Fans A, B, and C; FAN-77-5790 A, B, and C). Spot radiant heaters (Electric Heater Units A, B, and C, Cargo Container Bay; HTR-77-5740 A, B, and C) are provided in the Cargo Container Bay's work areas for personnel comfort.

5.1.1.4 Trailers

The Operations Support Trailer and the Change Room Trailer are heated and cooled by independent HVAC units, which can be either roof- or pad-mounted. The units are designed for 100 percent, filtered outside air delivery to the conditioned spaces to maintain room temperatures between 68 and 80°F.

5.1.1.5 CEM Building

Because of the temperature sensitivity of its instrumentation, the CEM Building is heated and cooled by an independent HVAC unit. The unit is designed for 100 percent, filtered outside air delivery to maintain a constant room temperature of 74°F.

5.1.1.6 Wastewater Tank Area and Storage Area

The Wastewater Tank Area (006) and the Storage Area (005) are adjacent and, as shown in Table 5-1, neither area is occupied or on the cascade system. Air is supplied to both areas through two louver/dampers equipped with roughing filters. Exhaust air from the two areas is directed to the atmosphere by two exhaust fans (Storage and Wastewater Tank Area exhaust Fans A&B; FAN-77-5792A&B). There are no provisions for heating either of the two areas.

5.1.2 Supply Air System (System 70)

The Supply Air System comprises package Air Conditioning Units 1, 2, and 3 (ACU-70-5700, -5710, and -5720). These units draw in ambient air, heat or cool the air (as dictated by ambient conditions), and distribute it to various "clean," normally occupied rooms/areas at the head end of the cascade ventilation system.

In addition to the Air Conditioning Units, electric heaters are provided in various rooms and areas to ensure that minimum temperatures are maintained during extremely cold periods. These heaters are as follows:

- HTR-70-5730 A, B, C, and D: Electric Heaters A, B, C, and D, Packaging Area 004

- HTR-70-5732: Electric Heater Entry Corridor 001
- HTR-70-5734A&B: Electric Heaters A&B Airlock 007
- HTR-70-5735: Electric Heater Airlock/Doff 003

5.1.3 Exhaust Air System (System 71)

Air from "clean" rooms/areas is drawn into those rooms/areas with a higher potential for contamination. Exhaust air is finally directed to the HEPA filters and discharged to the Exhaust Stack.

The Exhaust Air System comprises: Building Filtration Exhaust Fans A&B (FAN-71-5760A&B); and Building ULPA/HEPA Exhaust Modules A&B (FLT-71-5770 A&B).

The building ventilation/exhaust system collects air streams from all rooms and areas on the cascade system (see **Table 5-1**), and routes them through a system of galvanized steel ductwork to HEPA filter banks. Each of the two HEPA filters (FLT-71-5770A&B) includes roughing filters, HEPA filters, ULPA filters, in-place test sections, and transition pieces. Filter housings for the HEPA filters are stainless steel, side-access, "bag-in/bag-out" housings[4].

Each of the two filter trains is sized for 100 percent airflow (i.e., approximately 4,200 scfm); one train is standby. Air is pulled through the filter train by one of two 100 percent centrifugal fans (FAN-71-5760A&B). Exhaust air is discharged from the fans to the Exhaust Stack (see Section 4.4.5).

5.2 PLANT AND INSTRUMENT AIR SYSTEM (SYSTEM 40)

The following PFD and P&IDs illustrate the Plant and Instrument Air System:

94X-3900-F-01432	F0005	Plant, Instrument, and Breathing Air Systems	Rev. B
94X-3900-N-01441	N0108	Plant Air System	Rev. C
94X-3900-N-01442	N0109	Instrument Air System	Rev. C

The Plant and Instrument Air System provides both compressed and instrument-quality air for various end users, including VWMS air-jet nozzles, baghouse and cartridge filter pulse jets, packaging stations, air-operated valves, and miscellaneous instrumentation.

5.2.1 Plant/Instrument Air Compressor Skid (SKD-40-5300)

The Plant/Instrument Air Compressor Skid is a fully self-contained, structural steel skid unit. All components are purchased piped and wired and ready for installation upon receipt. The skid comprises the following equipment:

- ACP-40-5320A&B: Air Compressor A&B
- SKD-40-5302: Refrigeration Dryer Skid
- ART-40-5308: Plant Air Receiver Tank

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[4] The "bag-in/bag-out" feature minimizes the potential of releases during filter changes.

- Miscellaneous filters, aftercoolers, traps, etc.

Air from the Plant/Instrument Air Compressor Skid flows to the Plant Air Receiver Tank. This tank feeds air to both the Instrument Air Dryer Skid and the various plant air users.

5.2.2 Instrument Air Dryer Skid (SKD-40-5304)

The Instrument Air Dryer Skid is a fully self-contained, structural steel skid unit requiring only one electrical power connection and one instrument air piping connection. All components are purchased piped and wired and ready for installation upon receipt. The skid comprises the following equipment:

- ADR-40-5312A&B: Desiccant Vessels A&B
- ART-40-5310: Instrument Air Receiver Tank
- Miscellaneous filters, traps, etc.

Air from the Instrument Air Dryer Skid flows to the Instrument Air Receiver Tank, which in turn supplies air to the various instrument air users.

5.3 BREATHING AIR SYSTEM (SYSTEM 41)

The following PFD and P&IDs illustrate the Breathing Air System:

94X-3900-F-01432	F0005	Plant, Instrument, and Breathing Air Systems	Rev. B
94X-3900-N-01443	N0110	Breathing Air System	Rev. C

Because of the relatively high levels of contamination in some areas of the Silo 3 Project site, workers may need supplied air. Configuration of the Breathing Air System is similar to that of the Plant and Instrument Air System, with the addition of an activated-carbon filter and a carbon monoxide (CO) monitor. Also, the compressors are oilless (i.e., not oil-injected).

5.3.1 Breathing Air System Equipment

The Breathing Air System comprises the equipment listed in the following sections:

5.3.1.1 Breathing Air Compressor Skid (SKD-41-5350)

The Breathing Air System Compressor Skid is a fully self-contained, structural steel skid unit requiring only one electrical power connection and one air piping connection. All components are purchased, piped, and wired, ready for installation upon receipt. The skid comprises the following equipment:

- ACP-41-5360A&B: Breathing Air Compressors A&B
- ART-41-5352A&B: Breathing Air Receiver Tank A&B
- Miscellaneous filters and coolers

5.3.1.2 Breathing Air Conditioning Skid (SKD-41-5356)

The Breathing Air Conditioning Skid is a fully self-contained, structural steel skid unit. All components are purchased piped and wired and ready for installation upon receipt. The skid comprises the following equipment:

- SKD-41-5354: Refrigeration Dryer Skid

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- Afterfilter with activated carbon
- CO monitor
- Miscellaneous filters, coolers, traps, etc.

5.3.2 Breathing Air System Operation

Supplied-air respirator (SAR) hoods are available for personnel required to enter supplied-air areas for operational or maintenance purposes. Breathing air is supplied to the SAR hoods by individual breathing air stations (BASs). Depending on their locations, the BASs will be located either inside or outside of the supplied-air areas. To minimize worker discomfort during breathing air usage, provisions are in place for moisture addition to the dry air from the Breathing Air Conditioning Skid.

Personnel entering supplied-air areas are fitted with SAR hoods, filtering respirators, and other appropriate personal protective equipment; they also carry the necessary length of hose. Personnel remain attached to either the filtering respirator or the BAS until they leave the supplied-air area and enter a doffing area.

5.4 PROCESS WATER AND DOMESTIC WATER SYSTEMS (SYSTEMS 50 AND 51)

The following PFD and P&ID illustrate both the Process Water System and the Domestic Water System:

94X-3900-F-01430	F0004	Water and Wastewater Systems	Rev. C
94X-3900-N-01438	N0105	Wastewater System	Rev. C

Water is supplied to the Process Building, Excavator Room, and Excavator Service Room from an existing domestic-water main; this main divides into two branches.

One branch passes through a backflow preventer (BFP) and becomes the Process Water System (System 50). This system supplies water to Wastewater Tanks A&B (TNK-62-5600A&B) for such purposes as flushing and suspension of solids (see Section 5.5).

The other branch (which does not pass through a BFP), becomes the Domestic Water System (System 51). This system supplies water to: showers and eyewash stations in the Process Building; and utility hose connections in both the Process Building and the Excavator Service Room.

There is no process equipment associated with either system.

5.5 WASTEWATER SYSTEM (SYSTEM 62)

The following PFD and P&ID illustrate the Wastewater System:

94X-3900-F-01430	F0004	Water and Wastewater Systems	Rev. C
94X-3900-N-01438	N0105	Wastewater System	Rev. C

5.5.1 Wastewater System Equipment

The Wastewater System comprises the following equipment:

- PMP-62-5642: Excavator Room Sump Pump
- PMP-62-5404: Excavator Service Room Sump Pump

- PMP-62-5604: Wastewater Tank Area Sump Pump
- TNK-62-5600A&B: Wastewater Tanks A&B
- MXA-62-5602A&B: Wastewater Tank Agitators A&B
- PMP-62-5606A&B: Wastewater Pumps A&B

5.5.2 Wastewater System Operation

Both the Excavator Room Sump Pump and the Excavator Service Room Sump Pump are located in concrete sumps in their respective rooms. The rooms' floors are sloped to drain into the sumps. Infrequently, water may enter the sumps as a result of washdown and/or excessive misting. At such times, the pumps transfer water to either of the Wastewater Tanks.

The Wastewater Tank Area Sump Pump picks up leakage and spillage from the curbed area surrounding the Wastewater Tanks, and transfers it into either of the tanks. For rooms/areas without sumps (mainly the Packaging Area), floor drains are provided to transfer wastewater to the Wastewater Tank Area Sump.

The Wastewater Tanks are configured in parallel; both tanks receive water from the three sumps mentioned above, as well as from the Process-Water line (see Section 5.4).

Wastewater Tank Agitators and Wastewater Pumps are provided for the two tanks. Once the level in a given Wastewater Tank reaches a preset high value, input from all sources is diverted to the other tank. The tank's contents are then sampled and analyzed. Arrangements are made with Advanced Wastewater Treatment (AWWT) personnel to transfer the tank's contents to the AWWT. This is accomplished by using either of the two Wastewater Pumps to transfer wastewater to a tanker truck.

5.6 UTILITY VACUUM SYSTEM[5]

The following PFD and P&ID illustrate the Utility Vacuum System:

94X-3900-F-01429	F0002	Material Retrieval and Feed Systems	Rev. C
94X-3900-N-01434	N0101	Pneumatic Retrieval System	Rev. C

Periodically, the Utility Vacuum System is needed for: (1) Removal of fines from the Fines Collection Bins in the PVS (see Section 4.4.2); and (2) Removal of material from overfilled bags in the Packaging Area (see Section 3.3).

If the Pneumatic Retrieval System is in operation (i.e., during Phase 1), vacuum is supplied to these users by the Pneumatic Retrieval Blower (BLR-10-5006). If the Pneumatic Retrieval System is not in operation (i.e., during Phase 2 and downtimes), both the capacity and draft of the Pneumatic Retrieval Blower make it impractical to operate for the sole use of these low-volume, periodic users. Instead, the Auxiliary Vacuum Blower (BLR-10-5008) is brought on line to supply the needs of these other systems. In such

[5]The Utility Vacuum System is not an "official" system (i.e., not included in Table 1-1), but is an adjunct to the Pneumatic Retrieval System.

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cases, the following Pneumatic Retrieval System equipment is also brought on line (see Section 2.1):

- DCL-10-5002: Pneumatic Retrieval Collector
- FDR-10-5104: Pneumatic Retrieval Collector Discharge Feeder
- ROF-10-5108: Primary Rotary Feeder
- ROF-10-5110: Secondary Rotary Feeder

6.0 REFERENCES

1. FEMP, *Access and Retrieval Strategy for the Silo 3 Project*, Document No. 40430-PL-0002, Rev. 0, April 2002a.
2. FEMP, *Occupational ALARA Plan for Silo 3*, Document No. 40430-PL-0007, Rev. 0, April 2002b.
3. FEMP, *Process Control Summary for the Silo 3 Project*, Document No. 40430-PL-0004, Rev. 0, April 2002c.
4. FEMP, *Sampling and Analysis Plan for Silo 3 Material*, Document No.40430-PL-0009, Rev. B, April 2002d.
5. FEMP, *Specification No. ES-JM-RCV-25-5270 for Container Management and Packaging System*, Document No. 40430-ES-JM-RCV-25-5270, Rev. 0, April 2002e.

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ACCESS AND RETRIEVAL STRATEGY FOR THE SILO 3 PROJECT

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Revision C

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Prepared By	Eugene C. Sabo	J. T. Nelson	J. T. Nelson J T Nelson		
Checked By	James Nelson	R.L. Hicks	R.L. Hicks R L Hicks		
Reviewed By	Craig Smith	K.D. Rickett	K.D. Rickett K.D. Rickett		
Approved By	Jerry Van Fossen	R. G. Lenyk	R. G. Lenyk RGLenyk		

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Revision Sheet

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REFERENCE DRAWINGS:

Process Flow Diagrams:

94X-3900-F-01428	F0001	Material Balance Table	Rev. B
94X-3900-F-01429	F0002	Material Retrieval and Feed Systems	Rev. C
94X-3900-F-01431	F0003	Process Vent and Packaging Systems	Rev. C
94X-3900-F-01430	F0004	Water and Wastewater Systems	Rev. C
94X-3900-F-01432	F0005	Plant, Instrument, and Breathing Air Systems	Rev. B

General Arrangement Drawings:

94X-3900-M-01461	M0001	General Arrangement Plot Plan	Rev. B.
94X-3900-M-01463	M0002	General Arrangement East Elevation	Rev. B.
94X-3900-M-01464	M0003	General Arrangement 1st Floor Plan	Rev. B.
94X-3900-M-01465	M0004	General Arrangement Plan at EL 597'-8"	Rev. B.
94X-3900-M-01467	M0007	General Arrangement Section A	Rev. B.
94X-3900-M-01468	M0008	General Arrangement Section B	Rev. B.
94X-3900-M-01469	M0009	General Arrangement Section C	Rev. B.
94X-3900-M-01470	M0010	General Arrangement Section D	Rev. B.

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ACRONYMS

A&RS	Access and Retrieval Strategy
CCTV	close-circuit television
DOE	U.S. Department of Energy
FEMP	Fernald Environmental Management Project
FMPC	Feed Materials Production Center
HEPA	high efficiency particulate air
nd	not dated
PPE	personal protective equipment
PVS	Process Vent System
RCRA	Resource Conservation and Recovery Act of 1976
TSR	Technical Safety Requirements
ULPA	ultra low penetrating air
VWMS	Vacuum Wand Management System

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1.0 INTRODUCTION

This Access and Retrieval Strategy (A&RS) document describes the strategies, systems, and equipment for accessing and retrieving material from Silo 3. The silo is located at the U.S. Department of Energy (DOE) Fernald Environmental Management Project (FEMP) site in Fernald, Ohio.

The A&RS is limited to access and retrieval operations only and is not intended to describe the subsequent handling, packaging, and transport of the Silo 3 material. These activities are covered in the *Process Description for the Silo 3 Project* (FEMP 2002).

1.1 OVERVIEW OF ACCESS AND RETRIEVAL SYSTEMS

1.1.1 Preliminary Activities

Access and retrieval of the Silo 3 material will be accomplished by both pneumatic and mechanical systems. Before the silo is accessed, radon concentrations in the silo headspace will be reduced to acceptable levels (see Section 2.1). In preparation for mechanical retrieval, a reinforced concrete framework will be installed on the east silo wall, and a section of the silo wall will be removed (see Section 5.2).

1.1.2 Pneumatic Retrieval System (System 10)

Pneumatic retrieval involves vacuuming material through the existing top manways on Silo 3. In addition to extracting material, the system is used to remove material behind the silo wall prior to cutting an opening in the wall in preparation for mechanical excavation. The Pneumatic Retrieval System then transfers the material to the Process Building Packaging Area. These activities are referred to as "Phase 1" of the retrieval process.

1.1.3 Mechanical Retrieval System (System 11)

In addition to pneumatic retrieval, a mechanical excavator is used to access and remove the compacted material from Silo 3. The excavator transfers Silo 3 material to a bin located in the Excavator Room. A screw conveyor integral to the bin feeds the material to the Process Building Packaging Area. These activities are referred to as "Phase 2" of the retrieval process.

It is expected that the mechanical excavator will also be used to manipulate a vacuum hose end effector to retrieve material in a similar fashion to pneumatic retrieval (Section 1.1.2).

1.2 SILO 3 MATERIAL

Silo 3 contains metal oxide material generated from the operation of the former Feed Materials Production Center (FMPC), now known as the FEMP.

1.2.1 History of Generation of Silo 3 Material

Raffinate streams from FMPC's solvent extraction process were dewatered using rotary vacuum filters. The filtrate streams were then processed through evaporators, and the evaporator concentrates were further processed using either a spray calciner or a rotary calciner. From plant startup through the mid-1950s, a spray calciner processed the concentrates. Approximately 35 percent of the Silo 3 material is believed to have come from this process. Because of operational difficulties with the spray calciners, a rotary calciner process was implemented. In this process, the evaporator concentrates were transferred to a drum dryer and, finally, to a rotary calciner. The calciner removed residual liquids and converted the metal nitrates to metal oxides. The resulting fine powdered metal oxides were pneumatically transferred to Silo 3 for storage. Transfer of all materials into Silo 3 continued until 1957.

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1.2.2 Quantity and Characteristics of Silo 3 Material

Approximately 5,088 yd^3 of metal oxide material reside in Silo 3. The predominant radionuclide of concern is thorium-230, which is produced from the natural decay of uranium-238. Silo 3 material is classified as 11(e)(2) byproduct material under the Atomic Energy Act of 1954, as amended, and contains several Resource Conservation and Recovery Act of 1976 (RCRA) metals. Silo 3 material is specifically exempt from regulation as a hazardous waste under RCRA because of its classification as 11(e)(2) byproduct material.

Based on historical information (summarized in Section 1.2.1) and recent sampling events, the following assumptions are made regarding the physical characteristics of the Silo 3 material:

- The uppermost two-thirds of the material is dry, fine powder, similar to fly ash.
- Using data obtained during the Silo 3 Small Scale Waste Retrieval (FEMP 1998), and the Flow Properties Test Report (Jenike & Johanson 2002), the bottom material is assumed to be compacted to the extent that it does not flow freely. Small Scale Retrieval removed material up to 11 feet high and 4 feet into the silo.
- Miscellaneous debris, such as simple hand tools, personal protective equipment (PPE), and plastic bags, are potentially present in the silo (see Section 4.2 for a description of the handling of oversized material/debris).

About ninety percent (by weight) of the Silo 3 material sample passes through a 200-mesh sieve. This indicates that the majority of the contents are expected to be silt/clay size or smaller. Much of the Silo 3 material sample was easily fluidized and dispersible and flowable using the pneumatic system. Recent particle size analyses (Savannah River Technology Center 2001) showed that most of the material consists of particles greater than 1 micron. (However, these particles are aggregates of submicron size particles that can be easily dispersed during retrieval operations. It is expected that the retrieved Silo 3 material will have some variability in particle size and composition. It is not, however, expected to be a significantly different material from that found in previous testing (Argonne National Laboratory 1997), which identified particle size, physical characteristics, and chemical constituents) and which requires containment and ventilation be used which is described in the Process Description.

Based on a recent characterization study (FEMP 2001), the moisture content of Silo 3 material is approximately 3.2 percent by weight. The chemical constituents of the Silo 3 material are mostly inorganic metal oxides. Most of the Silo 3 radioactivity is from thorium-230; the balance is uranium-238 and other uranium daughters. The radon emanation rate[1] is approximately 10^5 pCi/second. Based on previous measurements (FEMP 1993/1994), the silo headspace's radon concentration is about 300,000 pCi/L.

1.3 SILO 3 STRUCTURE

Silo 3 was built in 1952 and is a freestanding, pre-stressed concrete, domed silo. As shown in **Figures 1-1** and **1-2**, it is 80 ft in diameter and the top is about 36 ft above ground level. The floor system is constructed of seventeen inches of compacted clay, a 2-in.-thick layer of asphaltic concrete, and an eight-inch layer of gravel topped by 4 in. of concrete.

[1]That is, the rate at which radon is transferred from the solid phase to the headspace.

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Figure 1-1 Plan View of Silo

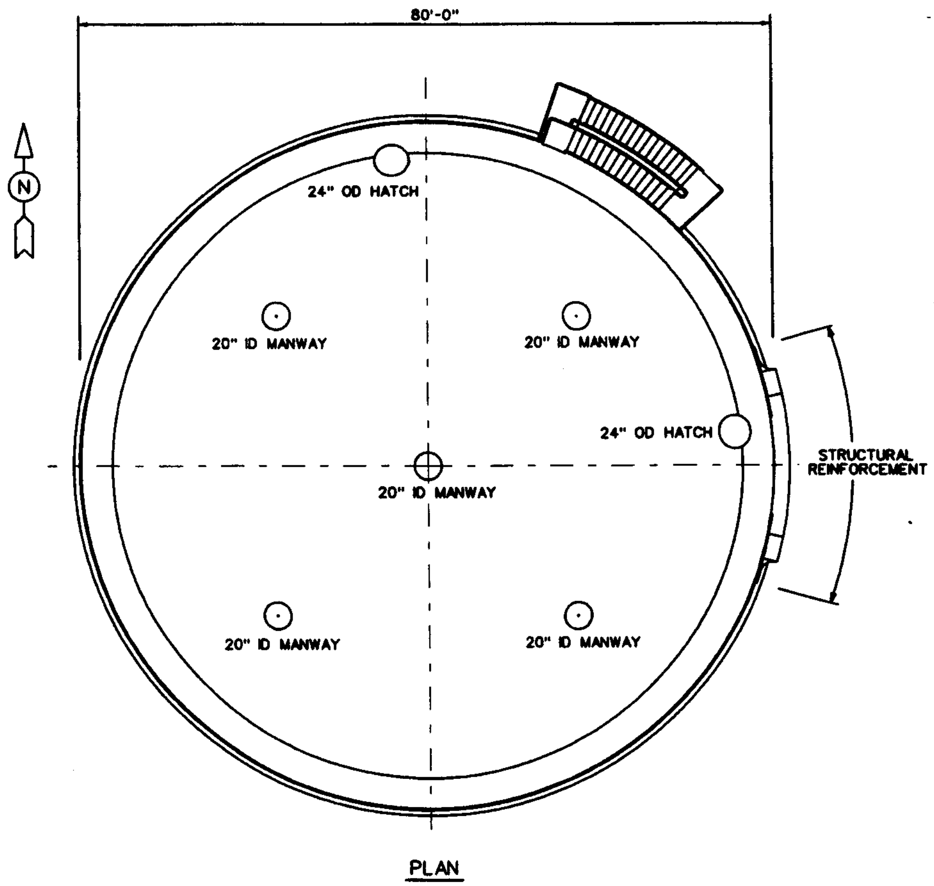

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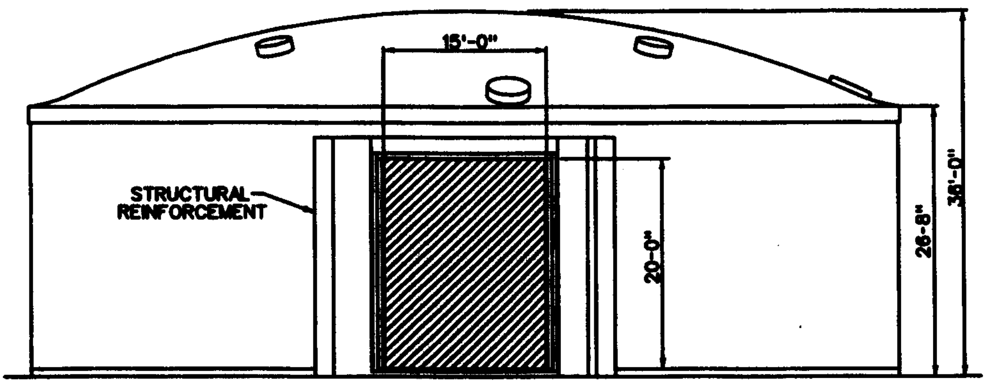
Figure 1-2 Elevation View of Silo Opening



ELEVATION
LOOKING WEST

Silo 3 does not have an underdrain system. The domed roof tapers from 8 in. thick at the silo walls to 4 in. thick at the apex. The apex is 36 ft high; and the walls are approximately 27 ft above the top of the foundation, with the earth on the outside approximately 2 ft above the silo floor. Silo 3 contains increased reinforcing around the dome periphery (ring beam). The manways on the silo dome have various diameters. Four of the manways, which were used as material inlet ports, are arranged radially, ninety degrees apart across the dome, and are 20 in. in diameter. There are two additional manways, 24 in. in diameter, one at the northern edge and the other at the eastern edge of the silo dome.

1.4 LOAD LIMITATIONS ON SILO 3

Section 3.0 of the Silo 3 Project Technical Safety Requirements (FEMP 2000) (TSR), "Limiting Conditions for Operation," places certain restrictions (i.e., limiting conditions for operations) on the loads placed on Silo 3. These restrictions include a significant safety factor; an engineering evaluation is under way to consider raising the load limitations.

Equipment live loads are to be distributed over the largest area practical. In no case shall equipment live loads be distributed over an area smaller than that of a 3-ft diameter circle, unless evaluated by a structural engineer, authorized by TSR revision, and approved by DOE. Under routine circumstances, personnel accessing the dome are not expected to occupy areas less than that described above.

All concentrated loads and changes to Silo 3 dead loads are to be evaluated for impact to silo integrity. Any increase to loads applied to the silo structure requires appropriate structural evaluation, authorization by TSR revision, and DOE approval.

Finite element analysis of the silo has been performed to support the design requirement to cut the opening.

Critical-lift plans are to be developed for all lifting performed over the silo structure, and for lifts in which a potential exists to impact the silo structure. The definition of a "critical lift," as well as the basis for critical lift plans, are contained in FEMP guidance (FEMP nd).

All loads to be placed on the silo dome are to be either measured or estimated (as appropriate), and are to be evaluated by engineering before performing activities on the silo dome.

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2.0 ACCESS AND RETRIEVAL SEQUENCE

Radon and radionuclide emissions to the environment, as well as the work area, are monitored during all access and retrieval operations. Operations are planned and implemented to maintain emissions and work area conditions within defined, acceptable ranges.

2.1 INITIAL SILO ACCESS

Before initial access to the silo, the radon concentration in the silo headspace will be reduced. Air flow will be introduced into the silo through a high efficiency particulate air (HEPA)-filtered air inlet line connected to one of the silo dome manways or sounding ports. The exhaust air line will be connected to the Process Vent System (PVS). This arrangement will provide a slightly negative pressure in the silo, and will route the exhaust air through the PVS dust collector, cartridge filter, and HEPA/ultra low penetrating air (ULPA) filters. The air is then discharged through the Exhaust Stack, where radon and particulate emissions are continuously monitored. Air flow during this initial activity will be closely monitored and metered to ensure that stack emissions, and the resultant fence-line impacts, are acceptable, within established limitations, and correspond to steady-state emission estimates. These estimates can be found in Section 2.2 of the Environmental Control Plan (FEMP 2002).

Weather conditions will be evaluated before the start of this initial radon release, to ensure that atmospheric stability and inversion conditions are consistent with as low as reasonably achievable principles. The silo dome connections will be planned (including radiological work permits) to protect workers and control radon releases.

The overall sequence for access and retrieval is as follows:

2.2 PNEUMATIC RETRIEVAL

Silo 3 material is initially retrieved pneumatically. To support this activity, the following facilities and systems must be in place and operational:

- Silo Enclosure (see Section 5.1);
- Pneumatic Retrieval System;
- PVS; and
- Heating, Ventilation, and Air Conditioning System.

Section 3.0 describes this phase of the access and retrieval.

2.3 SILO WALL ACCESS

An opening is cut in the silo wall to enable mechanical retrieval. The opening cut is preceded by the construction of a reinforcing frame around the opening (see Section 5.2); this will occur before pneumatic retrieval begins. Before cutting operations begin, the Excavator Room and Excavator Service Room must be constructed to provide containment. A description of the cutting operations can be found in Section 5.2.3.

2.4 MECHANICAL RETRIEVAL

Once the wall opening has been fully developed (see Section 5.2), the Excavator is used to retrieve material from the silo. The pneumatic system may be used in conjunction with excavator during mechanical retrieval. Retrieval operations are considered complete when no additional material can be removed using either the Pneumatic or Mechanical Retrieval Systems. Section 4.0 provides details on this final phase of the access and retrieval.

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Mechanical retrieval will be used to break compacted material that could not initially be pneumatically retrieved. Pneumatic retrieval can be used again if material is loosened and flowable, in combination with mechanical retrieval. Section 4.0 describes this phase of the access and retrieval.

3.0 PNEUMATIC RETRIEVAL SYSTEM

3.1 PNEUMATIC RETRIEVAL SYSTEM EQUIPMENT

The Pneumatic Retrieval System comprises the following equipment: items in italics are addressed primarily in the Process Description:

- ENC-10-5020 A-E: Vacuum Wand Management Systems A-E
- DCL-10-5002: Pneumatic Retrieval Collector
- FLT-10-5005: Cartridge Filter
- FLT-10-5004: HEPA/ULPA Filter
- BLR-10-5006 Pneumatic Retrieval Blower
- *FDR-10-5104: Pneumatic Retrieval Collector Discharge Feeder*
- *ROF-10-5108: Primary Rotary Feeder*
- *ROF-10-5110: Secondary Rotary Feeder*
- *FLT-10-5070: Supply HEPA Filter*

3.2 PNEUMATIC RETRIEVAL SYSTEM OPERATION

As indicated in Section 2.1, initial retrieval efforts are pneumatic. Material is vacuumed out of the silo through selected manways on the dome (see **Figure 1-1**). The first retrieval site is the easternmost manway; material is removed from this point until the east wall is clear enough to allow for wall-cutting activities (see Section 5.2.3). Pneumatic retrieval will continue from this and other selected manways until it is no longer effective or practicable due to either inaccessibility by the pneumatic wand or a reduction in flowability of the material.

The Vacuum Wand Management Systems (VWMSs) (ENC-10-5020 A-E) vacuum material from Silo 3; see **Figure 3-1**. The VWMSs are attached to glovebox type structures by flexible sleeves. The glovebox structures are set on top of the existing silo manways using flange attachments. Extensions to the vacuum wands are added through the gloveboxes, allowing the VWMSs to recover material at lower depths within the silo. The glovebox enclosures have a HEPA-filtered air supply connection that allows air to enter the appropriate manway. The glovebox structures also have exhaust air connections to the PVS to allow air to be pulled from the enclosures while spoolpieces are being added to the VWMSs. Spoolpiece additions are made while standing on top of the silo. During spoolpiece addition, air flows into the gloveboxes at a velocity greater than 150 ft per minute across the glovebox opening. The VWMSs are supported from hoists located above the wand assemblies; the hoists raise and lower the VWMSs through the glovebox assemblies for material retrieval at lower depths within the silo. Operations personnel manipulate the wands from platforms associated with the VWMSs. Manipulation of the vacuum wands is accomplished by lifting the wand assemblies and aligning them with a pair of indentations. The indentations are designed with eccentric offsets so the weight of the wand assemblies cause them to assume a non-vertical alignment. A series of indentations with different offset angles provides for several non-vertical alignments.

Material retrieved by the VWMSs is conveyed to the Pneumatic Retrieval Collector (DCL-10-5002). The collector separates out the solid fraction and drops it into the Pneumatic Retrieval Collector Discharge Feeder (FDR-10-5104). From this point, material is transferred to the Packaging Stations (see Process Description, Section 2.1).

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The air stream from the Pneumatic Retrieval Collector passes through the Cartridge Filter (FLT-10-5005), which also separates out a solids fraction and directs it to the Pneumatic Retrieval Collector Discharge Feeder. The air then passes through the HEPA Filter (FLT-10-5004) and the Pneumatic Retrieval Blower (BLR-10-5006) before being discharged to the atmosphere through the Exhaust Stack (STK-19-5209).

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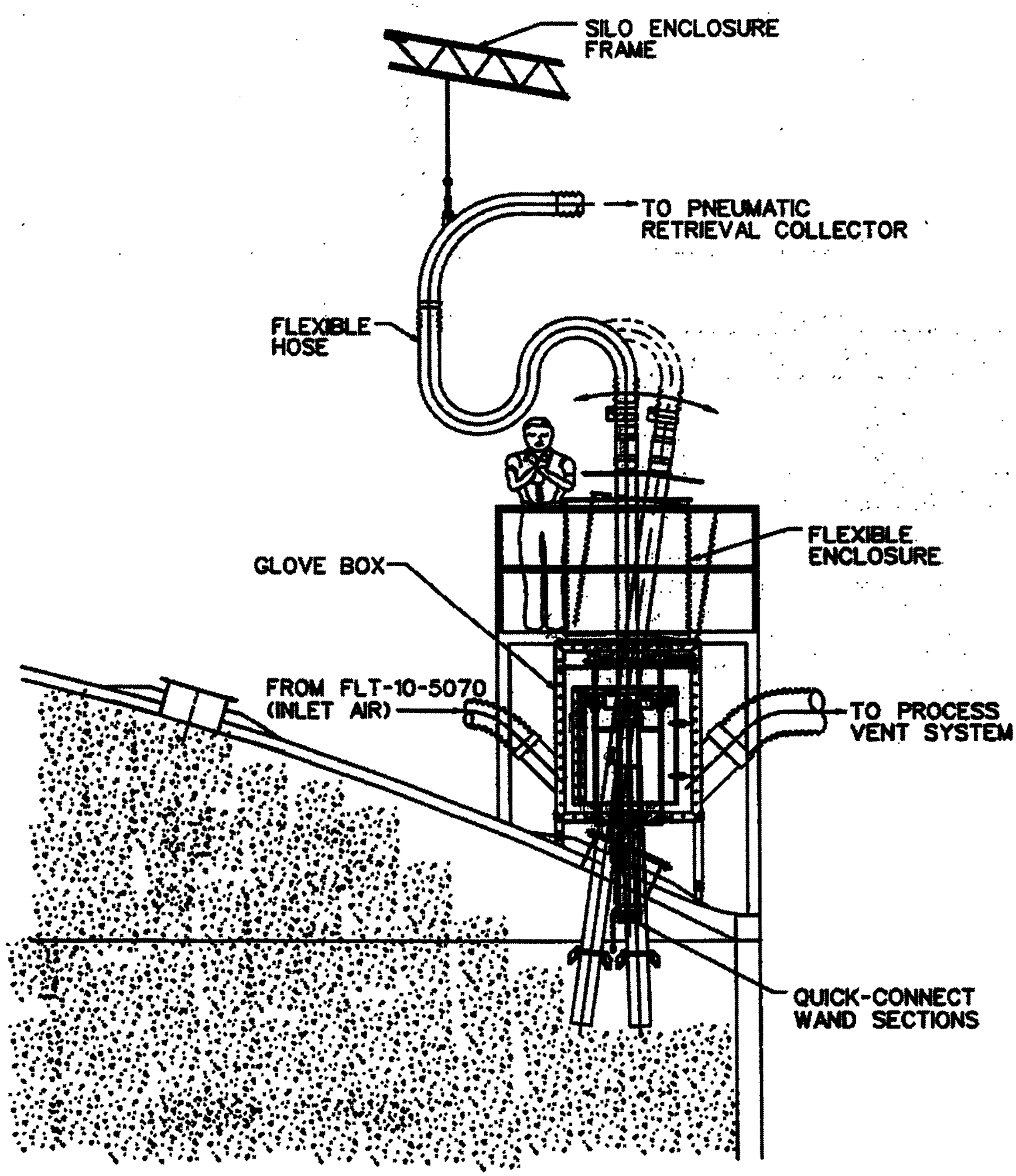
Figure 3-1 Vacuum Wand Management System (Conceptual Design)



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4.0 MECHANICAL RETRIEVAL SYSTEM

4.1 MECHANICAL RETRIEVAL SYSTEM EQUIPMENT

The Mechanical Retrieval System comprises the following equipment; items in italics are addressed primarily in the Process Description:

- EXC-11-5050: Excavator
- HBN-11-5054: Retrieval Bin
- *EAR-11-5052: Retrieval Bin Hood*
- *EAR-11-5053: Excavator Room Hood*
- *FDR-11-5106: Retrieval Bin Discharge Feeder*
- *DFC-11-5056: Inclined Conveyor*
- *FDR-11-5100: Transfer Conveyor*

Most of this equipment is described in Section 2.2 of the Process Description. A description of the Excavator, additional information on the Retrieval Bin, and information on both the Excavator Room and the Excavator Service Room, is as follows:

4.1.1 Excavator (EXC-11-5050)

The Excavator is an electrically powered, remotely controlled [using closed-circuit television (CCTV)], hydraulically operated crawler machine with the following features and capabilities:

- Rotational, elevation, and telescoping boom;
- Maneuverability;
- Load-handling capabilities;
- Concrete-cutting capabilities;
- Remote attachment and operation of all end effectors;
- Cable- and hose-management systems; and
- Lights and CCTV cameras.
- Water misting capabilities

The end effectors include, but are not limited to: rotary saw, bucket, rake, vacuum attachment, and grappler. The Excavator travels at a maximum speed of 1.8 ft per second. The boom of the Excavator has a reach of about 30 ft.

The Excavator is deployed from the Excavator Room, which is constructed adjacent to the silo; it can maneuver within the silo and remove material near the silo walls. The excavator is set in a slow, "precision work mode," and CCTV monitors its operation to ensure that it does not adversely contact the silo walls, or the walls and ceiling of the Excavator Room. Remotely controlled cameras are also mounted on the Excavator itself (see Section 5.4).

In addition to the actual transfer of material out of the silo, key functions of the Excavator are as follows:

- Break up compacted material within Silo 3;

- Retrieve miscellaneous debris, such as simple hand tools, PPE, and plastic bags from the silo; and
- Carry and manipulate a hose for pneumatic retrieval, as required, to support mechanical operations.

4.1.2 Retrieval Bin (HBN-11-5054)

The Retrieval Bin is a rectangular vessel located just to the east of the Silo 3 opening. The bin is below grade, and has steep sides that allow it to be used as both a chute and a hopper. Miscellaneous debris is prevented from entering the Retrieval Bin by standard, heavy-duty, grating at the bin. The bin is designed to allow the excavator to drive over the opening without damage to either the bin or the grate. Debris is removed from the grating by the Excavator (with appropriate attachments), and deposited in portable waste bins in the Excavator Room.

4.1.3 Excavator Room and Excavator Service Room

Both the Excavator Room and the Excavator Service Room include the following features:

- Provisions for decontamination of the Excavator (i.e., use plant air, vacuum, and/or process water); and
- Trenches, sumps, and sump pumps to collect and transfer both misting and wash water, and transfer it to the Wastewater Tanks (see Process Description, Section 5.5).

In addition, the Excavator Room includes provisions for the storage of end effectors, and containers for oversized material, tools, and debris recovered from the Retrieval Bin grating.

4.2 MECHANICAL RETRIEVAL SYSTEM OPERATION

As stated in Section 1.1.2, a reinforced concrete frame is installed on the east silo wall (see Section 5.2 for details). Once the frame has been installed and sufficient material has been pneumatically removed from behind the proposed wall opening, the silo wall is cut and an initial wall section is removed to allow mechanical retrieval to start (see Section 5.2). The opening allows the Excavator to access the Silo 3 contents. The Excavator (EXC-11-5050) transfers material to the Retrieval Bin (HBN-11-5054), which is located below grade in the Excavator Room. As material is removed from behind the wall, additional wall sections are cut and removed. This continues until the entire 15 ft by 20 ft opening has been cut.

Silo 3 material is pushed, raked, and lifted to the mouth of the Retrieval Bin. The Excavator operates both inside and outside of the silo. This system can be tied to the pneumatic system with a hose manipulated by the Excavator.

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Results from cohesive strength tests also show that a 1.3 percent moisture content sample is not very pressure sensitive, whereas wetter samples are highly sensitive to overpressure during storage at rest. Based on this fact, and coupled with the long period of storage at rest, the material in Silo 3 may be extremely cohesive.

To minimize the likelihood of material collapse, the Silo 3 material will be routinely graded to maintain an adequate angle of repose.

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5.0 SUPPORT SYSTEMS AND FACILITIES

5.1 SILO ENCLOSURE

A temporary, fabric-covered structure will be constructed to completely enclose Silo 3 for weather protection. The structure has the following features:

- Rigid structural frame consisting of a series of galvanized steel trusses connected and laterally braced by galvanized steel purlins.
- Framework clad with a high-strength, polyvinyl chloride-coated, polyester membrane that is tensioned over the frame and attached to the structure's foundation.
- Enclosure designed for compliance with building code standards for wind, snow, and seismic loads.
- Enclosure compatible with standard door, ventilation, and lighting systems.
- Sufficient height to allow operation of the VWMS at all candidate manways.

Air is supplied through a system of dampers. Exhaust air is directed to the atmosphere by a silo enclosure exhaust fan. Because controls have been provided to prevent the release of materials in this area, exhaust air from the Silo Enclosure is not HEPA-filtered.

5.2 SILO 3 WALL OPENING

The proposed Silo 3 wall opening is 15 ft wide and 20 ft high. This allows the Excavator ample clearance to enter the silo and remove material.

5.2.1 Frame Construction

A reinforced concrete frame will be constructed around the proposed opening to the silo. This frame will be anchored into the existing concrete core wall to prevent the wall from moving independently of the frame when the opening is cut. This frame will be cast-in-place around the area to be cut. Dowels will be set with epoxy into the core wall to provide full shear transfer and to physically attach the frame to the existing wall.

In addition, there will be a shotcrete extension with a large radius fillet on each vertical side of the frame. The fillet will provide additional bonding of the new concrete frame to the existing wall through the shotcrete-to-shotcrete bond; it will also minimize the intensity of the forces being transferred.

5.2.2 Facility Construction

The following facilities will be constructed/installed to support the cutting of the silo wall:

- Excavator Room and Excavator Service Area, including sumps and all related equipment. Temporary liners, berms, and other necessary drainage features are used in the Excavator Room to direct saw cooling water to the Excavator Room Sump[2];
- Process Vent System (for dust removal during cutting operations);
- Wastewater Tank to receive saw cooling water from sump; and
- Control system for remote operation of Excavator.

[2]When cutting operations are complete, these drainage features will be removed and disposed.

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5.2.3 Wall Cutting

The opening is created by cutting several sections, each a maximum of 4 ft high and 5 ft long, starting at the top of the opening; see **Figure 5-1**. General procedures and guidelines for the actual cutting are as follows:

1. Make all horizontal cuts within 1 in. of the inside surface.
2. Attach a bracing system with vertical steel stiffbacks bolted by drilled-in epoxy-set anchors to each section to be cut out and with steel kick back bracing to the concrete floor of the enclosure. The vertical stiffbacks would be designed to carry vertical loads and radial forces on the sections. The stiffbacks would also be designed to have segmental construction that would allow sections to be disconnected for removal of a section.
3. Make all the vertical cuts.
4. Attach horizontal back braces behind the vertical stiffbacks to carry all radial loads on the sections. One horizontal back brace would be behind each of the four lowest rows of sections. These horizontal braces would be attached to the concrete stiffening columns on each side of the opening.
5. Remove the kickback braces to allow full access of the excavator to the opening.
6. Remove the pins (bolts or other connecting mechanism) from the vertical stiffback section, then attach the excavator to the section and remove the section. The vertical stiffback section could be designed to allow the excavator to attach to it directly.
7. In a similar fashion, remove other sections.
8. Remove the horizontal back brace behind a row of the sections.
9. Remove material behind the opening to enable removal of next row.
10. Remove sections as for the previous row.
11. Repeat the last three steps for the remaining rows.

5.3 EXCAVATOR ROOM MISTING SYSTEM

Once the Excavator is in full operation, a water-misting system may be employed for one or both of the following functions:

- Dust suppression: During mechanical retrieval, the silo's contents will be disturbed, and dusting[3] in the Excavator Room may result (the Excavator will be operated in a manner to minimize dusting).
- Stabilization of working face: As piles of Silo 3 material are created and "groomed," water misting may be used as a safe working practice to help establish a stable face.

Water is supplied to the system from a water tank located on the Excavator. Tests have shown that the Silo 3 material has a tremendous capacity to absorb moisture before it becomes deliquescent. Because the misting system will be used infrequently and the water introduced is a small fraction of the absorbent capacity of the material, it is expected that the moisture addition would have no deleterious effect on the material handling process.

[3] "Excessive dusting" is defined as that degree of atmospheric dusting that interferes with visibility (both visual and CCTV) in the Excavator Room.

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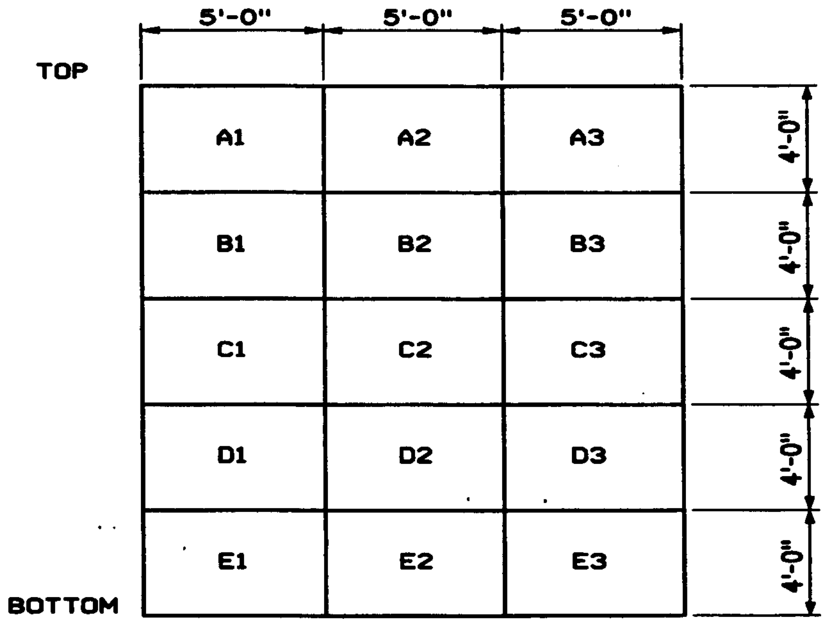
Figure 5-1 Layout of Section Cuts



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5.4 VIDEO EQUIPMENT AND LIGHTING

CCTV cameras are provided at the following locations:

- Silo 3 (selected ports)
- Excavator Room
- Excavator

In addition to general lighting throughout the facility, special lighting (as appropriate) is supplied with or near the CCTV cameras. All cameras have instrument-air sweeps over the lenses to prevent loss of visibility from fogging and dusting. Lighting will be provided inside the silo. Should the CCTV system not prove suitable, a concept similar to a gas processing system may be needed.

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6.0 REFERENCES

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JACOBS

PROCESS CONTROL SUMMARY FOR THE SILO 3 PROJECT

Document No. 40430-PL-0004
April 30, 2002
Revision C

FERNALD
Environmental Management Project

Fernald Project Number 40430

Revision	A	B	C			
Date	03/15/02	04/11/02	04/30/02			
Prepared By	R. Perricone	R. Perricone	R. Perricone R. Perricone			
Checked By	P. Bowman	P. Bowman	P. Bowman Pete Bowman			
Reviewed By	J. Carmony	J. Carmony	J. Carmony			
Approved By	R. G. Lenyk	R. G. Lenyk	R. G. Lenyk R G Lenyk			

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Revision Sheet

Revision	Date	Pages Affected	Reason for Revision
A	03/15/02	All	Issued for Review
B	04/11/02	All	Issued for Review
C	04/30/02	12,18	Issued for EPA Review

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Piping & Instrument Diagram (P&ID): 94X-3900-N-01383 Sht. N0003, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01433 Sht. N0100, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01434 Sht. N0101, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01435 Sht. N0102, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01436 Sht. N0103, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01437 Sht. N0104, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01438 Sht. N0105, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01439 Sht. N0106, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01440 Sht. N0107, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01441 Sht. N0108, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01442 Sht. N0109, Rev. C
Piping & Instrument Diagram (P&ID): 94X-3900-N-01443 Sht. N0110, Rev. C

RELATED DOCUMENTS:

1. FEMP, *Design Basis and Requirements Document for the Silo 3 Project*, Document No. 40430- DC-0001, Revision 0, February 2002.
2. FEMP, *Process Description for the Silo 3 Project*, Document No. 40430-RP-0003, Revision D, April 2002.
3. FEMP, *Access and Retrieval Strategy for the Silo 3 Project*, Document No. 40430-PL-0002, Revision C, April 2002.

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ACRONYMS AND ABBREVIATIONS

AWWT	Advanced Wastewater Treatment
CCTV	closed circuit television
FEMP	Fernald Environmental Management Project
HEPA	high-efficiency particulate air
HMI	human-machine interface
HVAC	heating, ventilation, and air conditioning
INWC	inches water column equivalent pressure
I/O	input/output
PC	personal computer
PLC	programmable logic controller
PID	proportional-integral-derivative control

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1.0 INTRODUCTION

This Process Control Summary relates to the Silo 3 Project at the U.S. Department of Energy Fernald Environmental Management Project (FEMP) site. Byproduct materials stored in Silo 3 at FEMP are to be removed, packaged, and shipped off site for treatment and/or disposal.

Removal of the material from the silo will be conducted in two phases. During Phase 1, a vacuum wand will be utilized to reach down into the silo through existing dome ports and vacuum the material out from above. Pneumatic transport will convey the vacuumed material to a baghouse separator, and the material will then be dispensed by mechanical feeders into bulk bag packages for transport.

Phase 2 will be implemented once all material that can be removed by the vacuuming method has been removed. In Phase 2, an excavating machine will be provided to remove the material through an opening cut into the side of the silo. The excavating machine will deposit the material into a retrieval bin in the Excavator Room floor, and mechanical conveyors will transport the material to the Packaging Area. Alternately, the excavating machine may be used to manipulate a vacuum hose for pneumatic material retrieval during Phase 2.

Dual packaging lines will be provided. Material from either the Pneumatic Retrieval System or the Mechanical Retrieval System can be routed through a final common conveyor feeder to either of the two packaging lines.

The objective of this document is to provide a preliminary description of the intended method for controlling the Silo 3 material handling equipment, the packaging equipment, and the associated system utilities.

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2.0 CONTROL SYSTEM OVERVIEW

The equipment will be provided with control system hardware and a control approach typical of that used in conventional industrial material handling and packaging operations. The control philosophy will be based on providing automated functions where applicable and utilizing plant floor local operator actions as required. Many of the operations, particularly in the packaging area, require continuous operator actions and control input on a local basis.

Operator interface will be primarily based on local operation with input via local push-buttons and hand switches. A primary hand control station shall be provided at the container filling stations. Other control stations shall be provided as required. These control stations shall be suitably configured for manipulation by operators who are in a standing position alongside the associated equipment.

Controls and instrumentation provided shall be suitable for use in an industrial environment. The devices will be conventional, readily available, "off-the-shelf" items having a proven history of performance.

A Programmable Logic Controller (PLC) based control system will be provided to monitor and control the material handling and packaging equipment. All control logic, sequencing, alarm monitoring, and interlocking will be performed in the PLC's. The use of relay logic, timers, or other control devices outside the PLC system shall be avoided. Operator pushbuttons, hand switches, conveyor controls, motion detectors, solenoid valves, etc. shall be configured to be inputs and outputs (I/O) to the PLC control system. Unless stated as exceptions, discreet input circuits will be 120 VAC, discreet output circuits will be contact closure or 24 VDC, and analog I/O circuits will be 4–20 mA. Emergency stop controls will be hard wired and will also have PLC inputs to reset process PLC control functions.

The main PLC processor will be situated in the Operations Support Center. A minimal number of PLC remote I/O racks will be placed in the packaging area and other locations as required to simplify control wiring to conveyor controls, material position sensors, instruments, etc. One or more basic alpha/numeric display stations will be provided at strategic locations in the process areas to display process parameters such as motor amps, process pressures, filter differential pressures, and alarm indications.

The PLC system will utilize PROFIBUS as a local area network dedicated for control and data acquisition requirements. The main control system PLC, local equipment dedicated PLC's, remote I/O racks, display stations, the data acquisition computer, and any of the more complex control devices such as variable speed motor drives and load cell systems will be linked with and configured as stations on this PROFIBUS network.

Two redundant PC-based Human-Machine Interface (HMI) stations will be installed in the Operations Support Center. These HMI stations will serve as a central point for monitoring and control of the process and supporting utilities. Monitoring and alarming capabilities will be configured for all systems. The necessary control functions to support unattended systems such as the Process Vent System, the heating, ventilation, and air conditioning (HVAC) System, and the Breathing Air System will be incorporated in the HMI stations.

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Systems such as the HVAC system and the Breathing Air System will be controlled and alarmed from the HMI stations.

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3.0 CONTROL PHILOSOPHY

The Silo 3 retrieval and packaging process comprises several separate systems working together. Each system has functional aspects and control concepts based on the requirements for that system. The systems are shown in **Table 3-1**.

Table 3-1 Silo 3 System Numbers and Names

System No.	System Name
10	Pneumatic Retrieval System
11	Mechanical Retrieval System
19	Process Vent System
25	Container Management System
40	Plant and Instrument Air System
41	Breathing Air System
62	Wastewater System
70	Supply Air System
71	Exhaust Air System
84	Sampling System
90	Control System

The Pneumatic Retrieval System and the Mechanical Retrieval System conveyors will not be operated simultaneously due to limitations in the available electrical power and due to conveyor flow path configuration.

Instrumentation and control philosophy for each system are discussed in Sections 3.1 through 3.8. The Sampling System components (System 84) are listed with the Container Management System in Section 3.4

3.1 PNEUMATIC RETRIEVAL SYSTEM (SYSTEM 10)

3.1.1 Equipment Description

Major equipment in the Pneumatic Retrieval System is as follows:

- ENC-10-5020A-E Vacuum Wand Management System
- DCL-10-5002 Pneumatic Retrieval Collector
- ROF-10-5108 Primary Rotary Feeder
- ROF-10-5110 Secondary Rotary Feeder
- FLT-10-5005 Cartridge Filter

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- FLT-10-5004 High-Efficiency Particulate Air (HEPA) Filter
- BLR-10-5006 Pneumatic Retrieval Blower
- BLR-10-5008 Auxiliary Vacuum Blower
- FDR-10-5104 Pneumatic Retrieval Collector Discharge Feeder
- FDR-10-5102 Feed Conveyor
- FLT-10-5070 Supply HEPA Filter

Instrumentation in the Pneumatic Retrieval System is as follows:

- LSH-DCL-10-5002 Pneumatic Retrieval Collector Level Switch High
- PDIT- DCL-10-5002 Pneumatic Retrieval Collector Differential Press Indicating Transmitter
- SIC-FDR-10-5104 Pneumatic Retrieval Collector Discharge Feeder Speed Indicating Controller
- YE/YIT-DCL-10-5002 Pneumatic Retrieval Collector Discharge Particulate Rate Indicating Transmitter
- PDIT-FLT-10-5005 Cartridge Filter Differential Press Indicating Transmitter
- LSH-FLT-10-5005 Cartridge Filter Level Switch High
- PDIT- DCL-10-5004 HEPA Filter Differential Pressure Indicating Transmitter
- IT-BLR-10-5006 Conveying Blower Motor Current Transmitter
- FE/FT-BLR-10-5006 Conveying Blower Discharge Flow Transmitter
- TIT-BLR-10-5006 Conveying Blower Discharge Temperature Indicating Transmitter
- PIT-BLR-10-5006 Conveying Blower Discharge Pressure Indicating Transmitter
- IT-BLR-10-5008 Auxiliary Blower Motor Current Transmitter
- FE/FT-BLR-10-5008 Auxiliary Blower Discharge Flow Transmitter
- TIT-BLR-10-5008 Auxiliary Blower Discharge Temperature Indicating Transmitter
- PIT-BLR-10-5008 Auxiliary Blower Discharge Pressure Indicating Transmitter
- PDIT-FLT-10-5070 Supply HEPA Filter Differential Pressure Indicating Transmitter

3.1.2 Control Philosophy

The Pneumatic Retrieval System will be used primarily in Phase 1 of the material removal from Silo 3. Pneumatic Retrieval Operations will consist of the following:

- Manipulation and control of the pneumatic vacuum wand (ENC-10-5020) through manways on the silo dome
- Operation of the Pneumatic Retrieval System (collectors, feeders, blowers, and filters)

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- Support operation of the two Packaging Stations (System 25)

Operators at the Packaging Stations will have overall control responsibility for the regulation of Pneumatic Retrieval System operations. The packaging station operators will communicate with the Pneumatic Retrieval System operators, who will communicate with the vacuum wand operators by radio voice communication. The operators will coordinate retrieval operations in order to supply silo material to the packaging stations as needed and to halt retrieval when necessary.

The Packaging Station controls are at the packaging stations. The Pneumatic Retrieval System controls are in the Process Building near the Packaging Stations. A local operator situated on the silo dome near the Vacuum Wand Management System will manipulate the vacuum wand using local hand controls. The wand operator will be required to manipulate or retract the wand, as required, to flow a suitable quantity of material to accomplish filling of the packages and also to halt material feed if material inventory is building up in the pneumatic retrieval collector.

The rate at which material can be conveyed to the packaging stations is controlled by the packaging station operators. This rate will be based on the capability of the packaging station crew to fill and process the packages. As one station is receiving material, the other will be prepared for receiving material (seal, close, and remove filled package from station and prepare next package for filling). The material packaging rate will range from 3 to 10 yd^3 per hour. The desired material rate is established by setting the speed of the Pneumatic Retrieval Collector Discharge Feeder (FDR-10-5104).

The Pneumatic Retrieval Collector has a high level switch that triggers an alarm at the vacuum wand station and in the Process Building. High level will occur if the system is retrieving material at a rate greater than the rate of material conveyed to the packaging stations. Upon reaching this high level, the vacuum wand operator will need to reduce or stop the retrieval rate of material from the silo.

Closed Circuit TV (CCTV) cameras will be installed in the silo (exact locations and approach to be determined) with monitors and camera controls provided in the Process Building and at the vacuum wand management stations on the silo dome. This CCTV system will allow the wand operator to view the silo material and the wand movement and control the retrieval of material.

The Vacuum Wand suction and material transport air velocity will be generated by the Pneumatic Retrieval System. Conveying airflow for the Pneumatic Retrieval System is provided by Pneumatic Retrieval Blower (BLR-10-5006). The blower will be purchased as a package unit with the following monitoring devices provided by the vendor: Conveying Blower Current Transmitter (IT-BLR-10-5006), Blower Discharge Flow Transmitter (FE/FT-BLR-10-5006), Blower Discharge Temperature Indicating Transmitter (TIT-BLR-10-5006), and Blower Discharge Pressure Indicating Transmitter (PIT-BLR-10-5006). The vacuum wand suction and transport airflow rate will be established through proper selection of the blower size and motor belt drive sheave. Manual dampers located in the flow path upstream of the blower can be adjusted for a partial reduction of flow rate. The blower will be started by the Pneumatic Retrieval operators and will run continuously while pneumatic retrieval is in operation.

Flowable material passing through the vacuum wand will continue through the transport piping and will be drawn into the Pneumatic Retrieval Collector (DCL-10-5002). Once in the dust collector, the silo material will be separated from the transport air stream and discharged to the Pneumatic Retrieval Collector Discharge Feeder (FDR-10-5104) and then through Primary and Secondary Rotary Feeders (ROF-10-5108 and ROF-10-5110). The material will feed by gravity onto Feed Conveyor (FDR-10-5102). This conveyor has two outlet valves on the underside. One valve (AOV-10-5114) allows material to flow to packaging line A, and the other valve (AOV-10-5116) allows material to flow to packaging line B. These valves are opened and closed as required by packaging area control operations. Only one packaging line will be filling a container at any given time.

Pneumatic Retrieval Collector (DCL-10-5002) material level, pressure drop, and particulate discharge rate will be monitored by Level Switch High (LSH-DCL-10-5002), Differential Pressure Indicating Transmitter (PDIT-DCL-10-5002), and Particulate Rate Indicating Transmitter (YE/YIT-DCL-10-5002).

Pneumatic conveying airflow leaving collector (DCL-10-5002) will pass through Cartridge Filter (FLT-10-5005) and then continue on to a HEPA Filter (FLT-10-5004) for removal of suspended fine material. Cartridge Filter (FLT-10-5005) material level and pressure drop will be monitored by Level Switch High (LSH-FLT-10-5005) and Differential Pressure Indicating Transmitter (PDIT-FLT-10-5005). A Differential Pressure Indicating Transmitter (PDIT-10-5004) will monitor the HEPA filter operating conditions.

An Auxiliary Vacuum Blower (BLR-10-5008) is provided to convey material from the Process Vent System fines collection bins and from the Container Management System in the event of an overfilled material package. This blower will be started by operators as required.

Exhaust air will then continue on to Exhaust Stack (STK-19-5209) for release to the atmosphere. See Process Vent System Section 3.3 for additional information on radon monitoring, particulate monitoring, and release of air to the atmosphere.

3.1.3 Key Parameters, Setpoints, and Responses

Instrument/Parameter	Setpoint*	Response
LSH-DCL-10-5002 Dust Collector High Material Level	30 IN	Alarm On High Level
PDIT-DCL-10-5002 Dust Collector Diff Pressure	7 INWC 8 INWC 1 INWC .7 INWC	Alarm On High Diff Pressure Shutdown On Hi-Hi Diff Press Alarm On Low Diff Pressure Shutdown On Lo-Lo Diff Press
YE/YIT-DC-10-5002 Dust Collector Discharge Particulate	TBD	Alarm On High Particulate Shutdown On Hi-Hi Particulate
LSH-FLT-10-5005 Cartridge Filter High Material Level	30 IN	Alarm On High Level
PDIT-FLT-10-5005 Cartridge Filter Diff	7 INWC	Alarm On High Diff Pressure

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Instrument/Parameter	Setpoint*	Response
Pressure	8 INWC 1 INWC	Shutdown On Hi-Hi Diff Press Alarm On Low Diff Pressure
PDIT-DCL-10-5004 HEPA Filter Diff Pressure	7 INWC 8 INWC	Alarm On High Diff Pressure Shutdown On Hi-Hi Diff Press
IT-BLR-10-5006 Conveying Blower Current	125 amps	Alarm On High Motor Current
FE/FI-BLR-10-5006 Conveying Blower Flow	TBD	Alarm On Low Air Flow
TIT-BLR-10-5006 Conveying Blower Air Outlet Temperature	175°F 250°F	Alarm On High Air Temperature Shutdown On Hi-Hi Air Temp
PIT-BLR-10-5006 Conveying Blower Air Outlet Pressure	TBD	Alarm On High Air Pressure Shutdown On Hi-Hi Air Press
PDIT-FLT-10-5070 HEPA Filter Diff Pressure	1 INWC 2 INWC	Alarm On High Diff Pressure Shutdown On Hi-Hi Diff Press

*Setpoints are estimated and must be confirmed in final design.

Diff = Differential

3.2 MECHANICAL RETRIEVAL SYSTEM (SYSTEM 11)

3.2.1 Equipment Description

Major equipment in the Mechanical Retrieval System is as follows:

- EXC-11-5050 Excavator
- HBN-11-5054 Retrieval Bin
- FDR-11-5106 Retrieval Bin Discharge Feeder
- DFC-11-5056 Inclined Conveyor
- FDR-11-5100 Transfer Conveyor

Instrumentation in the Mechanical Retrieval System is as follows:

- PIT-FLT-11-5070 Silo 3 Pressure Indicating Transmitter
- IT-DFC-11-5056 Inclined Conveyor Motor Current Transmitter
- IT-FDR-11-5100 Transfer Conveyor Motor Current Transmitter
- SIC-FDR-11-5108 Retrieval Bin Discharge Feeder Speed Indicating Controller

3.2.2 Control Philosophy

The Mechanical Retrieval System will be used during Phase 2 of material removal from Silo 3. Remaining silo material that was not removed during the Phase 1 operation will be excavated from the silo using the Excavator (EXC-11-5050). The excavator will enter an opening cut in the side of the silo.

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The Excavator will be a vendor supplied electrically powered machine. Operator control and machine status monitoring will be by radio-frequency-based (or "umbilical" hard-wired as an alternative) remote control and telemetry. A remote control operator station will be provided by the vendor, allowing the excavator to be controlled from within an observation room adjacent to the excavator room. This operator station will be capable of initiating and performing all excavator functions for machine surface travel and silo material removal. An excavator emergency stop will be provided.

The silo material will be carried or drawn out of the silo to the Retrieval Bin (HBN-11-5054). The Retrieval Bin Discharge Feeder (FDR-11-5106) will be speed-controlled to feed the material onto the Inclined Conveyor (DFC-11-5056) at an adjustable rate of 3 to 10 yd^3 per hour. Material loading of the Inclined Conveyor will be monitored through the Motor Current Transmitter (IT-DFC-11-5056). Material in the Inclined Conveyor is transported to Transfer Conveyor (FDR-11-5100), which then deposits the material into Feed Conveyor (FDR-10-5102). Conveyor (FDR-10-5102) has two outlets, one leading to Packaging Line A, and the other leading to Packaging Line B. Only one packaging line will be filling a container at any given time. These conveyors will be started manually by the Mechanical Retrieval System operators. Each conveyor will be interlocked with the downstream conveyor.

A local indicator panel and voice communication will be provided to communicate Inclined Conveyor operation, packaging equipment activities, and other equipment status to the excavator operator. The excavator operator will be required to handle material at a rate suitable for Packaging Station operations and to halt excavation if excess material inventory occurs in the conveying system.

CCTV cameras will be provided in the silo interior, on the excavator, and near the retrieval bin (exact locations and approach to be determined) to allow the operator to view the silo material and the excavator operation as required.

3.2.3 Key Parameters, Setpoints, and Responses

Instrument/Parameter	Setpoint*	Response
PIT-FLT-11-5070 Silo 3 Internal Pressure	N/A	Indicates Silo Internal Pressure
SIC-FDR-11-5106 Retrieval Bin Feeder Speed Indicating Controller	TBD	Controls Material Feed Rate
IT-DFC-11-5056 Incline Conveyor Motor Amps	14 amps 16 amps	Alarm On High Motor Amps Shutdown On Hi-Hi Mtr Amps

*Setpoints are estimated and must be confirmed in final design.

3.3 PROCESS VENT SYSTEM (SYSTEM 19)

3.3.1 Equipment Description

Major equipment in the Process Vent System is as follows:

- DCL-19-5202A and B — Process Vent Dust Collectors A and B
- FLT-19-5204A and B — Process HEPA Filters A and B

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- FAN-19-5206A and B — Process Exhaust Fans A and B
- STK-19-5209 — Exhaust Stack
- CEM-19-5208 — Isokinetic Stack Monitor (Radon, Particulate, and Flow Monitoring)

Instrumentation in the Process Vent System is as follows:

- Process Vent Dust Collector A Instrumentation:
  - MOV-19-5200 — Dust Collector A Inlet Valve
  - PDIT-DCL-19-5202A — Dust Collector A Differential Pressure Indicating Transmitter
  - LSH-DCL-19-5202A — Dust Collector A High Level Switch
  - HOV-19-5216 — Dust Collector A Discharge Dump Gate Valve
  - LSH-HBN-19-5205A — Dust Collector A Discharge Bin Level Switch
- Process Vent Dust Collector B Instrumentation:
  - MOV-19-5211 — Dust Collector B Inlet Valve
  - PDIT-DCL-19-5202B — Dust Collector B Differential Pressure Indicating Transmitter
  - LSH-DCL-19-5202B — Dust Collector B High Level Switch
  - HOV-19-5236 — Dust Collector B Discharge Dump Gate Valve
  - LSH-HBN-19-5205B — Dust Collector B Discharge Bin Level Switch
- Process Vent HEPA Filter and Process Exhaust Fan Instrumentation:
  - PDIT-FLT-19-5204A and B — HEPA Filters Differential Pressure Indicating Transmitters
  - YE/YIT-DCL-19-5202 — Dust Collector Disch Particulate Count Indicating Transmitter
  - IT-FAN-19-5206A and B — Exhaust Fan Current Transmitters
  - MOV-19-5230 — Exhaust Fan A Discharge Valve
  - MOV-19-5232 — Exhaust Fan B Discharge Valve
  - PIT-FAN-19-5206 — Vent Gas Discharge Pressure Indicating Transmitter
  - FIT-FAN-19-5206 — Vent Gas Discharge Flow Indicating Transmitter
- Exhaust Stack Instrumentation:
  - RQI-CEM-19-5208 — Exhaust Stack Radon Detection
  - ASH-CEM-19-5208 — Exhaust Stack Particle Detection

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- FT-CEM-19-5208 Exhaust Stack Flow Transmitter
- LSH-STK-19-5209 Exhaust Stack High Level Switch

3.3.2 Control Philosophy

Collection Header

The Process Vent System Collection Header consists of piping and manual dampers for the collection of silo material dust from various areas of the facility. These areas are the Silo 3 interior, the Retrieval Bin area, the Inclined Conveyor, and Package Loading Stands A and B.

The operators will be required to manually set the Process Ventilation flow rates from the various equipment areas using a series of manually operated dampers and by observing local duct airflow rate indicators.

The ventilation of Packaging Lines A and B will be maintained during both Phases 1 and 2. Ventilation of the Retrieval Bin and the Silo 3 interior will be active only during Phase 2. Dust collection in the Retrieval Bin area will be assisted by the Retrieval Bin Hood (EAR-11-5052).

Dust Collectors, Filters, and Blowers

Redundant trains of dust collectors, filters, and exhaust fans will be provided. Duct crossover capability will also be provided to allow operation with any combination of components active in either path. The inlet valve to each of the redundant Process Vent Dust Collectors and the valves at the outlet of each Process Exhaust Fan will be an electric motorized valve, selected and opened or closed as needed by the operator. All of the other dampers will be manually operated. Operators will align the valves and dampers and start one of the fans at the beginning of the work shift. The fan will run continuously at all times during material handling or packaging operations. The control system will have the capability to automatically realign the motorized valves and switch over to use the other dust collector or fan when available in the event of abnormal operating conditions as indicated in Section 3.3.3 below.

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3.3.3 Key Parameters, Setpoints, and Responses

Instrument/Parameter	Setpoint*	Response
PDIT-DCL-19-5202A & B Process Vent Dust Collector A & B Differential Pressure	7 INWC	Alarm On High Differential Press
	8 INWC	Alarm On Hi-Hi Differential Press - Realign Valves and Switch Over To Other Dust Collector
	1 INWC	Alarm On Low Differential Press - Realign Valves and Switch Over To Other Dust Collector
LSH-DCL-19-5202A & B Process Vent Dust Collector A & B High Level Switch	30 In	Alarm On High Level—Realign Valves and Switch Over To Other Dust Collector
YE/YIT-DCL-19-5202 Process Vent Dust Collector Particulate Monitor (Common to both A & B)	TBD	Alarm On High Particulate
	TBD	Alarm On Hi-Hi Particulate - Realign Valves and Switch Over To Other Dust Collector
PDIT-FLT-19-5204A & B HEPA Filter Differential Pressure	7 INWC	Alarm On High Differential Press
	8 INWC	Alarm On Hi-Hi-Differential Press - Realign Valves and Switch Over To Other Dust Collector
	1 INWC	Alarm On Low Differential Press - Realign Valves and Switch Over To Other Dust Collector
IT-FAN-19-5206A & B Process Exhaust Fan A & B Motor Amps	37 amps	Alarm On High Motor Amps
	41 amps	Realign Valves and Switch Over To Other Fan
PIT-FAN-19-5206 Exhaust Fan Outlet Air Pressure	TBD	Alarm On High Air Pressure
	TBD	Realign Valves and Switch Over To Other Fan
FIT-FAN-19-5206 Exhaust Fan Outlet Airflow Rate	TBD	Alarm On High/Low Air Flow
	TBD	Alarm On Hi-Hi OR Lo-Lo Flow - Realign Valves and Switch Over To Other Fan
CEM-19-5208 Isokinetic Sampling System	TBD	Alarm on High Radon/Particulate Shutdown Pneumatic Retrieval System, Process Vent System, and HVAC on Hi-Hi Radon/Particulate

*Setpoints are estimated and must be confirmed in final design.

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3.4 CONTAINER MANAGEMENT SYSTEM (SYSTEM 25)

3.4.1 Equipment Description

Two redundant packaging lines will be provided. Packaging line A will be described herein. Line B will be similar.

Major equipment in the Container Management System is as follows:

- RCV-25-5270A Package Loading Stand A
- RCV-25-5274A Intermediate Packaging Conveyor A
- RCV-25-5278A Package Staging Conveyor A
- RCV-25-5282A Airlock Conveyor A
- RCV-25-5288A Off-Loading Conveyor A
- SSS-84-5252A Package Sampler A
- BRC-25-5280 Bridge Crane
- EAR-25-5290A Packaging Station A Exhaust Hood
- SKD-25-5250A Container Management and Packaging System A

Instrumentation in the Container Management System is as follows:

- AOV-25-5260A Package Fill Valve A
- WIT-RCV-25-5270A Package Scale System A
- SOV-25-5273 Bag Deflator Solenoid
- SOV-25-5286 Package Vibration Solenoid
- SOV-25-5285 Package Height Adjustment Solenoid
- ZT-SOV-25-5285 Package Height Position Transmitter
- ZS-RCV-25-5274AA Intermediate Conveyor Pallet Position Switch
- ZS-RCV-25-5274AB Intermediate Conveyor Pallet Position Switch
- ZS-RCV-25-5278AA Staging Conveyor Pallet Position Switch
- ZS-RCV-25-5278AB Staging Conveyor Pallet Position Switch
- ZS-RCV-25-5282AA Airlock Conveyor Pallet Position Switch
- ZS-RCV-25-5282AB Airlock Conveyor Pallet Position Switch
- ZS-RCV-25-5288AA Off-Loading Conveyor Pallet Position Switch
- ZS-RCV-25-5288AB Off-Loading Conveyor Pallet Position Switch

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3.4.2 Control Philosophy

The Container Management and Packaging System will be a vendor-supplied package. The vendor will be given a general physical configuration for the Package Loading Stand and a set of detailed functional requirements. The vendor, following final design, shall provide the final detailed control system configuration and a detailed sequence of operation.

The Packaging System will be a continuously manned operation. The operators will perform several manual steps to prepare the bags for filling. These steps will include placing the pallet and loading frame onto the Package Loading Stand, placing the bag into the loading frame, lowering the loading spout, and coupling the bag to the spout. The operator will then activate a blower, pre-inflating the bag to conform to the loading frame and thus ensuring that it fits the contours of the container properly, leaving no folds in the inner liner.

Operator interface will be primarily based on local operation with input via local pushbuttons and hand switches. A primary hand control station shall be provided at the container filling station, and other control stations shall be provided as required associated with the downstream conveyors. These control stations shall be suitably configured for manipulation by operators who are in a standing position alongside the packaging equipment.

Control for the actual filling of the bags will be a combination of manual operations and some limited automated sequences. Coupling the bag to the filling port, inflating the bag seal, and confirming an adequate closure will be performed manually. Dispensing the material into the bag and operation of the vibrating densification devices will be automated to reduce the possibility of overfilling. The operator will initiate a filling sequence after having positioned the bag and having confirmed proper seal to the spout. The material discharge valve will open, and material will begin filling the bag. The deaerator vent valve will open to remove air from the bag as it is being filled. The densification vibrator will be activated when a fill weight of approximately 20 percent final weight has been reached. This amount of fill is usually sufficient to prevent the vibrators from causing the bag and container to shift around or vibrate excessively. The actual weight value used can be adjusted with experience. When a fill weight of approximately 75 percent is reached, an adjustable delay interval will be provided in the program sequence to allow the densification vibrators to operate with material filling halted. If required, this delay may be a few seconds to several minutes; actual times will be adjusted with experience. Following the delay, material filling will resume until a target full bag weight is reached. This target filled weight will be an initial setpoint, but will be adjusted with experience from recent previously filled bag weights. A level sensor installed at the mouth of the fill spout will provide an indication of filling level to the operator. This level sensor signal will be used to automatically stop the filling if material fills to that level before the target fill weight is achieved. Operators will also be required to visually monitor the filling level and be prepared to halt the filling process if required. If overfilling occurs, a manually operated vacuum line is provided, allowing operators to draw some material from the bag and transfer it to the Pneumatic Retrieval System.

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Sampling Units SSS-84-5252A and B are provided for obtaining samples of the silo material as it is being dispensed into the bags. Operation of these sampling units will be incorporated into the operating sequence for filling each package. Precise sampling requirements are to be determined.

The Control System will archive a unique bag identifier, time and date of filling, bag weight data, and sample data.

The bag will then be manually detached from the spout, closed, and sealed. The loading frames will be disassembled and removed from the bag. The containers will be moved to the Intermediate Packaging Conveyor for "swipe" checking. When the bags pass operator examination and swipe tests, transparent plastic folders containing required labeling information are attached. The filled and completed bags will then be conveyed out of the packaging area for loading into cargo containers.

Operation of the downstream conveyors is initiated by the local operators using hand controls at the conveyors. Position sensors and interlocks provided on the conveyors and on the building doors prevent collision of packages with each other and with the doors and will also prevent running a package beyond the end point of a conveyor. Bags will be lifted off the pallets by the Bridge Crane (BRC-25-5280) and lifting frame assembly and placed in the cargo container.

CCTV monitors will be installed at the packaging stations to allow the operators to view the Pneumatic Retrieval Vacuum Wand operation and/or the Mechanical Retrieval Bin status. CCTV cameras will be provided in the packaging area to allow the operators in the Operations Support Center to view activities in the packaging area.

3.4.3 Key Parameters, Setpoints, and Responses

Instrument/Parameter	Setpoint*	Response
WIT-RCV-25-5270A Filling Station Load Cell System Container Weight	5000 Lb	Input to PLC System Filling Sequence Alarm On High Fill Weight
ZI-AOV-25-5260A Bag Filling Level Sensor	TBD	Input to PLC System Filling Sequence Alarm On High Fill Weight
ZT-SOV-25-5285 Conveyor Height Adjust	N/A	Manual Adjustment of Conveyor and Bag Height For Coupling
ZS-RCV-25-52XX/YY Conveyor Pallet Position Sensors and Roll-Up Door Position Monitoring Sensors	N/A	Monitor Position of Pallets and Doors for Conveyor Safety Interlocks

*Setpoints are estimated and must be confirmed in final design.

3.5 PLANT AND INSTRUMENT AIR SYSTEM (SYSTEM 40)

The Plant and Instrument Air Compressors, Air Dryers, and associated equipment will be vendor-supplied packages with controls provided by the vendors in accordance with purchase specifications. The vendors will be required to provide control systems typical of such equipment as used in industrial environments. Operating parameters, such as

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compressor motor running, air pressure, and system alarms, will be required to be available to the main PLC system for monitoring and alarming.

3.6 BREATHING AIR SYSTEM (SYSTEM 41)

The Breathing Air System will also be a vendor-supplied package (see Section 3.5 above). All control functions, system monitoring, and alarming capabilities will be suitably specified for the high reliability requirements needed in this equipment. Operating parameters and alarms will be displayed in the Operations Support Area.

3.7 WASTEWATER SYSTEM (SYSTEM 62)

3.7.1 Equipment Description

Major equipment in the Wastewater System is as follows:

- TNK-62-5600A and B — Wastewater Tanks A and B
- PMP-62-5606A and B — Wastewater Pumps A and B
- MXA-62-5602A and B — Wastewater Tank Agitators A and B
- PMP-62-5604A and B — Wastewater Tank Area Sump Pumps A and B
- PMP-62-5404 — Excavator Service Room Sump Pump
- PMP-62-5642 — Excavator Room Sump Pump

Instrumentation in the Wastewater System is as follows:

- LIT-TNK-62-5600A and B — Wastewater Tank Level Indicating Transmitter A and B
- FIT-AOV-62-5670 — Wastewater Discharge Flow Rate Indicating Transmitter
- AOV-62-5670 — Wastewater Discharge Flow Control Valve
- AOV-62-5474A and B — Process Water Supply Valves A and B
- AOV-62-5672 — Wastewater Tank B to AWWT Block Valve
- AOV-62-5624 — Wastewater Tank A to AWWT Block Valve
- LS-PMP-62-5604 — Sump Level Switch
- LSH/L-PMP-62-5642 — Excavator Room Sump Pump Level Switch
- LSH/L-PMP-62-5604 — Excavator Service Area Sump Pump Level Switch

3.7.2 Control Philosophy

Wastewater will be generated from wash down activities. Sump pumps in the Excavator Room, the Excavator Service Room, and the Wastewater Tank Area will each start automatically in response to high water level actuating level switches in the sumps. A manual selector switch will be provided at the Wastewater Tank Area sump pumps to allow manually selecting which of the two pumps will run. Manual valves in the piping will be aligned to direct the water from the sump pumps to wastewater tank A or tank B. As

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one tank reaches high level and is being analyzed or emptied, ongoing operations will utilize the other tank. The tanks will be duplexed on-line and off-line in this manner.

The tank agitators will be activated by the operators, as needed, via manual switches located near the tanks.

The Wastewater Pumps (PMP-62-5606A and B) have recirculation block valves. Running the pumps with the recirculation valves open will also cause agitation of the wastewater.

Whenever a high level is reached in either of the Wastewater Tanks and an appropriate mixing time has elapsed, the contents of that tank will be analyzed. This analysis is to ensure that the contents are suitable for on-site processing by the Advanced Wastewater Treatment (AWWT) facility.

If contents are cleared for treatment by AWWT, the entire contents will be transferred by tanker to the AWWT facility. Recirculation Block Valve (AOV-62-5668) will be closed, and wastewater to tanker Block Valve (AOV-62-5624 - Tank A or AOV-62-5672 - Tank B) will be opened. Flow rate and flow total will be monitored through Flow Control Loop (FQIC-AOV-62-5670).

3.7.3 Key Parameters, Setpoints, and Responses

Instrument/Parameter	Setpoint*	Response
LIT-TNK-62-5600/5650 Tanks A & B Level Indicating Transmitters	86 In 80 In 10 In	Alarm On high level Stop Additional Water Infeed Stop Wastewater Pumps
FE-AOV-62-5670 Wastewater Flow Rate Indicating Transmitter/Totalizer	N/A	Totalizes Water Flow to Tanker/AWWT
AOV-62-XXXX Wastewater System Flow Direction Valves	N/A	Operators to Align Valves as Required for Direction of Flow
LS-PMP-62-5604 Sump Pump High Level Switch	TBD	Actuates Sump Pump On Presence of Wastewater in Sump

*Setpoints are estimated and must be confirmed in final design.

3.8 BUILDING HVAC SYSTEMS (SYSTEMS 70 AND 71)

The Building HVAC System will utilize controls typical of industrial or commercial installations. Each of the three air-handling units (consisting of intake filters, fan, electric heaters, and refrigeration-based air conditioning components) will have local controls provided by the manufacturer. The exhaust filtration system will consist of two filters and two exhaust fans with a crossover to allow either filter to be used with either fan. The major HVAC system components will be interfaced with the main PLC control system allowing monitoring and control of HVAC functions via the main HMI in the Operations Support Center. The HMI display configuration will include a suitable display area for HVAC control requirements.

The system will be operated from the HMI by aligning the dampers and selecting and starting one of the two exhaust fans and two of the three air-handling units. One of the three air-handling units will be available as a backup. The pressure differential between the packaging room and ambient will be regulated using a variable flow vacuum relief damper.

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A PLC-based proportional-integral-derivative control (PID) control loop utilizing input from a differential pressure transmitter sensing packaging room pressure and ambient pressure will modulate this damper. This PID control loop will be enabled and provided with operating and alarm setpoints from the HMI. Additional inputs will be provided from door position sensors in order to tailor the response of the PID algorithm during off-normal operating conditions.

The interior temperature will be controlled by a PLC-based PID control loop utilizing input from a temperature sensor in the packaging room and setpoints from the HMI.

Failure of an air-handling unit or fan to run, failure to maintain temperature or differential pressure, fire detection, and other upset conditions will be alarmed at the HMI.

The HVAC system control logic will be interlocked with fire detection and air quality monitoring to force the system to the most suitable operating mode during upset conditions. Operators will be able to control or reset the HVAC system from the Operations Support Center without entering the main facility.

3.9 CONTROL SYSTEM (SYSTEM 90)

3.9.1 Equipment Description

- PLC-90-5870 — Main Control PLC (Located in the Operations Support Area)
- PNL-90-5872 — Primary Control Operator Station (Located in the Operations Support Area)
- CPU-90-5875 — Engineering/Programming and Backup Operator Station (Located in the Operations Support Area)
- PRN-90-5880 — Report Printer
- PLC-90 5885A — Packaging Area A PLC (Vendor Supplied)
- PLC-90-5885B — Packaging Area B PLC (Vendor Supplied)
- Local PLC Racks — (One In MCC Room and TBD-Other Locations per Final Design)

3.9.2 Control System Function

State-of-the-art personal computer (PC)-based HMI software will be provided for monitoring and control of the facility. Two PC's will be set up in the Operations Support Area. The first PC will be provided with HMI operating system software only and the second PC will be provided with HMI operating system and engineering support/programming software. This configuration will offer redundancy and will cover any programming, start-up, and trouble shooting requirements.

A series of screens will be configured to display a mimic for each major portion of the facility. This is expected to include, as a minimum, the Pneumatic Retrieval System, the Mechanical Retrieval System, the Process Vent System, the HVAC System, the Wastewater System, the Breathing Air System, and other utilities. Extensive monitoring

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capability will be incorporated and process control will be provided where applicable. Alarm status and history information will be provided.

The main PLC processor will be situated in the Operations Support Center. A Profibus local area network will link the Main PLC with the two PC's and also with other PLC's or smart devices throughout the facility. Some vendor-supplied systems such as the packaging stations are expected to have local dedicated PLC's, which will be linked to the main control system via the local area network.

The HMI software will have typical batch reporting functions, which will be utilized to archive a software/electronic copy of the package identification unique identifier and time/date information.

The Operations Support Center will be equipped with redundant CCTV monitors linked with the cameras in the Pneumatic Retrieval System, the Silo interior, the Mechanical Retrieval System, and the Packaging Area. This will enable Operations Support Center personnel to monitor and assist in coordinating facility activities.

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SAMPLING AND ANALYSIS PLAN FOR SILO 3 MATERIAL

40430-PL-0009, REV. B

APRIL 2002

APPROVED BY:

______________________________________ ______________

Doris T. Edwards, Project Manager, Silo 3 Project Date

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

U.S. DEPARTMENT OF ENERGY

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
DOT	Department of Transportation
EP Tox	Extraction Procedure Toxicity (analysis)
ESD	Explanation of Significant Differences
FACTS	Fernald Analytical Computerized Tracking System
FEMP	Fernald Environmental Management Plan
GFAA	Graphite Furnace Atomic Absorption Spectrometry
ICP-MS	Inductively coupled plasma - mass spectroscopy
IIMS	Integrated Information Management System
mg/L	milligrams per Liter
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
OEPA	Ohio Environmental Protection Agency
OU4	Operable Unit 4
pCi/g	picoCurie per gram
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SED	Sitewide Environmental Database
TAL	Target analyte list
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substance Control Act
USEPA	U.S. Environmental Protection Agency
VSL	Validation Support Level
VOCs	Volatile organic compounds
WAC	Waste acceptance criteria
WISDM	Windows Integrated Sample and Data Management system

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1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) has been developed to document sampling and analysis activities to be performed in support of remedial action activities for the Silo 3 Project. Specifically, this SAP has been prepared to provide details associated with the sampling and analysis of the untreated Silo 3 material to support transportation of the material, and its subsequent disposition at Envirocare of Utah, Inc. (Envirocare), the assumed disposal facility based on currently available 11e.(2) disposal capability in the commercial sector. Alternative disposal sites are discussed in the Silo 3 Transportation and Disposal Plan; however, the basis of this Sampling and Analysis Plan is the transportation and disposal of untreated Silo 3 material at Envirocare. This SAP does not include the sampling and analysis of anything other than the Silo 3 material.

Existing analytical data were reviewed in determining the analytes to be monitored and the frequency of sampling required. Techniques to be used for collecting and analyzing samples, as well as general methodologies, are described in this plan. Details necessary to implement the program identified in this plan are currently covered under existing procedures or will be written into operating procedures to meet the objectives reflected in this plan.

1.1 PROJECT BACKGROUND

The Fernald Environmental Management Project (FEMP) is a 1,050-acre government-owned, contractor-operated facility located in southwestern Ohio approximately 18 miles northwest of the city of Cincinnati. The facility is located just north of Fernald, Ohio, a small farming community, and lies on the boundary between Hamilton and Butler Counties. The FEMP, which operated under the name of the Feed Materials Production Center, produced high purity uranium metal products for the United States Department of Energy (DOE) and its predecessor agencies from 1952 to 1989. Former uranium processing operations at the FEMP were limited to a fenced, 136-acre tract, closed to public access, known as the production area. In June 1991, the site was officially closed for production by an Act of Congress. The Fernald site was included on the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) National Priorities List in 1989. The current mission of the site is the safe environmental restoration of the site in accordance with all applicable requirements.

Silo 3 is part of Operable Unit 4 (OU4) which is situated in the southwestern portion of the Waste Storage Area, west of the former Production Area. Silos 1, 2, and 4, which are also part of OU4, will not be discussed in this SAP; details on those silos can be found in the OU4 Record of Decision (ROD).

The material in Silo 3 is classified as by-product material, as defined in Section 11e.(2) of the Atomic Energy Act of 1954. This material is known as cold metal oxides and was generated at the FEMP site during uranium extraction operations in the 1950s. These oxides were formed by calcining residues from the solvent extraction process used to extract uranium from ore concentrates and residues. The material in Silo 3 is substantially different from that in Silos 1 and 2. Silo 3 material is dry and powdery and contains similar radiological constituents as those found in Silos 1 and 2. However, certain radionuclides (such as radium) are present in much lower concentrations. On an activity basis, the predominant radiological constituent of the Silo 3 material is thorium-230 (Th-230). Data from the OU4 Remedial Investigation (RI) (Extraction Procedure Toxicity [EP Tox] analysis, since replaced by the Toxicity Characteristic Leaching Procedure [TCLP]) indicates Silo 3 material contains eight metals, with the highest mean concentrations being attributed to arsenic (9.48 milligrams per Liter [mg/L]), cadmium (0.85 mg/L), chromium (5.05 mg/L), and selenium (2.65 mg/L).

As detailed in the OU4 ROD, the identified remedy for Silos 1, 2, and 3 material was retrieval, vitrification, and disposal at the Nevada Test Site (NTS). The Explanation of Significant Differences (ESD) for OU4 Silo 3 Remedial Action, approved March 1998, documented the change in remedy for Silo 3 material to retrieval, treatment by polymer encapsulation or chemical stabilization, and off-site disposal at the NTS or an appropriately permitted commercial disposal facility (PCDF), such as Envirocare. The ESD allowed that the Silo 3 material could be transported without treatment as long as the combination of onsite pretreatment and packaging in accordance with Department of Transportation (DOT) requirements provides an acceptable transportation risk. An amendment to the OU4 ROD is being initiated in parallel with the Silo 3 remedial design to require onsite or offsite treatment only as required to achieve the WAC of the NTS or an appropriately permitted commercial disposal facility (PCDF). This SAP assumes that the Silo 3 material will be retrieved and packaged at the FEMP and transported untreated to Envirocare for disposal. Implementation of an alternate disposal option will require modification of this SAP.

1.2 SCOPE OF ACTIVITIES

This Plan describes the sampling and analysis strategy to satisfy Waste Acceptance Criteria (WAC) requirements at the Envirocare commercial disposal facility in Clive, Utah and demonstrate that the applicable DOT requirements are met. The basis of this SAP is the transportation of untreated Silo 3 material by rail to Envirocare for disposal in the 11e.(2) cell. Since this plan is specific to the Envirocare WAC, disposal at any other government or commercial site will require a revision of this SAP to reflect the receiving facility's WAC and disposal requirements. Likewise, since this plan assumes transportation and disposal of untreated Silo 3 material, any requirement imposed to treat the material prior to disposal will require a revision to this SAP as well.

This SAP will remain current at all times and be updated whenever necessary to address current operating conditions. In keeping with this "living document" obligation, this initial version of the Silo 3 SAP is written to apply conceptually to the Silo 3 material eligible for disposal at Envirocare. The sole drivers for sampling and analysis will be what is required to facilitate disposition at the assumed 11e.(2) disposal facility and what is required (if anything) to demonstrate compliance with U.S. DOT requirements. Should direct operating experience indicate a need later to revise the plan, the revision will be provided to Envirocare for information and to the United States Environmental Protection Agency (USEPA) and Ohio EPA (OEPA) for approval as part of this "living document" obligation.

As required, sampling will be conducted on the final waste stream (untreated Silo 3 material) as the material is accumulated for packaging.

1.3 SAMPLING AND ANALYSIS PLAN OBJECTIVES

The objectives for this SAP are as follows:

- To satisfy the analytical requirements for Envirocare WAC demonstration.
- To satisfy Department of Transportation (DOT) waste packaging and shipping requirements.

These objectives has been considered in the formulation of the sampling protocols behind this SAP and the selection of an appropriate suite of analytical parameters and sample collection frequency to accomplish the ex-situ characterization of the material prior to disposition. The sampling and analysis strategy contained in this SAP considers only the license and permit restrictions for WAC compliance at Envirocare, and the appropriate DOT requirements.

1.4 ASSUMPTIONS

This SAP is based on several assumptions, including the following:

- Primary containers will be industrial package-2 (IP-2) 3 yd^3 soft-sided containers to be overpacked in cargo containers or sea/lands.
- Process capability of the Silo 3 system is approximately 15 soft-sided containers per day, on average.
- The material for disposal will be untreated Silo 3 material.
- Transportation will be by rail (or by truck should rail become infeasible).

- Material sampling will be performed by Silo 3 operations personnel in accordance with Silo 3 operating procedures.

- Sample collection will be from a point just upstream of the packaging systems.

If any of these assumptions change, a variance to this SAP explaining the significant differences will be generated and distributed.

2.0 SAMPLING AND ANALYSIS APPROACH

Prior to developing the specific requirements of the sampling and analysis approach for the Silo 3 material, the requirements, agreements, and criteria which drive the need for the data to be generated through the sampling and analysis program must be assessed. The purpose of this section is to describe the assessment of the information that drives the data needs for the management of this material. Specifically, this section discusses the objectives, expectations, and specifics of a sampling and analysis strategy (i.e., the selection of analytical parameters, sampling frequency, and laboratories). This section details the approach to be used to collect and analyze the samples by identifying the analytical requirements for the Silo 3 material.

2.1 ENVIROCARE SAMPLING REQUIREMENTS

As previously mentioned, the Silo 3 material is characterized as 11e.(2) by-product material. Envirocare is licensed by the Nuclear Regulatory Commission (NRC) to receive this type of material for disposal. The Envirocare 11e.(2) license allows an average concentration per manifested DOT package, "not to exceed" the specified license limit.

This section discusses the requirements to verify the Silo 3 material meets Envirocare's established WAC prior to disposition at Envirocare. The information contained in this section is based upon Envirocare guidelines and associated permit/license requirements.

2.1.1 Envirocare's Expectations of the Waste Generator

Envirocare requires that the waste generator perform sufficient sampling to verify the profile and acceptance status of the waste. With NRC concurrence, this sampling can be "in-situ." In general, these requirements can be summarized as follows:

- Obtain sufficient samples such that any/all radionuclides present in the material have been identified and quantitated; this information will be used to determine the range and weighted average activities of the radionuclides present in the material.

- Provide waste stream physical property results as identified in Envirocare's 11e.(2) Waste Profile Record, EC-0230."

- Provide "worst case" or "range" (as required by Envirocare's Radioactive Waste Profile Record) analytical results for the eight RCRA metals (plus zinc) and the 32 RCRA characteristic organics (listed in Table 1 of 40CFR261).

Upon review and approval of the FEMP's completed Radioactive Waste Profile Record and receipt of a delivery order, Envirocare will issue a "Notice to Transport, EC-1800". An update to the approved profile will be necessary if the reported concentration ranges exceed those originally reported on the Radioactive Waste Profile Record.

Table 2-1 summarizes Envirocare's WAC constituent list for radioactive materials (such as Silo 3 material) as contained in Envirocare's facility license renewal and accompanying implementation guidance documents. Only those constituents expected to be present in the waste stream (by historical data, current sampling, or process knowledge) must be accounted for and manifested by the waste generator.

2.1.2 Envirocare's Receipt Sampling of Generator Shipments

In addition to the sampling conducted by the waste generator, Envirocare conducts receipt sampling for waste materials shipped to the facility. This receipt sampling is conducted independently from the waste generator's sampling. A summary of this receipt sampling for shipments is provided in the following subsections.

Due to the dispersability and hazardous nature of the untreated Silo 3 material, Fluor Fernald is requesting that Envirocare perform "remote sampling and analysis" of the material and approve the material for disposal prior to the Silo 3 material being shipped from the FEMP to Envirocare. This remote sampling and analysis would eliminate additional analysis upon receipt at Envirocare.

2.1.2.1 Receipt Sampling Parameters

Two types of parameters are considered by Envirocare during 11e.(2) receipt sampling: radiological and chemical parameters. A brief description of each of these parameters is listed below.

- Radiological parameters (full suite): gamma scan, isotopic uranium and thorium, plus non-gamma analysis for specific constituents identified by the generator on the EC-0230, Waste Profile Record that require methods other than gamma spectroscopy; site scaling factors and calculations are acceptable where appropriate.

- Chemical parameters: TCLP for the eight RCRA metals (plus zinc) and the 32 RCRA characteristic organics.

Envirocare's discussions with the NRC indicate that existing data collected to support waste characterization can be used in total to demonstrate that this waste stream is acceptable for disposal without additional sampling.

TABLE 2-1
ENVIROCARE FACILITY WASTE ACCEPTANCE CRITERIA CONSTITUENT LIST

RADIOLOGICAL:

Americium-241
Americium-243
Antimony-124
Antimony-125
Barium-133
Beryllium-7
Bismuth-207
Cadmium-109
Calcium-45
Carbon-14
Cerium-139
Cerium-141
Cesium-134
Cesium-135
Cesium-137
Chromium-51
Cobalt-56
Cobalt-57
Cobalt-58
Cobalt-60
Copper-67
Curium-242
Curium-243
Curium-244
Europium-152
Europium-154
Europium-155
Gadolinium-153
Germanium-68
Gold-195
Hafnium-181
Hydrogen-3 (Tritium)
Iodine-125
Iodine-129
Iridium-192
Iron-55
Iron-59
Lead-210
Manganese-54
Mercury-203
Neptunium-237
Nickel-59
Nickel-63
Niobium-94
Plutonium-238
Plutonium-239
Plutonium-240
Plutonium-241
Plutonium-242
Polonium-210
Potassium-40
Promethium-147
Radium-226
Radium-228
Rubidium-83
Ruthenium-106
Samarium-151
Scandium-46
Selenium-75
Silver-108m
Silver-110m
Sodium-22
Strontium-85
Strontium-89
Strontium-90
Sulfur-35
Tantalum-182
Technetium-99
Thallium-204
Thorium-230
Thorium-232
Tin-113
Uranium-233
Uranium-234
Uranium-235
Uranium-236
Uranium-238
Uranium-depleted
Uranium-natural
Yttrium-88
Yttrium-91
Zinc-65
Zirconium-95

TCLP INORGANICS:

Arsenic
Barium
Cadmium
Chromium
Copper
Lead
Mercury
Selenium
Silver
Zinc

TCLP ORGANICS:

1,4-dichlorobenzene
2,4,5-trichlorophenol
2,4,6-trichlorophenol
2,4-dinitrotoluene
Cresol
Hexachlorobenzene
Hexachlorobutadiene
Hexachloroethane
m-Cresol
Nitrobenzene
o-Cresol
p-Cresol
Pentachlorophenol
1,1-dichlorethylene
1,2-dichlorethane
Chlordane
Endrin
Heptachlor
Heptachlor epoxide
Lindane
Methoxychlor
Toxaphene
Benzene
Carbon tetrachloride
Chlorobenzene
Chloroform
Methyl ethyl ketone
Pyridine
Tetracholorethylene
Trichloroethylene
Vinyl chloride
2,4,5-TP (Silvex)
2,4-D

TSCA CONSTITUENTS:

Polychlorinated biphenyls

GENERAL INDICATORS:

Solid/soil pH
Paint Filter Liquids Test
Oxidizer/reducer test
Cyanide/sulfide test
Photoionizer "sniffer" test
Pyrophoricity
Shock sensitivity
Air reactive
Water reactive

2.1.2.2 Receipt Sampling Frequencies

As stated previously, the NRC has tentatively agreed to accept existing "in-situ" data for demonstration of waste acceptance criterion compliance at the 11e.(2) disposal facility. As a condition of Envirocare's groundwater permit, they must collect chemical samples as described below.

- Chemical analysis: One composite sample from each of the first 10 cargo containers or sea/lands and one composite sample for every additional 50,000 tons (which equates to one additional composite sample).

2.2 RELATIONSHIP OF SAMPLING AND ANALYSIS ACTIVITIES TO THE EC-0230 WASTE PROFILING PROCESS

For the Silo 3 material, the initial Envirocare EC-0230 form will be generated from existing data taken from the OU4 RI. As progressive sampling results are obtained under this SAP, the Profile Record will be updated under a "living document" approach, if and when maximum concentrations during operations exceed those delineated in the Envirocare profile. If this situation occurs, Envirocare will be notified and a new profile update will be submitted to reflect the new ranges observed during operations. Material affected by this situation will not be shipped until authorization is provided by Envirocare.

As stated above, operational decisions that rely on ex-situ information need to be made under conditions that offer less lead time for updates to the Profile Record and/or adjustment of screening-parameter tolerance limits compared to an in-situ approach. Successful implementation requires effective coordination of the Profile Record updates with appropriate "hold points" for retaining affected material while Envirocare's update approvals are pending. Typical hold points include profile approval, analytical exceedances which require profile revision, and radiological exceedances requiring loading geometry configuration. Operating procedures will be prepared outside this SAP to describe this coordination and use of material hold points during operations.

2.3 SILO 3 MATERIAL PRE-SHIPMENT CERTIFICATION

Due to the dispersability and hazardous characteristics of the untreated Silo 3 material, Fluor Fernald is requesting that Envirocare perform pre-shipment certification of the Silo 3 material. Under this approach, Envirocare would perform "remote sampling and analysis" of the Silo 3 material here at the FEMP in an effort to pre-certify compliance with the established Envirocare license and permit requirements.

If pre-shipment certified compliance is approved for Silo 3 material, Envirocare will pre-certify the material to meet the WAC and assess the operations processes in place to ensure the material will be within the established parameters. Fluor Fernald would utilize the processes assessed and perform minimal sampling and analysis to ensure the material is within the established limits.

2.3.1 Analytical Parameters

Existing "in-situ" data will be utilized for demonstration of WAC compliance. The "remote sampling and analysis" approach for satisfying the conditions of Envirocare's groundwater permit is summarized below.

- Chemical Parameters: Conduct analysis for the eight RCRA metals (plus zinc) and the 32 RCRA characteristic organics.

2.3.2 Sampling Frequency

The sampling frequency chosen to verify compliance with the pre-certified material is focused primarily on ensuring the material is homogenous and does not exceed Envirocare's permit and license limits. Samples will be collected from the process, to conduct the necessary chemical analyses required for waste disposition, at a frequency to mutually agreed upon by Fluor Fernald and Envirocare. The "remote sampling and analysis" process will be overseen by a certified Envirocare agent.

2.3.3 Selection of Appropriate Laboratories

Analyses will be conducted by a laboratory designated by Envirocare. This outside laboratory will be expected to meet the analytical turnaround times demanded by the project's needs, as well as meet requirements for Utah laboratory certification.

2.4 SILO 3 MATERIAL ROUTINE SAMPLING AND ANALYSIS STRATEGY

It is assumed that pre-shipment certification will be implemented for Silo 3 material; however, if this process is not feasible, Fluor Fernald will perform routine sampling and analysis of the untreated Silo 3 material to ensure that the Envirocare license and permit requirements and applicable DOT requirements are being met. This section summarizes the sampling and analysis strategy (selection of analytes and sampling frequency) for the Silo 3 material under the SAP, should pre-shipment certification not be implemented.

This version of the Silo 3 SAP presents those elements considered necessary to initiate the detailed WAC attainment demonstration process. If actual direct operating experience with the material indicates a need to revise any elements of the approach, an updated variance or, depending upon significance of the change(s), a revised SAP will be submitted to key affected parties (Envirocare, USEPA, and OEPA).

A key ingredient to the success of the analytical evaluations involves the use of appropriate analytical methods and laboratories that can provide quick-response turnaround times to support real-time material dispositioning decisions. The packaged Silo 3 material will typically reside in the overpack containers in a specified staging area until analytical results are received. Quick response laboratory methods and capabilities are imperative to disposition the Silo 3 material in a timely manner.

2.4.1 Analytical Parameters

Existing "in-situ" data will be utilized for demonstration of WAC compliance. A graded approach has been utilized to select appropriate analytes for material characterization, based on an adoption of Envirocare's receipt sampling analytes and a general knowledge of contaminant concentration levels indicated by the OU4 RI. This approach, developed to satisfy the conditions of Envirocare's groundwater permit, is summarized below.

- Chemical Parameters: Conduct analysis for the eight RCRA metals (plus zinc) and the 32 RCRA characteristic organics.

Routine sampling and analysis will require that the collected samples of Silo 3 material be sent to an off-site Utah-certified laboratory and analyzed for the identified analytes in Tables 2-2 and 2-3. Table 2-4 provides summary information on the sampling requirements associated with these samples, while Table 2-5 provides information on the proposed analytical methodologies. Minimum detection limits for these chemical parameters are delineated in the Sitewide CERCLA Quality Assurance Project Plan (SCQ).

The results of the sample analyses and the existing "in-situ" data will be used to manifest the material and show that the Silo 3 material is representative of the historical data used to profile the waste stream for disposal.

2.4.2 Sampling Frequency

Samples will be collected from the process, to conduct the necessary chemical analyses required for waste disposition, at a frequency based on an adoption of Envirocare's receipt sampling frequency. The basis for the frequency of the sampling is to ensure the material is homogenous and does not exceed Envirocare's permit and license limits.

Silo 3 material will be packaged in 3 yd^3 soft-sided containers, placed in an overpack container, such as a cargo container or sea/land, and shipped by flatbed railcars. The current transportation approach assumes nine soft-sided containers (27 yd^3) per overpack container and four overpack containers per flatbed railcar. Samples will be collected in-stream, prior to packaging of the material. On average, 45 yd^3 of material will be packaged each day.

TABLE 2-2
ROUTINE SAMPLE ANALYSIS FOR SILO 3 MATERIAL

Parameter	Target Analyte List (See Table 2-3)
1st sampling phase:	
Each of the 1st ten cargo containers or sea/lands	
RCRA Metals and Organics	A
Subsequent samples:	
Every additional 50,000 tons	
RCRA Metals and Organics	A

TABLE 2-3
TARGET ANALYTE LIST

A
RCRA Characteristic Metals and Organics:

Metals:	Organics:
Arsenic	1,4-dichlorobenzene
Barium	2,4,5-trichlorophenol
Cadmium	2,4,6-trichlorophenol
Chromium	2,4-dinitrotoluene
Lead	Cresol
Mercury	Hexachlorobenzene
Selenium	Hexachlorobutadiene
Silver	Hexachloroethane
Zinc	m-Cresol
	Nitrobenzene
	o-Cresol
	p-Cresol
	Pentachlorophenol
	1,1-dichlorethylene
	1,2-dichlorethane
	Chlordane
	Endrin
	Heptachlor
	Heptachlor epoxide
	Lindane
	Methoxychlor
	Toxaphene
	Benzene
	Carbon tetrachloride
	Chlorobenzene
	Chloroform
	Methyl ethyl ketone
	Pyridine
	Tetracholorethylene
	Trichloroethylene
	Vinyl chloride
	2,4,5-TP (Silvex)
	2,4-D

TABLE 2-4
SUMMARY OF SAMPLE CONTAINERS, PRESERVATION, AND HOLD TIME FOR SILO 3 SAMPLES

Parameter	Container	Preservative	Hold Time
TCLP metals	500 mL- widemouth glass jar	Cool (2-6 degrees C)	180/180 days[a]
TCLP organics	120 mL widemouth	Cool (2-6 degrees C)	14/40 days[a]

[a]For holding times listed as xx/yy days, the first number is the allowed holding time for extraction or preparation of the sample for analysis and the second number is the allowed holding time for analysis of the extract.

TABLE 2-5
SUMMARY OF SILO 3 SAMPLE ANALYSES METHODS

Parameter	Standard Analytical Method	Turnaround Time	Laboratory	Validation Support Level
TCLP Metals				
Extraction	SW-846, 1311	3 days	Off-Site	B
ICP	SW-846, 3010A	3 days	Off-Site	B
GFAA	SW-846, 3020A	3 days	Off-Site	B
Mercury	SW-846, 7470A	3 days	Off-Site	B
TCLP Organics	SW-846, 8260,8270 8082,8150	10 days	Off-Site	B

ICP = Inductively coupled plasma
GFAA = Graphite Furnace Atomic Absorption Spectrometry

The sampling approach is described below. Note that each composite sample is comprised of four random samples.

- Chemical analysis: One composite sample for each of the first 10 cargo containers or sea/lands and one composite for every additional 50,000 tons.

  This equates to four random samples collected for every nine soft-sided containers filled (for the first 90 containers) and four additional samples collected for the final 1,000 yd^3 to be packaged.

2.4.3 Selection of Appropriate Laboratories

Analyses will be conducted by an outside laboratory under contract to the FEMP. This outside laboratory will be expected to meet the analytical turnaround times demanded by the project's needs, as well as meet requirements for Utah laboratory certification.

2.5 DEPARTMENT OF TRANSPORTATION HAZARD CLASS DETERMINATION

The existing "in-situ" data will be used for verifying the appropriate DOT hazard class. This will be accomplished by verifying that the material meets the definition of LSA-II waste, as defined in 49 CFR 173.403, through determining if the material is essentially uniformly distributed, and through the analytical data by performing the following calculation:

$$\sum_{i=1}^{n} (a_i/A_{2i}) < 10^{-6}$$

Where a_i is the activity per gram of the i radioisotope and A_{2i} is the DOT A_2 value of the i isotope. The existing data will provide the information required for DOT shipping determination.

2.6 SAMPLE COLLECTION APPROACH

The sample collection approach employed by this SAP is based on a total waste stream volume of 5,100 yd^3 of Silo 3 material.

Samples of the untreated Silo 3 material will be taken upstream of the two packaging stations and placed in wide mouth containers. Samples will be taken at a frequency described in Sections 2.3.2 and 2.4.2. The samples will be appropriately labeled (See Section 3.2) and submitted to the on-site FEMP Sample Processing Lab (SPL) for shipment to the off-site laboratory. Upon receipt at the off-site laboratory, composite samples will be analyzed for the appropriate analytes. If analytical results on the composite samples are acceptable, the corresponding samples may be returned to the FEMP for disposition.

Duplicate samples will be collected, for quality assurance purposes, at a one in 20 frequency, as required by the SCQ for Validation Support Level (VSL) B data.

3.0 SAMPLE IDENTIFICATION, LABELING, AND CHAIN OF CUSTODY

The data generated from the Silo 3 material sampling effort represents the waste stream to be sent off-site for disposal. This material must meet the receiving facility's requirements, permits, and licenses. In order to accomplish that, the data must be defensible, thereby requiring integrity of the sample and resulting data.

The following sections discuss the means to ensure these requirements are met, should routine sampling and analysis be required. If "remote sampling and analysis" is established, sample identification, labeling and chain of custody requirements will be identified by Envirocare.

3.1 SAMPLE IDENTIFICATION

All samples collected for laboratory analysis will be assigned a unique sample identifier. This identifier will consist of a prefix designating the area name (Silo 3), followed by the container number, the sample sequence (1 through X, with a "-D" identifier for duplicate samples), and the type of sample ("TM" for TCLP metals, "TB" for trip blank, etc.). For example:

- Silo3-80-2-TM is the Silo 3 material from container #80, the second sample collected from the process, to be analyzed for TCLP metals.
- Silo3-40-1-TM-D is the Silo 3 material from container #40, is a duplicate of the first sample collected from the process, to be analyzed for TCLP metals.
- Silo3-TB-1 is the first trip blank collected and is associated with specific Silo 3 material samples (identified through the chain of custody and field logs).

3.2 SAMPLE LABELING

Sample labeling will be conducted as directed in the Silo 3 procedures to be generated separate from this SAP.

3.3 CHAIN OF CUSTODY

Silo 3 material samples will be collected by Silo 3 operations personnel under Silo 3 operating procedures and entered onto a chain of custody prior to forwarding the samples to the off-site laboratory for analysis. The procedure for completing and routing the chain of custody form can be found in FEMP procedure EW-0002, "Chain of Custody/Request for Analysis Record for Sample Control," and in Section 7 of the SCQ.

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4.0 SAMPLE EQUIPMENT DECONTAMINATION

Sample equipment decontamination will be conducted as specified by the Silo 3 procedures to be generated separate from this SAP.

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5.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

5.1 QUALITY CONTROL SAMPLES, ANALYTICAL REQUIREMENTS, AND DATA VALIDATION

Field quality control samples include trip blanks and duplicate samples. Trip blanks will be associated with the collection of samples for volatile organic compound (VOC) analyses and will accompany these samples from the field to the laboratory. Trip blanks will identify any external volatile organic compound contaminants that the associated field samples may be exposed to during sample collection, processing, or analysis. Trip blanks will be collected once per each shipping container of VOC samples transmitted to an off-site laboratory. Duplicate samples will be collected for quality assurance purposes, at a one in 10 frequency. Sampling and laboratory analysis will be performed at VSL B.

Analytical data may undergo a validation review as described in Section 7.0. VSL B validation activities will involve a review of sample collection logs and custody records, analytical results and quality control (QC) sample results to ensure the data satisfy relevant analytical performance specifications.

A Quality Assurance (QA) representative will conduct independent assessments of the work process and operations by conducting surveillances. The assessments will encompass technical and procedural requirements of this SAP and the SCQ. Surveillances will be implemented by monitoring/observing ongoing project activities and work areas to verify conformance to specified requirements. Surveillances will be planned and documented according to the SCQ.

5.2 PROJECT-SPECIFIC PROCEDURES AND MANUALS

To assure consistency and data integrity, field activities in support of this SAP will follow the requirements and responsibilities outlined in controlled procedures (both Silo 3-specific and FEMP-site procedures) and manufacturers' operational manuals.

5.3 IMPLEMENTATION OF FIELD CHANGES

If field conditions require changes or variances to this SAP, verbal or written approval (electronic mail is acceptable) must be obtained from the appropriate managers and the appropriate QC representative before the changes may be implemented. Changes to the SAP will be noted in the applicable field or laboratory logs and on a Variance/Field Change Notice Form. The completed form, including the required signatures, must be completed and distributed to the appropriate personnel within seven working days of the granted verbal or written approval. Laboratory variances will be handled and documented as specified in the SCQ.

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6.0 RECORD KEEPING

Field documentation of recorded observations and findings during field activities will be conducted according to Silo 3 procedures to be generated separate from this SAP.

All FEMP-generated records and documents will be generated, stored, and filed in accordance with the SCQ (which incorporates applicable DOE Orders) and FEMP procedures.

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7.0 DATA MANAGEMENT AND REPORTING

Data management will be conducted to meet the requirements of the project. The objective of the Silo 3 data management process is to compile field and analytical data, to develop a database for data retrieval, and to maintain records which can be used to demonstrate compliance with the specific (regulatory and contractual) requirements for shipment of Silo 3 material to Envirocare. The data management system utilized by the project is designed to ensure the following:

- Data and records accessibility.
- Correctness and completeness of information.
- Documented change control.
- Timely data reporting.

Existing integrated site database infrastructure will serve as the primary data management tools for the project and will be utilized to generate summary reports directly to meet operational needs and compliance reporting obligations. Specifically,

- the Fernald Analytical Computerized Tracking System (FACTS) will be utilized to manage on-site analytical data.

- the Windows Integrated Sample and Data Management (WISDM) system will be utilized to track the sample process through the system.

- the Sitewide Environmental Database (SED) will serve as repository for both off-site and on-site analytical data and related sampling and processing information.

The appropriate waste tracking system will depend on the off-site disposal option and shipping container configuration. The Integrated Information Management System (IIMS) is used for bulk waste and SWIFTS is used for containerized waste. Use of these systems will be as directed by existing FEMP procedures.

7.1 DATA REDUCTION AND MANAGEMENT

Data reduction involves the process and the calculations used to convert raw field or laboratory measurements/analytical data into final results with proper reporting units. All data reduction processes and calculations will be documented in the project files, as necessary, to ensure that the final data output is reproducible and defensible.

7.1.1 Field Data Reduction and Management

Field measurements that are direct readouts require no reduction or calculation. Such data will be entered into field logbooks immediately after the measurements are taken, as directed by Silo 3 procedures generated separate from this SAP.

7.1.2 Laboratory Data Reduction and Management

Analytical data are generated and reduced by extracting required information from laboratory worksheets, run logs, and instrument printouts and making necessary calculations to reduce the data to its final reporting concentrations. Sample results are calculated by using the equations provided in the approved analytical methods. In many cases, this is performed by proprietary equipment manufacturer software. All raw data necessary to support the calculations and quality assurance are archived at the laboratory. This raw data must be readily available for inspection and auditing by interested parties such as regulatory agencies or quality oversight personnel. Data reduction and management will be conducted in accordance with Section 11 of the SCQ.

7.2 DATA VALIDATION

The following sections provide a general discussion of the data validation process as it will be applied in the field and in the laboratory. Data validation is not a requirement of Envirocare; however, Fluor Fernald will perform data validation of the analytical results for the first shipment of Silo 3 material, prior to the material being released from site. Field data will be validated and a minimum of 10 percent of the analytical data from the laboratory will be subject to analytical validation to VSL B requirements in the SCQ.

Following this initial validation, QA surveillances will be conducted periodically to ensure the sample and analysis process is resulting in quality data. If additional validation is performed following the first shipment of Silo 3 material, a copy of the data results will be provided to Envirocare in parallel to validation of the data, to avoid any delays in shipment.

7.3 SUMMARY REPORTING

Summary reports will be generated for each sample or sample set as needed to fulfill regulatory and contractual obligations for the characterization and shipment of material. The reports may be issued electronically and/or hard copy to meet the operational needs and regulatory commitments of the Silo 3 project. Summary reports will be generated directly from the existing site database systems, which are integrated such that they allow for the easy development of individual reports that display data from all the systems. Precise reporting requirements will be refined as they become specifically known.

8.0 REFERENCES

Atomic Energy Act, 1954

Code of Federal Regulations, 40 CFR 261, "Identification and Listing of Hazardous Waste"

Code of Federal Regulations, 49 CFR 173.403, "Definition of LSA-II Material"

Comprehensive Environmental Response, Compensation and Liability Act

Envirocare Waste Acceptance Criteria, 2000

Fernald Environmental Management Project, 1994, "Remedial Investigation Report, Operable Unit 4," OU4RI-6-Final, November 1994

Fernald Environmental Management Project, 1994, "Final Record of Decision for Remedial Actions at Operable Unit 4, December 1994

Fernald Environmental Management Project, 1998, "Explanation of Significant Differences for Operable Unit 4 Silo 3 Remedial Action," OU4-ESD-0-Final, January 1998

Fluor Fernald, 2001, "Chain of Custody/Request for Analysis Record for Sample Control," EW-0002, Revision 1, UDC 2, August 2001

Fluor Fernald, 2002, "Sitewide CERCLA Quality (SCQ) Project Plan," FD-1000, Revision 2, January 2002

Fluor Fernald, 2002, "Silo 3 Project Transportation and Disposal Plan," 40430-PL-0008, Revision A, March 2002

Resource Conservation and Recovery Act

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SILO 3 PROJECT
TRANSPORTATION AND DISPOSAL PLAN

40430-PL-0008, REV. B

APRIL 2002

APPROVED BY:

Doris T. Edwards, Project Manager, Silo 3 Project	Date

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

U.S. DEPARTMENT OF ENERGY

DRAFT

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ACRONYMS

AEA	Atomic Energy Act
AEDO	Assistant Emergency Duty Officer
ARAR	Appropriate, Relevant and Applicable Requirement
ATMS	Automated Transportation Management System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DOE	Department of Energy
DOT	Department of Transportation
EDO	Emergency Duty Officer
EMS	Emergency Management System
Envirocare	Envirocare of Utah, Inc.
EOC	Emergency Operations Center
ESD	Explanation of Significant Differences
FEMP	Fernald Environmental Management Project
Fluor Fernald	Fluor Fernald, Inc.
FS	Feasibility Study
IP-2	Industrial Packaging-Type 2
ISA	Interim Storage Area
LLW	Low Level Waste
LSA	Low Specific Activity
MCEP	Motor Carrier Evaluation Program
NCP	National Contingency Plan
NORM	Naturally Occurring Radioactive Material
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
OU	Operable Unit
PCDF	Permitted Commercial Disposal Facility
Ra-226	Radium 226
Ra-228	Radium 228
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPP	Radiological Protection Program
RWP	Radiological Work Permit
SPR	Safety Performance Requirement
TC	Toxicity Characteristic
TEP	Transportation Emergency Plan
Th-230	Thorium 230
US EPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria
WPRAP	Waste Pit Remedial Action Project

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This plan describes how transportation and disposal operations will be evaluated to ensure safe and successful staging and transportation of Operable Unit 4 (OU4) Silo 3 material from the Fernald Environmental Management Project (FEMP) to Envirocare of Utah, Inc. (Envirocare) or the Nevada Test Site (NTS). Modes of transportation may include rail, motor carrier, or intermodal (i.e., a combination of rail and truck). This plan was prepared by Fluor Fernald, Inc. (Fluor Fernald) as a component of the Silo 3 Project Remedial Design (RD) Package.

This plan serves to: (1) describe the transportation logistics associated with Silo 3 material; (2) generally describe operational aspects of transportation plans to demonstrate that Silo 3 material can be transported to the designated disposal site safely, and in accordance with applicable regulations; and (3) identify design requirements and/or Silo 3 Project design interfaces critical to the implementation of transportation operations.

Submittal of this Transportation and Disposal Plan complies with the requirements put forth in the Silo 3 Remedial Design Work Plan (40400-WP-0001, Rev. 0, April 1998), which require an operational description of Fluor Fernald's responsibility for transportation and disposal of Silo 3 material.

The transportation and disposal approach assumed as the basis for the RD Package is rail shipment of containerized, untreated Silo 3 material to Envirocare for disposal. The Silo 3 Explanation of Significant Differences (ESD) allows Silo 3 material to be transported without treatment, as long as onsite pretreatment, in combination with packaging in accordance with Department of Transportation (DOT) regulations, results in a transportation risk less than 1×10^{-6}. An amendment to the OU4 Record of Decision (ROD) is being initiated in parallel with the Silo 3 remedial design to require onsite or offsite treatment only as required to achieve the waste acceptance criteria (WAC) of the NTS or an appropriately permitted commercial disposal facility (PCDF).

At this time, Envirocare is pursuing a modification to their Nuclear Regulatory Commission (NRC) license to allow containerized, untreated Silo 3 material to be disposed in the 11e.(2) cell as oversized debris. If the Envirocare license modification is not obtained, another transportation and disposal option will be selected, such as:

- Disposal of untreated material in the low-level waste cell at Envirocare (no modifications required);
- Bulk disposal of untreated material at Envirocare under their current license (would require conditioning of the material for dispersability);
- Disposal of untreated material at the NTS; or
- Disposal at Envirocare or the NTS after treatment to meet the WAC.

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Operable Unit 1 is using rail to transport bulk waste to Envirocare in covered, lined gondola cars. Shipments to the NTS are currently being performed exclusively by truck. The FEMP has determined that direct shipment of Silo 3 material to Envirocare by rail is the safest, most feasible, and cost-effective option (40400-RP-0007, Silo 3 Project Rescoping Evaluation and Recommendation). The current transportation and disposal approach assumes untreated Silo 3 material is packaged in 3 yd^3 soft-sided containers, loaded into cargo containers or sea/lands and transported by flatbed railcars in the OU1 Waste Pits Remedial Action Project (WPRAP) unit train to Envirocare. Direct shipment by truck to Envirocare and the NTS, as well as intermodal shipment to the NTS (the NTS cannot accept direct rail shipment), have been included as alternative transportation options. Although the preference is to dispose of the Silo 3 material at Envirocare, safety, feasibility, and cost-effectiveness will be the determining factors in the final decision.

Since this plan is specific to transportation and disposal of Silo 3 material at Envirocare or the NTS, disposal at any other government or commercial site will require a revision of this Transportation and Disposal Plan to reflect the receiving facility's license and permits.

1.2 PROJECT APPROACH

Fluor Fernald is responsible for material retrieval and packaging; selection of the disposal facility and mode of transportation; analysis of the Silo 3 material for compliance with the ROD and disposal facility WAC; loading Silo 3 material for shipment; and transporting the Silo 3 material to the disposal facility. Plans and requirements for completing this scope are described in the remainder of the RD Package.

2.0 OFF-SITE TRANSPORTATION

2.1 INTRODUCTION

The FEMP will conduct its operations in compliance with applicable federal, state, local, and tribal requirements governing materials transportation, unless exemptions or alternatives are approved in accordance with the Department of Energy (DOE) Order 460.1A and DOT regulations. A description of the Silo 3 waste form is included in Section 6.2. The Silo 3 material disposal strategy is to maintain the potential to transport and dispose of the material at either Envirocare or the NTS in the event any of these options becomes less preferable or even unavailable.

2.2 DEPARTMENT OF TRANSPORTATION REQUIREMENTS

DOT regulations, under 49 Code of Federal Regulations (CFR) Part 173.403, categorize low specific activity (LSA) material into three classifications: LSA-I, LSA-II, and LSA-III. To be considered LSA material, the material need only meet criterion under one of the classifications. Evaluation of the radiological content of the Silo 3 material indicates this material meets one criterion for LSA-II material. Specifically, Silo 3 material is considered "other material in which the radioactive material is distributed throughout and the estimated average specific activity does not exceed 10^{-4} A_2/g for solids..."

The results of the LSA-II determination on Silo 3 material are presented in Appendix A.

The LSA determination drives the container requirements for packaging the Silo 3 material for off-site shipment to a disposal facility. Based on the evaluation performed, the minimum packaging requirement for the Silo 3 material is an Industrial Packaging – Type 2 (IP-2) container. Soft-sided IP-2 containers will be used to containerize the Silo 3 material for staging and subsequent shipment. The soft-sided containers will be placed in an overpack container, such as a cargo container or sea/land, to facilitate handling and transport of the Silo 3 material. An IP-2 shipping container with liner is also an acceptable packaging alternative.

2.3 MATERIAL TRANSPORT

The mode of carriage (rail or highway) and carrier(s) will be selected to meet the requirements of each shipment and provide safe, expeditious, and economical delivery to the final destination.

For highway Route Controlled Quantities of radioactive materials, any truckload quantities of radioactive material, and hazardous waste in any quantity, only motor carriers with satisfactory ratings under the DOE Motor Carrier Evaluation Program (MCEP) will be considered. Vendors hired for segregation, packaging, transportation, and disposal are not included in this evaluation program.

The Silo 3 ESD allows Silo 3 material to be transported without treatment, as long as onsite pretreatment, in combination with packaging in accordance with DOT regulations, results in a transportation risk less than 1 x 10^{-6}.

2.3.1 Rail to Envirocare

Rail transportation to Envirocare will include coordinating shipment of the Silo 3 material with shipment of the WPRAP unit train, utilizing the existing FEMP site rail infrastructure. Rail shipments will be conducted in accordance with 49 CFR Parts 200-266, Federal Railroad Administration.

2.3.1.1 Routes

The route to be used for transportation of containerized Silo 3 material to Envirocare, via flatbed railcars in the WPRAP unit train, is shown in Figure 2-1. The route traverses the following states: Ohio, Indiana, Illinois, Missouri, Kansas, Nebraska, Colorado, Wyoming, and Utah.

2.3.1.2 Risk and Safety Requirements

A transportation risk assessment has been conducted comparing the risks associated with rail shipments of untreated Silo 3 material to Envirocare. The assessment evaluated both potential risks associated with accident-free waste transportation (direct radiation) and the risks associated with an accident scenario. As documented in Appendix B, the calculated excess cancer risk to members of the general public for both scenarios meets the criteria specified by the Silo 3 ESD.

It is assumed that transportation of treated Silo 3 material by rail to Envirocare would also meet the criteria specified by the Silo 3 ESD. If treatment of the Silo 3 material is required, a transportation risk assessment will be performed to document the risks associated with that approach.

2.3.2 Motor Vehicle Transport to Envirocare

2.3.2.1 Routes

Currently, the FEMP does not ship waste to Envirocare by truck; therefore, routes for transport of Silo 3 material to Envirocare via truck are not currently specified. The motor carrier transporting the material would be required to stay on FEMP-specified routes.

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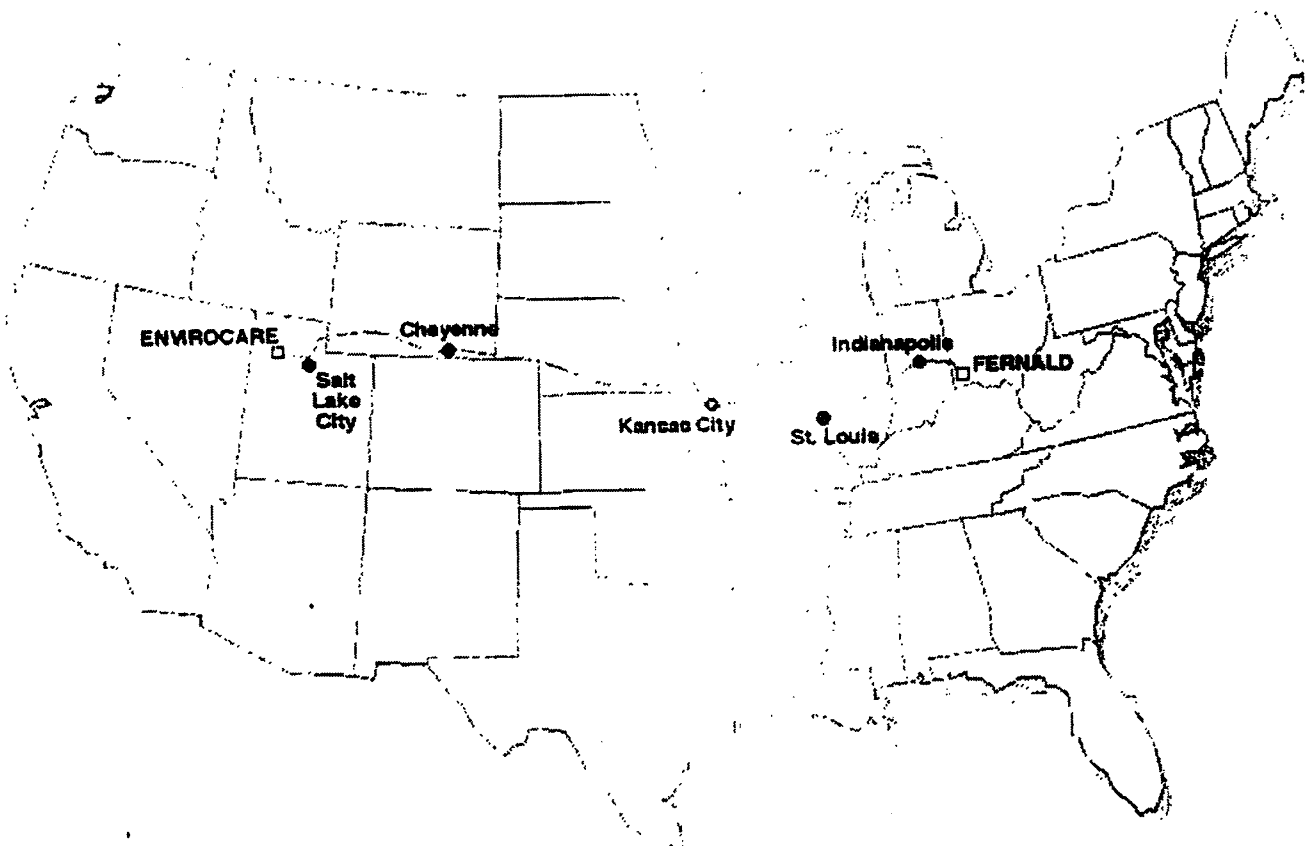
Figure 2-1
RAIL ROUTE TO ENVIROCARE



Per 49 CFR 397 Subpart D, Routing of Class 7 (Radioactive) Materials, the truck route selected for shipment of radioactive material from the FEMP to Envirocare shall ensure that the radiological risk is minimized. Accident rates, transit time, population density and activities, and the time of day and week which transportation will occur will be included in the radiological risk determination.

2.3.2.2 Risk and Safety Requirements

A transportation risk assessment comparing the risks associated with truck shipments of untreated Silo 3 material to Envirocare has been performed. The assessment evaluated both potential risks associated with accident-free waste transportation (direct radiation) and the risks associated with an accident scenario. As documented in Appendix B, the calculated excess cancer risk to members of the general public for both scenarios meets the criteria specified by the Silo 3 ESD.

It is assumed that transportation of treated Silo 3 material by truck to Envirocare would also meet the criteria specified by the Silo 3 ESD. If treatment of the Silo 3 material is required, a transportation risk assessment will be performed to document the risks associated with that approach.

2.3.3 Rail Transportation to the NTS

Rail transportation (intermodal) to the NTS was evaluated as part of the risk assessment for Silo 3 remedial alternatives and is provided in Appendix D of the OU4 FS, dated February 1994. The assessment evaluated potential risks associated with accident-free waste transportation (direct radiation) and the risks associated with an accident scenario. As documented in the FS, the calculated excess cancer risk to members of the general public for both accident scenarios meets the criteria specified by the Silo 3 ESD.

An updated transportation risk assessment will be performed if intermodal transportation of Silo 3 material (untreated or treated) to the NTS is the chosen transportation approach.

Per 49 CFR Parts 200-266, Federal Railroad Administration, the routes selected for shipment of radioactive material shall ensure that the radiological risk is minimized. Accident rates, transit time, population density and activities, and the time of day and week during which transportation will occur should be included in the radiological risk determination.

If rail transportation to the NTS is necessary, shipments would be coordinated with the existing FEMP site rail infrastructure established to ship waste material off-site. The use of existing rail shipment processes and infrastructure would be evaluated.

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2.3.4 Motor Vehicle Transport to the NTS

2.3.4.1 Routes

There is currently one northern route and two southern routes that could be used for transportation of Silo 3 material to the NTS via truck. Should the routes change, the motor carrier transporting the material will be required to stay on the specified routes.

Northern Route – Route No. 1

Travel south on Route 128 from the FEMP and take I-74 west to I-80; or travel south on Route 128 to I-74 west to Indianapolis, IN. Take I-70 west to I-29 north to I-80. Take I-80 west to Alternate US 93 south to US 93. At Ely, NV, take US 6 to Tonopah, NV. At Tonopah, NV, take US95 to the NTS Mercury Gate.

The Northern Route traverses the following states: Ohio, Indiana, Illinois, Missouri, Iowa, Nebraska, Wyoming, Utah, and Nevada.

Southern Route - Route No. 1

Travel south on Route 128 from the FEMP. Take I-74 west to I-275 west/south. Take I-275 to I-75 south to I-71 west to Louisville, KY. From Louisville, KY take I-64 west to St. Louis, MO. From St. Louis, MO follow I-44 to Oklahoma City, OK. Take I-40 through Kingman, AZ to Needles, CA. Proceed north on US 95 into Nevada. Go west on NV 164/Nipton Road to I-15. Proceed north on I-15 and west on Route 160 to Route 95. Take Route 95 east to Mercury, NV.

The Southern Route No. 1 traverses the following states: Ohio, Kentucky, Indiana, Illinois, Missouri, Oklahoma, Texas, New Mexico, Arizona, California, and Nevada.

Southern Route - Route No. 2

Travel south on Route 128 from the FEMP. Take I-74 west to Indianapolis, IN. Take I-70 west to St. Louis, MO. From St. Louis, MO, take I-44 to Oklahoma City, OK. Take I-40 through Kingman, AZ to Needles, CA. Proceed north on US 95 into Nevada. At NV 164/Nipton Road proceed west to I-15 at Baker, CA. Travel southwest on I-15 to Baker, CA. Go north on CA 127 and NV 373 to Amargosa Valley, NV. Take US 95 East from Amargosa Valley to Mercury, NV.

The Southern Route No. 2 traverses the following states: Ohio, Indiana, Illinois, Missouri, Oklahoma, Texas, New Mexico, Arizona, California, and Nevada

2.3.4.2 Risk and Safety Requirements

A transportation risk assessment comparing the risks associated with intermodal shipments to the NTS for Silo 3 remedial alternatives is provided in Appendix D of the OU4 Feasibility Study (FS), dated February 1994. The assessment evaluated both potential

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risks associated with accident-free waste transportation (direct radiation) and the risks associated with an accident scenario. As documented in the FS, the calculated excess cancer risk to members of the general public for both scenarios meets the criteria specified by the Silo 3 ESD.

An updated transportation risk assessment will be performed if transportation of Silo 3 material (untreated or treated) by truck to the NTS is the chosen transportation approach.

2.3.5 Shipping Requirements

2.3.5.1 Department of Transportation Requirements

The FEMP shall comply with applicable federal, tribal, state, and local regulations. Each package and shipment of hazardous materials for off-site shipment shall be prepared in compliance with 49 CFR 100-185, Hazardous Materials Regulations and the applicable tribal, state, and local regulations.

2.3.6 Department of Energy Requirements

The primary DOE transportation and packaging requirements are contained in DOE Orders 460.1A, Packaging and Transportation Safety, and 460.2, Departmental Materials Transportation and Packaging Management.

2.3.6.1 Rail

The FEMP will use the same two (2) Class 1 railroads (CSX Transportation, Inc. and Union Pacific Railroad Company) and follow the same procedures that the OU1 WPRAP Project uses. Minor revisions may be required to the WPRAP procedures to include Silo 3 shipments. These procedures cover the inbound and outbound railcar inspections for federal rail regulations, the safe movement and storage of railcars, and the preparation of shipment documentation, among other activities.

2.3.6.2 Motor Carrier

The FEMP will participate in and use the DOE MCEP in the selection of motor carriers as needed, or upon request from the DOE Field Element. Upon request from the DOE Field Element, the FEMP shall evaluate carriers, in accordance with the DOE MCEP. Carrier selection will be performed consistent with DOE Orders and 41 CFR 101-40, Transportation and Traffic Management. Shipments will be consolidated to the extent practicable into larger shipping quantities or units whenever such arrangements will result in transportation or administrative economies. To the maximum extent practicable, the FEMP shall utilize the Automated Transportation Management System (ATMS) to perform transportation tasks and audits.

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3.0 ON-SITE WASTE MANAGEMENT

3.1 INTRODUCTION

This section addresses the on-site management of the Silo 3 material, including the facilities, staging, inspections, and Silo 3 material container movements. The containers will be filled with Silo 3 material, weighed, labeled, placed in cargo containers or sea/lands, and staged for shipment to the off-site disposal facility. Samples will be taken prior to packaging the Silo 3 material and confirmatory analysis performed to verify that the Silo 3 material meets the disposal facility WAC. Once the Silo 3 Project receives verification that the material meets the disposal facility WAC, the Silo 3 material will be released for shipment from the FEMP. Individual containers of Silo 3 material and railcars (if shipped by rail) will be tracked using the existing on-site waste tracking databases.

3.2 FACILITIES

Portions of the existing Interim Storage Area (ISA) pad, not utilized for the Silo 3 facility, will be used for staging filled Silo 3 material containers while awaiting results of confirmatory sampling. Once the containers have been approved for disposal, they will be prepared for shipment. The Silo 3 Project continues to evaluate options available for the staging of Silo 3 material relative to changing site funding and land use scenarios.

3.2.1 Rail Transport

Once approved for disposal, the Silo 3 material containers will be transported to the FEMP Track 12 rail loading area and placed on flatbed railcars. Figure 3-1 shows the location of the Silo 3 work area, container staging area, and rail loading area. Once loaded, the railcars will be moved to the WPRAP rail facility and placed in the unit train. No new facilities are required for shipment by rail. Minor upgrades to the track will be made to set the track at grade with the Haul Road and switches will be installed for support of the Silos 1 and 2 Project.

3.2.2 Motor Vehicle Transport

Once approved for disposal, the Silo 3 material containers would be transferred to a second pad (either existing or new) on-site for continued staging and loading of containers for shipment.

3.3 STAGING AND INSPECTIONS

Although the Silo 3 material is 11e.(2) by-product material, and therefore exempt from regulation under Resource Conservation and Recovery Act (RCRA), the OU4 applicable, relevant and appropriate requirements (ARARs) require compliance with certain substantive

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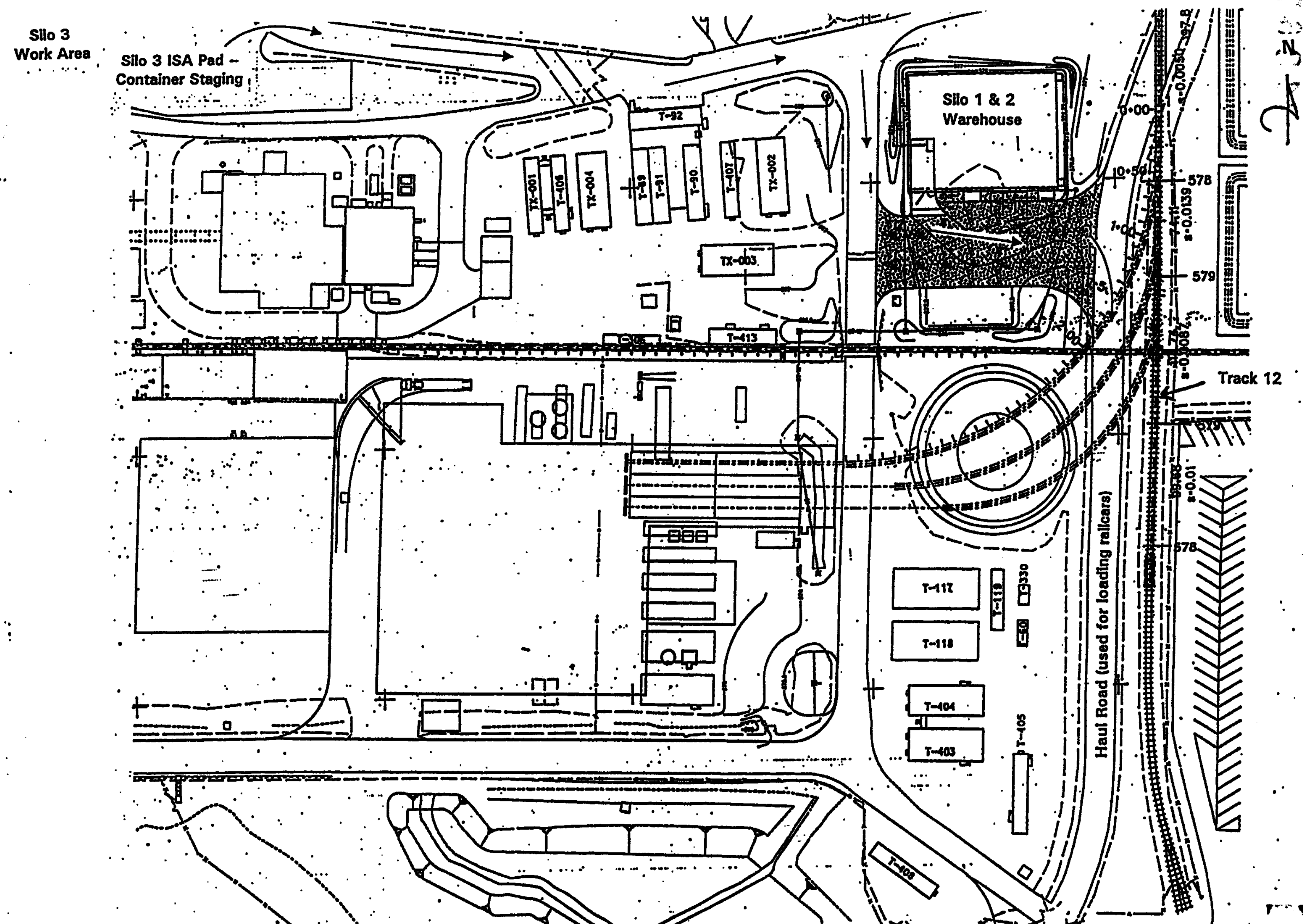

FIGURE 3-1
SILO 3 PROJECT AREA LAYOUT

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requirements of the RCRA regulations. Staging and inspections will be performed consistent with these ARARs and other applicable site procedures. The following are the substantive requirements from the RCRA container management regulations that need to be met for management of containers of Silo 3 material, and secondary waste containing, or contaminated with, Silo 3 material.

- The containers must be made of, or lined with, materials that are compatible with the material to be stored in the container.
- Access to the container staging area must be controlled (e.g., locked building, fenced or roped off pad, etc.).
- Documented inspections of the staging area for deteriorated containers, leaks, etc. must be conducted on a weekly basis.
- Documentation of all inspections must be retained and available.
- Spill response equipment must be located in the area.
- Emergency procedures must define response to emergencies (fires, etc.) in the area; these procedures must be incorporated into the RCRA Contingency Plan.
- The staging area must be constructed/operated in a manner that protects the containers from the contact with accumulated liquid.
- Containers must be handled in a way that prevents rupture, leakage, or spillage and must remain closed during staging.

The duration of interim (outdoor) staging of containers will be minimized to the extent possible. Approximately two or three weeks will elapse from the point of material packaging until the time results from confirmatory sampling indicate whether the Silo 3 material meets the disposal facility WAC. During this time the containers will be staged on the ISA Pad or another on-site staging location. Once the containerized material is characterized and manifested, and WAC certified, the containers will be loaded for shipment.

3.4 CONTAINER MOVEMENTS

Once the Silo 3 material is containerized, weighed, labeled, and placed in cargo containers or sea/lands, the containers will be moved to the ISA pad or another on-site staging location. Prior to release from the FEMP, the loaded containers will remain at the staging area until the material is certified to meet the disposal facility WAC. Sample analysis results for containers not meeting the WAC requirements will be further analyzed and the containers segregated from the rest of the loaded containers until disposition is determined. Containers meeting the requirements will be transported to the shipment loading area.

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Once an inventory of material is approved for shipment, the final shipping certification will occur prior to loading. Depending on the transportation mode chosen (rail or truck), containers will be loaded onto an acceptable transport conveyance, such as flat bed rail cars, box cars, gondola cars, flat bed trucks, or vans using fork trucks or other necessary heavy equipment. Silo 3 rail shipments would be coordinated with the existing FEMP site rail infrastructure established to ship WPRAP waste off-site.

After the soft-sided containers are removed from the cargo container or sea/land at the disposal facility, the emptied containers will be decontaminated and returned to the FEMP for re-use. Upon return to the FEMP, the empty containers will be unloaded from the transport conveyance using fork trucks or other necessary heavy equipment and transferred to the Silo 3 work area for use.

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4.0 HEALTH AND SAFETY

4.1 INTRODUCTION

The focus of this section will be the Health and Safety approach for on-site transportation operations-related activities. The overall on-site project Health and Safety responsibility lies directly with the DOE, Fluor Fernald, and its contractors. The specific functional areas of safety addressed in this section are Nuclear and Systems Safety, Occupational Safety and Health, Radiological Protection, and Security.

4.2 NUCLEAR AND SYSTEMS SAFETY

The FEMP Nuclear and System Safety Program is identified in RM-2116, System Safety Requirements and is implemented by Fluor Fernald through site procedures. An evaluation will be required of any existing safety analysis documentation for applicability. Safety analyses are performed to help ensure the health and safety of the public, the workers, and the environment.

The WPRAP shipping area has been categorized in accordance with DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports. Based on the categorization, the level of safety basis documentation required has been identified. It is assumed that Silo 3 material can be shipped and handled under the existing WPRAP safety basis documentation.

Safety analysis documentation has also been developed at the FEMP and approved for staging of material, motor vehicle transport, and rail shipping activities.

4.3 OCCUPATIONAL SAFETY AND HEALTH

The FEMP Occupational Safety and Health Program requirements are defined in the RM-0021, Safety Performance Requirements (SPR) Manual. The SPRs apply to activities at the FEMP. SPRs identify requirements established by federal, state, and local regulations, in addition to requirements from DOE Orders and Best Management Practices established by Fluor Fernald through experience, lessons learned, and employee input. SPRs identify safety and health standards for assessing and planning work at the FEMP. SPRs contain guidelines on what must be done to safely execute work and are not intended to specify how to execute work. The Fluor Fernald Silo 3 Project team will implement the SPRs by incorporating their requirements into any project-specific procedures and contracts that will be developed to guide the performance of transportation activities. Silo 3 material shipment will be performed in accordance with existing WPRAP procedures, which incorporate the required SPRs.

Project-specific safety and health requirements will be developed as the details of the project unfold. For planning purposes, however, existing SPRs are being used as the basis

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for health and safety on this project. The SPRs and additional project-specific safety requirements are incorporated into planning documents and implementing procedures.

4.4 SAFETY PRECAUTIONS

This section addresses safety precautions related to staging, rail operations, and motor vehicle transport activities involving Silo 3 material.

4.4.1 Staging of the Silo 3 Material

The Silo 3 material will be transported directly from the cargo loading area to the ISA pad or other on-site staging location. From there, the containers will be prepared for transport to the shipment loading area.

A hazard analysis has been performed for these types of activities in other areas of the FEMP. The Silo 3 Project team will use as much of those analyses as possible. Further project-specific hazard analyses will be performed as part of the Silo 3 Operational Health and Safety Plan and the results will be used to identify controls and mitigators, as necessary. The controls and mitigators will be incorporated into project documentation (e.g., design, plans, and procedures).

4.4.2 Rail Transportation

If shipping by rail, the FEMP will employ the existing site rail service, including plans and procedures utilized by WPRAP.

Hazard analyses have been performed by WPRAP, and controls and mitigators identified, for these activities. The FEMP will review and update these analyses, as necessary, to identify specific hazards and incorporate controls and mitigators identified for the shipping operations.

4.4.3 Motor Vehicle Transport

If it is determined that motor vehicle transport is the preferred method of transport, the FEMP will use existing FEMP programs and procedures for these activities.

Hazard analyses have been performed, and controls and mitigators identified, for these activities. The FEMP will review and update these analyses, as necessary, to identify specific hazards and incorporate controls and mitigators identified for the shipping operations.

4.5 RADIOLOGICAL PROTECTION

Equipment and material, including containers of Silo 3 material, will be released from the Silo 3 facility when the exterior of the item meets DOT surface contamination limits. Therefore, it is planned that shipping activities will take place in a Controlled Area. FEMP Radiological Control Technicians (RCTs) will conduct routine radiological surveys to ensure contamination levels are maintained below Contamination Area limits. The exterior of each container (soft-sided containers or cargo containers) will be surveyed by FEMP Radiological Control for compliance with DOT regulations and Fluor Fernald Radiological Protection Program (RPP) requirements. Exterior non-fixed contamination levels will be determined per 49 CFR 173.443, Contamination Control for shipments and 10 CFR 835, Occupational Radiation Protection for staging. Once the containers have been surveyed and are ready for release, the containers will be transported to the ISA Pad or other on-site staging location.

If the equipment or material in the Controlled Area exceeds Contamination Area levels, a Contamination Area will be established and a new Radiation Work Permit (RWP) will be issued. The RWP will define the level of anti-contamination clothing and RCT coverage required. If decontamination is feasible, decontaminating the work surface to a level below Contamination Area limits will eliminate the need for routine wearing of anti-contaminating clothing and reduce the RCT coverage requirements. If/when Contamination Areas are established, whole body monitoring will be required for exiting the area. Immediately following the completion of work, the area will be decontaminated, as necessary, and surveyed for the purpose of down-posting.

As the shipment loading area for the Silo 3 material is identified in further detail, more detailed project-specific radiological control requirements will be developed. These requirements will be incorporated into procedures and work permits.

4.5.1 Access of Personnel

Only necessary personnel with the appropriate training will be given access to the radiologically-controlled areas. The crew will ingress/egress through a radiological control point and will be subject to personal contamination monitoring upon exit. Incidents of personal contamination will be addressed per existing, approved site procedures.

4.6 SECURITY

Areas where Silo 3 material will be loaded and staged pending the completion of shipment, will be fenced and provided with the appropriate levels of security and lighting. FEMP security monitors site access by using stationary posts, conducting walking, driving, and perimeter patrols on a 24-hour basis.

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5.0 EMERGENCY RESPONSE

5.1 INTRODUCTION

This section documents the emergency response procedures that are in place to respond to transportation accidents involving shipments of Silo 3 material. The scope of this discussion focuses on off-site occurrences and references procedures for on-site occurrences.

DOE Order 151.1, Comprehensive Emergency Management, provides for a DOE Emergency Management System (EMS). Pursuant to this order, DOE must maintain a Transportation Emergency Preparedness Program that enhances and integrates transportation emergency preparedness capabilities within the EMS. The Transportation Emergency Preparedness Program has been established at DOE headquarters. The FEMP has a similar program. The Transportation Emergency Preparedness Program ensures that an adequate DOE response to transportation incidents involving DOE materials is performed and that DOE's responsibilities under the NCP and the Federal Radiological Emergency Response Plan are adequate. The Transportation Emergency Preparedness Program also provides technical advice and assistance as required for transportation incidents involving radioactive wastes.

5.1.1 Department of Energy Requirements

The primary DOE requirements are contained in DOE Orders 460.1A, Packaging and Transportation Safety, and 460.2, Departmental Materials Transportation and Packaging Management, which cover DOT requirements that regulate the operations and activities associated with the transportation and packaging of hazardous materials in interstate and intrastate commerce.

DOE Order 435.1, Radioactive Waste Management and associated manual DOE M 435. 1-1, Chapter IV, Section L.2, Transportation, also state that the volume of waste and number of waste shipments shall be minimized to the extent practical. This requirement was considered in development of the Silo 3 waste form and associated transportation planning.

5.2 FEMP EMERGENCY RESPONSE PREPAREDNESS PLANS

The FEMP Transportation Emergency Plan (TEP), PL-3043, is part of the DOE-FEMP Transportation Emergency Preparedness Program. The FEMP TEP provides a centralized program approach to off-site transportation emergency response including products, samples, waste, and rail shipments.

The FEMP TEP describes the overall DOE/FEMP process developed for the coordination of response efforts to off-site transportation incidents. This assistance planning is accomplished by adherence to applicable federal, state, and local transportation-related emergency response requirements, plus utilizing existing DOE programs designed to protect the well-being of citizens and the environment from accidental release of transported materials.

Procedures for on-site emergencies are addressed in PL-3020, FEMP Emergency Plan, which details the procedures to be followed at the FEMP in the event of an accident or emergency, highlights FEMP safety features, and governs the spill response actions. The FEMP Emergency Plan is distributed to participating mutual aid organizations, such as local fire departments and hospitals, in the general vicinity of the FEMP. Additionally, PL-2194, the FEMP Spill Prevention Control and Countermeasure Plan will be implemented accordingly for incidents on, or in close proximity to, the FEMP.

5.3 EMERGENCY RESPONSE FOR THE FEMP OFF-SITE SHIPMENTS

A Silo 3 material shipment will become an off-site shipment at the point when the entire shipment crosses the facility boundary. When the shipment is off-site, the rail or motor carrier will be responsible for providing emergency response support to the local authorities in proximity of any incident. The carrier also has contractors available for containment and cleanup as necessary. DOE will advise and provide support as requested by the local response authority (49 CFR 174.750). Local response personnel including police, firefighters, and emergency responders, typically are the first to arrive on the scene of an incident. They must be provided with the technical information needed by first responders to accurately identify the hazards involved in the incident. Information contained in the shipping papers includes source terms, health and safety concerns, and recommended protective actions. The information is consistent with the DOT, Research and Special Programs Administration publication, North American Emergency Response Guidebook, Guide 162.

The following is an overview of the emergency response responsibilities of the rail and motor carriers, DOE, individual states, and the FEMP to support local authorities at an accident scene.

1. Carriers
   - Trained in accordance with DOT Emergency Response Guidebook and the carrier's respective Emergency Response Plans
   - Stabilize situation
   - Provide notification of incident to carrier home office
   - Provide notification to FEMP/DOE

2. Carrier Emergency Response Organization
   - Make appropriate additional notification (local authorities, DOE, etc.)
   - Dispatch Emergency Response Personnel to the scene to support On-Scene Commander

- Mobilize strategically positioned emergency response subcontractors, if necessary
- Responsible for Recovery Actions

3. Local Authorities
   - Typically function as the On-Scene Commander

4. State Emergency Response Organizations
   - Each state possesses an Emergency Response Organization capable of responding to radiological emergencies

5. DOE Regional Radiological Assistance Teams
   - Eight Radiological Assistance Teams across the United States
   - Provide On-Scene Commanders with support in terms of radiological monitoring, communications, and information coordination during an emergency
   - Consist of DOE and contracted personnel possessing expertise in health physics, public information, and communications

The FEMP TEP is activated when the carrier or the local response organizations contacts the FEMP to notify DOE that an incident has occurred. The 24-hour emergency phone number provided on the bill of lading, as required by 49 CFR 172.604, Emergency Response Telephone Number, is a direct telephone line to the FEMP Communications Center.

The FEMP Communications Center provides communication capability for the FEMP, monitors conditions, and makes notifications as required. The FEMP Communication Center establishes and maintains direct communication with the On-Scene Commander and the FEMP Assistant Emergency Duty Officer (AEDO) until the Emergency Operations Center (EOC) is activated.

The FEMP EOC is activated at the direction of the AEDO or Emergency Duty Officer (EDO) for events categorized at the emergency level, including transportation events and for non-emergency events at the discretion of the EDO. The EOC officially becomes operational when the Emergency Director or Deputy Emergency Director arrives on the scene, determines that sufficient personnel are available to manage the response, and declares the EOC operational. The combined efforts of EOC staff members provide support, guidance, and direction to the On-Scene Commander in the field. The EOC staff assumes responsibilities such as making protective action recommendations, providing notifications, and obtaining necessary resources, as required by the specific circumstances of the event.

5.3.1 Rail/Motor Carriers

Rail and motor carriers maintain Emergency Response Plan(s), which outline the procedures the carrier's employees must take in the event of an incident. The plan includes notification responsibilities, emergency response procedures for personnel on the scene, environmental considerations, and additional precautions to take in the event of an incident. DOE, as the shipper, will be notified by the carrier immediately should an incident occur. Both the carrier and DOE will initiate emergency procedures upon notification.

The Emergency Response Plans for the two railroads utilized for shipment to Envirocare (CSXT and Union Pacific) are on file at the FEMP.

6.0 WASTE DISPOSAL

6.1 INTRODUCTION

This section discusses disposal of Silo 3 material at Envirocare or the NTS and the related regulatory and waste acceptance information.

6.2 SILO 3 MATERIAL QUANTITIES/CHARACTERISTICS

Silo 3 contains approximately 5,100 yd^3 of material that was generated at the FEMP during uranium extraction operations in the 1950s. Samples collected from Silo 3 indicate the presence of significant activity and concentrations of the radionuclides within the uranium decay series, confirming prior process knowledge. The predominant radionuclide of concern identified within Silo 3 is Th-230, a radionuclide produced from the natural decay of Uranium-238. Approximately 450 curies of Th-230 are distributed within the Silo 3 material. (Note: The 450 curies is a mean inventory value. The 95% upper confidence limit inventory value is approximately 530 curies. For most determinations, the upper confidence limit values are used for conservatism.)

The Silo 3 material is classified as 11e.(2) by-product material under the Atomic Energy Act (AEA), of 1954, as amended, because the material resulted from the processing of uranium ore concentrate and is specifically exempt, as defined, from regulation as solid waste under RCRA, 40 CFR 261.4(a)(4), Identification and Listing of Hazardous Waste, Exclusions. Since Silo 3 material is not a solid waste, requirements under RCRA are not "applicable".

Some analyses of Silo 3 material, documented in the OU4 Remedial Investigation (RI), identify levels of arsenic, cadmium, chromium and selenium at levels that exceed the RCRA Toxicity Characteristic (TC) limits. Data from the OU4 RI also identifies that Silo 3 material contains other RCRA-regulated metals such as beryllium, nickel, and thallium. The levels of these other metals do not exceed the RCRA TC limit. Concentrations of beryllium are below the 0.1 percent level as defined in 10 CFR 850, Chronic Beryllium Disease Prevention Program. Although several metals exceed the RCRA TC limits, Silo 3 material that is managed and disposed as 11e.(2) by-product material is not governed by RCRA and therefore is not prohibited from exhibiting RCRA characteristics.

The basis for the RD Package is disposal of Silo 3 material, without treatment, in accordance with the disposal facility WAC. An amendment to the OU4 ROD is being initiated in parallel with the Silo 3 remedial design to require onsite or offsite treatment only as required to achieve the WAC of the NTS or an appropriately permitted commercial disposal facility (PCDF). If this disposal approach becomes infeasible, the Silo 3 material would have to be treated prior to disposal. In that case, the material would be shipped off-site by rail or truck as described in Section 2.2 and Envirocare or another off-site facility contracted to treat the material.

6.3 DISPOSAL OF SILO 3 MATERIAL

At this time, Envirocare is the only PCDF capable of disposing untreated Silo 3 material. Envirocare has obtained a license modification to accept Th-230 activity up to 60,000 pCi/g and is in the process of obtaining a license modification to allow disposal of over-sized debris in the 11e.(2) cell. A recent revision (Revision 4) of the NTS WAC, however, may allow management and disposal of untreated Silo 3 material at the NTS as 11e.(2) material.

Should the option to transport and dispose of untreated Silo 3 material become infeasible, the Silo 3 material would have to be treated to meet the appropriate disposal facility WAC. Both Envirocare and the NTS are capable of disposing of treated Silo 3 material, should treatment be necessary.

6.3.1 <u>Envirocare</u>

This section provides information pertinent to the disposal of Silo 3 material at Envirocare. This section will describe regulatory requirements, Envirocare waste acceptance, and the receipt of waste at Envirocare. This section description is based on existing FEMP experiences.

Silo 3 material is proposed for shipment and disposal at Envirocare without treatment. Envirocare is in the process of performing an engineering study/evaluation for placement of three – 20 yd^3 bags of untreated Silo 3 material in the 11e.(2) cell.

Sampling and analysis of the Silo 3 material will be performed to ensure that the material being offered for disposal meets the Envirocare WAC. Therefore, only material that meets the disposal facility WAC will be accepted for transportation and disposal under this plan.

Due to the dispersability and hazardous nature of untreated Silo 3 material, efforts will be taken to accommodate Envirocare in performing "remote sampling" of the Silo 3 material at the FEMP in an effort to pre-certify compliance with the established WAC and license limits.

6.3.1.1 Regulatory Information

The NRC, as well as certain state agencies given the authority by the NRC, has the authority to permit commercial disposal facilities to dispose of radioactive materials, including low-level radioactive waste (LLW), Naturally Occurring Radioactive Material (NORM), and 11e.(2) by product material. WAC, license limits, and other requirements are established to regulate disposal of specified categories of radioactive materials. In permitting the disposal of radioactive materials at a PCDF, the regulatory agency with authority over the facility determines and ensures that disposal of the specified material is in accordance with the criteria and is protective of human health and the environment.

Envirocare is licensed by the NRC to dispose of 11e.(2) by-product material. The WAC for Envirocare's 11e.(2) and LLW disposal cells specify radionuclide concentration limits and other criteria to ensure that material accepted for disposal in these cells will meet the requirements of the NRC license.

Appropriate documentation must be provided in writing prior to shipping activities. Accordingly, packaging and transportation of shipments to Envirocare for disposal must be in compliance with DOE Order 435.1, "Radioactive Waste Management," 40 CFR and 49 CFR." As applicable, other federal, state, and local requirements, including generator site requirements, must be met.

6.3.1.2 Envirocare Waste Acceptance

Prior to determining waste stream acceptability at Envirocare for disposal, the proposed waste stream would be completely and accurately characterized, including sampling and analysis, as necessary. Once the waste is adequately characterized, a waste profile will be developed and submitted for the waste stream proposed for disposal at Envirocare. Information entered into this profile provides Envirocare with an understanding of the physical, chemical, and radiological properties of the waste material. Additionally, the history of the waste, and the process by which the waste was generated, will be fully documented in the profile.

Once the information is documented, the profile will be submitted to Envirocare for review and approval. The technical review will evaluate the waste stream based on its physical, chemical, and radiological properties. In addition, the waste stream will be evaluated upon the existing or desired shipment packaging and mode of transportation. This portion of the review process is to help determine if the waste stream is acceptable and if any handling is necessary to accept and dispose of the waste.

6.3.1.3 Receipt of Waste at Envirocare

Once the generator has received profile/waste stream approval, delivery must be scheduled. The first step would be contacting the Scheduling Department at Envirocare. A written request must be provided a minimum of five working days prior to the arrival of each shipment. In addition to this advance notice, the generator must provide advance copies of the Uniform Low-Level Radioactive Waste Manifest (NRC 540 and 541) and other shipping documents at least three days prior to the scheduled arrival date.

6.3.2 <u>Nevada Test Site</u>

This section provides information pertinent to disposal of Silo 3 material at the NTS. This section will describe regulatory requirements, the NTS waste acceptance, and the receipt of waste at the NTS.

6.3.2.1 Regulatory Information

The DOE, Nevada Operations Office, and Nevada Test Site Waste Acceptance Criteria (NTSWAC) establish the requirements for disposition of waste at the NTS. Additionally, the NTSWAC, DOE/NV-325, Revision 4, requires that packaging and shipments to the NTS be performed in accordance with DOE Order 435.1, "Radioactive Waste Management", 40 CFR, and 49 CFR. As applicable, other federal, state, and local requirements, including generator site requirements, must be met.

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Off-Site Rule is found in CERLCA Section 121(d)(3) and promulgated at 40 CFR Part 300.440, Procedures for Planning and Implementing Off-Site Response Actions. The CERCLA Off-Site Rule requires that waste from a remedial action that is shipped off-site for treatment and/or disposal be transferred only to those units at a facility that (1) are operating in compliance with RCRA and other applicable federal and state requirements, and (2) do not have any uncontrolled releases of hazardous waste or constituents. The rule applies to any remedial action involving the transfer of hazardous substances, pollutants, or contaminants as defined under CERCLA Sections 101(14) and (33) pursuant to any CERCLA authority, including cleanups at federal facilities [40 CFR Part 300.440(a)(1)].

In a letter dated July 7, 1998, the EPA Region 9 granted approval to the NTS to dispose of CERCLA waste from DOE facilities in waste management areas 3 and 5, in accordance with the above-mentioned Off-Site Rule. As clarification, the EPA Region 9, in a letter dated December 4, 1998, stated that the CERCLA Off-Site Rule approval for the NTS waste management areas 3 and 5, included management of small volumes of 11e.(2) by-product materials from Fernald OU4 as low-level waste under the provisions of Chapters III and IV of DOE Order 435.1, or any subsequent applicable DOE directive.

Silo 3 material has been determined by DOE to be 11e.(2) by product material. DOE Order 435.1 allows small volumes of 11e.(2) material to be managed at the NTS as low level waste in accordance with their low level waste WAC. Historically, the NTS WAC required that low level waste accepted for disposal could not "exhibit a hazardous waste characteristic" and therefore would not allow disposal of untreated Silo 3 material.

A recent revision (Revision 4) of the NTS WAC, however, may allow management and disposal of untreated Silo 3 material at the NTS as 11e.(2) material. The current WAC has removed the criterion that waste not exhibit a hazardous waste characteristic, and now specifies only that "waste regulated under title 40 CFR 261-268 and state of Nevada hazardous waste regulations shall not be accepted for disposal." Discussions with NTS indicate that contingent upon a site-specific protectiveness demonstration, the presence of metals levels above TC limits in 11e.(2) material does not necessarily preclude disposal of 11e.(2) material under Revision 4 of the NTS WAC.

6.3.2.2 NTS Waste Acceptance

DOE/Nevada Operations Office requires that prior to generator approval to ship waste to the NTS, they must develop a certification program to ensure waste is compliant with the requirements of the NTSWAC. The process used by DOE/Nevada Operations Office for approval of a generator's certification program includes program reviews and evaluations of implementation at the generator's facility.

Once the generator has an approved program, a waste profile must be developed and submitted for each waste stream that is to be disposed at the NTS. These profiles provide the NTS with an understanding of the characterization and quantities of the material. If the profiles as stated are approved, the generator is then notified in writing of the authorization and packaging and shipment may commence.

The generator's Waste Certification Official and his designees, in accordance with the Waste Certification Program Plan, will provide oversight of any packaging and shipping operations that are performed to ensure and document that requirements have been met for waste disposal at the NTS. If requirements are met, then the waste packages, the documentation packages, and the transport vehicles are "certified" in accordance with the NTSWAC and Fluor Fernald requirements and released for transport to the NTS.

The NTS performed a Performance Assessment per DOE Order 435.1 on Area 5, which established volumetric radionuclide concentration limits. Informal review indicates treated Silo 3 material meets the radionuclide concentration limits and could be disposed in Area 5.

6.3.2.3 Receipt of Waste at the NTS

Once the waste generator has received approval to ship and has performed certification activities to release shipments for disposal, the generator must notify the NTS Manager to arrange for transfer of the waste and accompanying records.

Prior to shipment, certain records must be sent electronically. Pre-notification information such as time of departure, estimated time of arrival; carrier, trailer, and security seal numbers; description of load; waste type; and a copy of the Package Storage and Disposal Request.

Once the shipment arrives at the NTS (Mercury location), the driver must provide a copy of the Nuclear Materials Transaction Report, completed proper shipping papers with shippers certification, original Package Storage Disposal Request, and an appropriate Waste Certification Statement signed by the Waste Certification Official or an alternate designee (Alternate Waste Certification Official). Once these documents are reviewed and accepted, the shipment may be unloaded at the disposal location.

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7.0 REFERENCES

Code of Federal Regulations, 10 CFR 835,"Occupational Radiation Protection"

Code of Federal Regulations, 10 CFR Chapter 1,"Nuclear Regulatory Commission"

Code of Federal Regulations, 40 CFR 261.4, "Identification and Listing of Hazardous Waste, Exclusions"

Code of Federal Regulations, 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan"

Code of Federal Regulations, 40 CFR 300.440, "Procedures for Planning and Implementing Off-Site Response Actions"

Code of Federal Regulations, 41 CFR 101-40, "Transportation and Traffic Management"

Code of Federal Regulations, 49 CFR 106-199, "Hazardous Materials and Oil Transportation"

Code of Federal Regulations, 49 CFR 107.103, "Hazardous Materials Program Procedures"

Code of Federal Regulations, 49 CFR 172.604, "Emergency Response Telephone Number"

Code of Federal Regulations, 49 CFR 173.403, "Definition of LSA-II Material"

Code of Federal Regulations, 49 CFR 173.443, "Contamination Control"

Code of Federal Regulations, 49 CFR 174.450, "Incidents Involving Leakage"

Code of Federal Regulations, 49 CFR 200-266, "Federal Railroad Administration"

Code of Federal Regulations, 49 CFR 350-399, "Commercial Motor Carrier Safety Assistance Program"

Code of Federal Regulations, 49 CFR 397, Subpart D, "Routing of Class 7 (Radioactive) Materials"

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U.S. Department of Energy, 1996, "Packaging and Transportation Safety," DOE-460.1A, October 1996

U.S. Department of Energy, 1999, "Radioactive Waste Management," DOE-435.1, July 1999

APPENDIX A
SILO 3 MATERIAL LSA DETERMINATION

The table below presents the source term for the Silo 3 material, as well as the LSA-II classification determination. Columns 2 and 3 present the activity for each radionuclide in picoCuries/gram (pCi/g) and curies per gram (Ci/g), respectively. The activities in Column 3 were summed together to provide a total activity for the mixture of radionuclides. This value is presented at the bottom of Column 3. Column 4 presents the fractional contribution (f_i) of each radionuclide by dividing the activity for each radionuclide in the Silo 3 material by the total activity. For Silo 3 material, the total activity is approximately 1.14×10^{-7} Ci/g.

The A_2 value for the mixture was determined in accordance with 49 CFR Part 173.433(d)(2)(ii):

$$A_2 = 1/(\textstyle\sum_i f_{(i)}/A_{2(i)}) \qquad \text{(Eq.1)}$$

where f_i/A_{2i} is the fraction of activity of nuclide "I" in the mixture compared to the radionuclide's respective A_2 value.

There are three decay chains associated with Silo 3 material: uranium-238, uranium-235, and thorium-232. These three decay chains were divided into "sub-chains" in which each parent nuclide had a half-life greater than 10 days. Radionuclides with a half-life less than 10 days were considered to be in secular equilibrium with their parent nuclide so only the A_2 value associated with the parent nuclide was used in determining the A_2 value for the mixture, as allowed under 49 CFR Part 173.433(c). Column 5 of the Table provides the A_2 value for those radionuclides with a half-life greater than 10 days.

Column 6 presents the fraction of activity for each radionuclide compared to the radionuclide's respective A_2 value (Column 4 values divided by Column 5 values). The inverse of the sum of these values equals the A_2 value for the mixture. This calculation is provided at the bottom of Column 6. For Silo 3 material, the A_2 value is determined to be approximately 0.11 Ci.

One of the definitions for LSA-II material requires that the activity of a material be less than 10^{-4} times the calculated A_2 value per gram (10^{-4} A_2/g). This value is calculated at the bottom of Column 6 and presented in Column 7. For Silo 3 material, the LSA-II limit is determined to be approximately 1.1×10^{-5} Ci/g.

Column 8 then calculates the fraction of activity for each radionuclide compared to the calculated LSA-II limit determined for the mixture (Column 3 values divided by Column 7 values). For a mixture of radionuclides, the sum of the fractions must be less than "1" to be classified as LSA-II material. The sum of the fractions for Silo 3 material is determined to be approximately 0.0976. Therefore, Silo 3 material qualifies as LSA-II material. Documented discussions with DOT representatives have verified this determination.

SILO 3 MATERIAL LSA-II SOLID DETERMINATION

Radionuclide	Source Term Silo 3 Mat. (pCi/g)	Source Term Silo 3 Mat. (Ci/g)	f(I)	A_2 Limit (Ci)	f(I)/A_2 (Ci^{-1})	LSA-II Limit 10^{-4} x A_2 (Ci/g)	Fraction of LSA-II Limit
Ac-227	9.25E+02	9.25E-10	8.11E-03	5.41E-04	1.50E+01	8.51E-07	1.09E-03
Ac-228	8.42E+02	8.42E-10	7.39E-03				
Bi-210	3.48E+03	3.48E-09	3.05E-02				
Bi-211	9.25E+02	9.25E-10	8.11E-03				
Bi-212	3.67E+02	3.67E-10	3.22E-03				
Bi-214	3.87E+03	3.87E-09	3.39E-02				
Fr-223	1.30E+01	1.30E-11	1.14E-04				
Pa-231	6.27E+02	6.27E-10	5.50E-03	1.62E-03	3.40E+00	8.51E-07	7.37E-04
Pa-234	3.00E+00	3.00E-12	2.63E-05				
Pa-234m	1.78E+03	1.78E-09	1.56E-02				
Pb-210	3.48E+03	3.48E-09	3.05E-02	2.43E-01	1.26E-01	8.51E-07	4.09E-03
Pb-211	9.25E+02	9.25E-10	8.11E-03				
Pb-212	3.67E+02	3.67E-10	3.22E-03				
Pb-214	3.87E+03	3.87E-09	3.39E-02				
Po-210	3.48E+03	3.48E-09	3.05E-02	5.41E-01	5.64E-02	8.51E-07	4.09E-03
Po-211	3.00E+00	3.00E-12	2.63E-05				
Po-212	8.50E+01	8.50E-11	7.46E-04				
Po-214	3.87E+03	3.87E-09	3.39E-02				
Po-215	9.25E+02	9.25E-10	8.11E-03				
Po-216	3.67E+02	3.67E-10	3.22E-03				
Po-218	3.87E+03	3.87E-09	3.39E-02				
Ra-223	9.25E+02	9.25E-10	8.11E-03	8.11E-01	1.00E-02	8.51E-07	1.09E-03
Ra-224	3.67E+02	3.67E-10	3.22E-03				
Ra-226	3.87E+03	3.87E-09	3.39E-02	5.41E-01	6.27E-02	8.51E-07	4.55E-03
Ra-228	4.06E+02	4.06E-10	3.56E-03	1.08E+00	3.30E-03	8.51E-07	4.77E-04
Rn-219	9.25E+02	9.25E-10	8.11E-03				
Rn-220	3.67E+02	3.67E-10	3.22E-03				
Rn-222	3.87E+03	3.87E-09	3.39E-02				
Th-227	9.12E+02	9.12E-10	8.00E-03	2.70E-01	2.96E-02	8.51E-07	1.07E-03
Th-228	7.47E+02	7.47E-10	6.55E-03	1.08E-02	6.07E-01	8.51E-07	8.78E-04
Th-230	6.02E+04	6.02E-08	5.28E-01	5.41E-03	9.76E+01	8.51E-07	7.07E-02
Th-231	1.17E+02	1.17E-10	1.03E-03				
Th-232	8.42E+02	8.42E-10	7.39E-03	unlimited			
Th-234	1.78E+03	1.78E-09	1.56E-02	5.41E+00	2.89E-03	8.51E-07	2.09E-03
Tl-207	9.22E+02	9.22E-10	8.09E-03				
Tl-208	1.32E+02	1.32E-10	1.16E-03				
Tl-210	1.00E+00	1.00E-12	8.77E-06				
U-234	1.73E+03	1.73E-09	1.52E-02	2.70E-02	5.62E-01	8.51E-07	2.03E-03
U-235	1.17E+02	1.17E-10	1.03E-03	unlimited			
U-238	1.78E+03	1.78E-09	1.56E-02	unlimited			
Sum		3.71E-06			9.09		9.76E-02
		A_2 (Ci) =		Sum^{-1} =	0.110		
		LSA-II limit =	10^{-4} x A_2	(Ci/g) =	1.10E-05		

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APPENDIX B
SILO 3 RADTRAN5® EVALUATION

This section evaluates the radiological risk posed to the general public and workers by the routes proposed for transporting untreated Silo 3 material from the FEMP to Envirocare of Utah, Inc. (Envirocare). Fluor Fernald, Inc. (Fluor Fernald) evaluated one direct rail route to Envirocare and one direct truck route to Envirocare. A discussion of these routes is presented below. For both transportation options, Silo 3 material will be loaded into soft-sided containers that will be overpacked into cargo containers or sea/lands for ease of handling and shipping operations.

TRANSPORTATION OPTIONS

Direct Rail Shipments to Envirocare of Utah

For direct rail shipments, nine soft-sided containers will be placed into an overpack container (cargo container or sea/land). Each railcar shipment will consist of four overpack containers per flatbed railcar. Retrieval and shipping operations will result in the need for an estimated 1,700 soft-sided containers. With nine soft-sided containers per overpack container, 189 overpack containers and 48 railcar shipments will be required to transport Silo 3 material to Envirocare.

Railcar shipments of Silo 3 material will follow the same route as the unit trains used for shipment of OU1 WPRAP material.

Direct Truck Shipments to Envirocare of Utah

For direct truck shipments, eight soft-sided containers will be placed into an overpack container (cargo container or sea/land). Each truck shipment will consist of one overpack container. Retrieval and shipping operations will result in the need for an estimated 1,700 soft-sided containers. With eight soft-sided containers per overpack container, 213 truck shipments will be required to transport Silo 3 material to Envirocare.

The proposed truck route to Envirocare consists of traveling I-74 and I-275 through Ohio and Indiana to I-75/I-71 in Kentucky to I-64 through Indiana and Illinois to I-70 through Missouri to I-29 up through Iowa to I-80 through Nebraska, Wyoming, and Utah to Envirocare.

This route passes through the following major cities: Louisville, Kentucky when transferring from I-71 to I-64; St. Louis, Missouri when transferring from I-64 to I-70; Columbia on I-70 through Missouri; Kansas City, Missouri when transferring from I-70 to I-29; St. Joseph on I-29 through Missouri; Omaha, Nebraska when transferring from I-29 to I-80; Lincoln on I-80 through Nebraska; Cheyenne on I-80 through Wyoming; and Salt Lake City on I-80 through Utah.

EVALUATION OF RISK

DOT requires carriers to utilize routes that minimize radiological risk when transporting radiological material. When determining radiological risk, DOT regulation 49 CFR Part 397.101(a)(2) requires the carrier to consider available information, such as, accident rates, population densities, and transit time.

The estimated radiological risk to the public and workers during transportation was calculated using the RADTRAN5® computer model developed by Sandia National Laboratories. RADTRAN5® produces estimates of incident-free population dose, accident dose-risk, nonradiological mortality, as well as individual dose estimates. Calculation of incident-free population dose considers persons adjacent to the route, persons in vehicles sharing the route, crew members, and persons at stops. Potential dose-risks are also calculated for populations that are downwind from hypothetical releases associated with accidents of varying severity or within stated radial distances of loss-of-shielding accidents of varying severity.

Where possible, "standard" RADTRAN5® values for parameters were used if they were not specific to the radioactive material, package, vehicle, or route.

RADTRAN5® relies on various parameters, which are defined by the user, for calculating dose. This information relates to the radioactive material, the package, the vehicle, and the route. It includes parameters for the number of shipments, the number of containers per shipment, the radionuclide content of the container, the radiation dose associated with the container, and the radiation dose associated with the shipment. Table 1 presents the user-defined package-specific and vehicle-specific parameters associated with the proposed transportation routes.

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TABLE 1
PACKAGE-SPECIFIC AND VEHICLE-SPECIFIC PARAMETERS
FOR RADTRAN5® ANALYSIS

Parameter	DIRECT TRUCK	DIRECT RAIL
Number of Shipments	213	48
Number of Overpack Containers per Shipment	1	4
Dose Rate 1 m from Package (mrem/hr)	2.5	2.5
Characteristic Package Dimension (m)	7.08	7.08
Dose Rate 1 m from Vehicle (mrem/hr)	2.5	2.5
Characteristic Vehicle Dimension (m)	7.08	28.32
Number of Crew Members	2	2
Average Distance from Package to Crew Members (m)	7.62	100
Crew View Package Dimension (m)	3.56	3.56

Table 2 presents the radionuclide content for each shipping alternative. For truck transportation, it is assumed that eight - 3 yd^3 soft-sided containers are placed in an overpack container, such as a cargo container or sea/land, for a total of 24 yd^3 of Silo 3 material per overpack container. For rail transportation, nine - 3 yd^3 soft-sided containers are placed in an overpack container for a total of 27 yd^3 of Silo 3 material per overpack container.

RADTRAN5® requires data that expresses the likelihood of accidents of a given severity for urban, suburban, and rural population areas. Accident severity categories with their respective probabilities of occurrence for each population area were obtained from the Nuclear Regulatory Commission document, "Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes," (NUREG-0170) and are presented in Tables 3 and 4 for truck and rail, respectively. The tables are arranged from high probability, low speed, low impact accidents (Severity Category 1) that are more likely to occur in urban areas to low probability, high speed, high impact accidents (Severity Category 8) that are more likely to occur in rural areas.

TABLE 2
RADIONULCIDE CONTENTS FOR TRANSPORTATION OPTIONS

Radionuclide	Raw Material pCi/g	Curies per Overpack Container	
		Truck	Rail
Ac-227	925	1.36E-02	1.53E-02
Ac-228	842	1.24E-02	1.39E-02
B-210	3,480	5.11E-02	5.75E-02
B-211	925	1.36E-02	1.53E-02
Bi-212	367	5.39E-03	6.07E-03
Bi-214	3,870	5.69E-02	6.40E-02
Fr-223	13	1.91E-04	2.15E-04
Pa-231	627	9.21E-03	1.04E-02
Pa-234	3	4.41E-05	4.96E-05
Pa-234m	1,780	2.62E-02	2.94E-02
Pb-210	3,480	5.11E-02	5.75E-02
Pb-211	925	1.36E-02	1.53E-02
Pb-212	367	5.39E-03	6.07E-03
Pb-214	3,870	5.69E-02	6.40E-02
Po-210	3,480	5.11E-02	5.75E-02
Po-211	3	4.41E-05	4.96E-05
Po-212	85	1.25E-03	1.41E-03
Po-214	3,870	5.69E-02	6.40E-02
Po-215	925	1.36E-02	1.53E-02
Po-216	367	5.39E-03	6.07E-03
Po-218	3,870	5.69E-02	6.40E-02
Ra-223	925	1.36E-02	1.53E-02
Ra-224	367	5.39E-03	6.07E-03
Ra-226	3,870	5.69E-02	6.40E-02
Ra-228	406	5.97E-03	6.71E-03
Rn-219	925	1.36E-02	1.53E-02
Rn-220	367	5.39E-03	6.07E-03
Rn-222	3,870	5.69E-02	6.40E-02
Th-227	912	1.34E-02	1.51E-02
Th-228	747	1.10E-02	1.24E-02
Th-230	60,200	8.85E-01	9.95E-01
Th-231	117	1.72E-03	1.93E-03
Th-232	842	1.24E-02	1.39E-02
Th-234	1,780	2.62E-02	2.94E-02
Tl-207	922	1.36E-02	1.52E-02
Tl-208	132	1.94E-03	2.18E-03
Tl-210	1	1.47E-05	1.65E-05
U-234	1,730	2.54E-02	2.86E-02
U-235	117	1.72E-03	1.93E-03
U-238	1,780	2.62E-02	2.94E-02

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TABLE 3
REGIONAL FRACTION OF ACCIDENT SEVERITY OCCURENCES – TRUCK

Severity Category	Rural	Suburban	Urban
1	0.462	0.435	0.583
2	0.302	0.285	0.382
3	0.176	0.221	0.0278
4	0.0403	0.0506	0.00636
5	0.0118	0.00664	0.000742
6	0.00647	0.00174	0.000146
7	0.000571	0.0000672	0.0000113
8	0.000113	0.00000593	0.000000994

TABLE 4
REGIONAL FRACTION OF ACCIDENT SEVERITY OCCURENCES – RAIL

Severity Category	Rural	Suburban	Urban
1	0.356	0.313	0.572
2	0.214	0.188	0.343
3	0.385	0.451	0.0772
4	0.0385	0.0451	0.00772
5	0.00641	0.00338	0.000514
6	0.000648	0.000163	0.0000186
7	0.000342	0.0000376	0.00000857
8	0.0000641	0.00000313	0.000000715

In addition, for each accident severity category, the user inputs data on the fraction of material that could be expected to be released from a container during an accident, the fraction of material released that can become airborne, and the fraction of airborne material that can become respirable. The accident release fractions for untreated Silo 3 material is presented in Tables 5 and 6 for rail and truck, respectively.

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TABLE 5
ACCIDENT RELEASE FRACTIONS - RAIL

Severity Category	Release Fraction	Airborne Fraction	Respirable Fraction
1	0.0	N/A	N/A
2	0.01	4.94E-06	1
3	0.1	1.98E-05	1
4	1	5.21E-05	1
5	1	1.26E-04	1
6	1	2.50E-04	1
7	1	4.04E-04	1
8	1	4.93E-04	1

TABLE 6
ACCIDENT RELEASE FRACTIONS - TRUCK

Severity Category	Release Fraction	Airborne Fraction	Respirable Fraction
1	0.0	N/A	N/A
2	0.01	6.0E-06	1
3	0.1	2.0E-05	1
4	1	8.0E-05	1
5	1	2.0E-04	1
6	1	4.0E-04	1
7	1	1.0E-03	1
8	1	2.0E-03	1

Results

As stated previously, RADTRAN5® estimates the risk of fatalities to workers and the public due to non-radiological accidents, dose to workers and the public resulting from incident-free transport of radiological material, and dose to populations that are downwind from hypothetical releases associated with accidents of varying severity.

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Table 7 presents data on the non-radiological risk of fatality to workers and the public for each of the proposed routes. There are two types of risk to the public for non-radiological fatalities. One is the risk of a fatality resulting from an accident and the other is the risk of a fatality resulting from exhaust emissions from the operation of a motor vehicle.

TABLE 7
ESTIMATED NON-RADIOLOGICAL FATALITIES

	Estimated Non-Radiological Fatalities	
Route	Non-Occupational	Occupational
Direct Truck	0.0624	0.0177
Direct Rail	0.00782	0.000536

Table 8 presents data on the estimated dose received by the maximally exposed individual resulting from incident-free transport of Silo 3 material and the estimated dose of the maximally exposed individual resulting from a hypothetical accident. The estimated dose from incident-free transport is the sum of the individual doses received by each shipment of Silo 3 material. The estimated dose resulting from a hypothetical accident is based on an evacuation time of 24-hours for an individual originally standing 33 meters away from a Severity Class 8 accident that results in a total release of material.

TABLE 8
ESTIMATED DOSE - MAXIMALLY EXPOSED INDIVIDUAL

Route	Incident-Free Transport (REM)	Hypothetical Accident (REM)
Direct Truck	2.99E-05	0.826
Direct Rail	3.24E-05	0.916

The risk from exposure to ionizing radiation is measured in latent cancer fatalities (LCF), which is the number of potential cancer fatalities estimated as a result of radiation exposure. An incremental lifetime cancer risk (ILCR) - the increased potential of an individual developing a cancer over a lifetime as a result of exposure - can be determined by comparing the potential number of cancers against the total exposed population. LCFs are calculated by Eq.1.

$$LCF = H_E \bullet CRF \qquad \text{(Eq. 1)}$$

where,

H_E = collective effective dose equivalent for exposed population

LCF = latent cancer fatalities

CRF = cancer risk factor, LCF/person-rem

The cancer risk factor for members of the public is 5×10^{-4} per rem. These values are used in the RADTRAN5® computer model and are from the latest edition of ICRP-30.

Table 9 presents the estimated ILCRs calculated for the maximally exposed individual resulting from the dose received during incident-free transportation and a hypothetical accident. Using as an example the estimated dose of 0.826 rem for a hypothetical accident involving shipment of the Silo 3 material by direct truck to Envirocare of Utah, the ILCR is calculated to be 4.13×10^{-4}. This equates to an additional 1 in 2,420 chance of the maximally exposed individual developing cancer over a lifetime.

TABLE 9
INCREMENTAL LIFETIME CANCER RISK - MAXIMALLY EXPOSED INDIVIDUAL

Route	Incident-Free Transport		Hypothetical Accident	
	Dose (REM)	ILCR	Dose (REM)	ILCR
Direct Truck	2.99E-05	1.5E-08	0.826	4.13E-04
Direct Rail	3.24E-05	1.62E-08	0.916	4.58E-04

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Fernald
Silo 3 Project
Environmental Control Plan

Document No. 40430-PL-0005
April 30, 2002
Revision B

FERNALD
Environmental Management Project

Fernald Project Number 40430

Revision	A	B			
Date	03/15/02	04/30/02			
Prepared By	Frank Parton	Frank Parton			
Checked By	Grant Morar	GMorar			
Reviewed By	Craig Smith	CSmith			
Approved By	Bob Lenyk	RLenyk			

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Appendix E Estimated Amounts of Waste Streams

ACRONYMS

ALARA	As Low As Reasonably Acheivable
BAT	best available technology
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
DPC	Designated Primary Contact
EDE	estimated dose equivalent
FEMP	Fernald Environmental Management Project
FTL	Field Tracking Log
HEPA	high-efficiency particulate air
NESHAP	National Emissions Standard for Hazardous Air Pollutants
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OSDF	On-Site Disposal Facility
OU	operable unit
PPE	personal protective equipment
PVS	Process Vessel Vent System
RI	remedial investigation
WAC	Waste Acceptance Criteria
WAO	Waste Acceptance Organization
ULPA	Ultra Low Penetration Air

REFERENCE DRAWINGS

G3104	94X-3900-G-01297, Site Plan
G3105	94X-3900-G-01298, Grading, Drainage and Erosion Control Plan
F0003	94X-3900-F-01431, Process Flow Diagram, Process Vent & Packaging Systems
F0002	94X-3900-F-01429, Process Flow Diagram, Material Retreival & Feed Systems
H0004	94X-3900-H-01349, Air Flow Diagram, Exhaust Filtration Units

1.0 PURPOSE

This Environmental Control Plan provides details of the methods and materials to be used during implementation of the Silo 3 Project to control erosion, air emissions, stormwater, fugitive dust, contaminated soil, and construction and operations waste and minimize the impact of these activities on the environment. This plan covers the construction of the Silo 3 process building, Silo 3 ancillary facilities, and the silo enclosure at the U.S. Department of Energy Fernald Environmental Management Project (DOE-FEMP) site. These areas are shown on drawing 94X-3900-G-01297, Rev. B, Site Plan. The Silo 3 Environmental Control Plan contains the following plans:

- Air Emissions Control: The *Stack Release Considerations for the Silo 3 Project* document (Doc. No. 40430-CA-0003) calculates the potential emissions of air contaminants during operation of the Silo 3 Project.

- Erosion and Stormwater Control: The methods and materials that will be used to prevent erosion of soil, either by wind or surface water, in the process or project work area and to reduce sediment loading in stormwater are described. Also described are the methods, materials, and existing site features that will be used to capture and control stormwater.

- Fugitive Dust Control: The methods and materials that will be used to suppress and minimize the creation and dispersion of dust are described.

- Waste Management: The methods that will be used to manage waste and debris generated during site preparation construction and operations are described.

2.0 AIR EMISSIONS CONTROL PLAN

The *Stack Release Considerations for the Silo 3 Project* document (Doc. No. 40430-CA-0003) calculates the potential emissions of air contaminants during operation of the Silo 3 Project. Primary sources of air contaminants are expected to be Silo 3, the process equipment, and the process building. The locations of the sources of potential air emissions are illustrated on the Civil Site Plan (Drawing 94X-3900-G-01297, Rev. B) and the Process Flow Diagram (Drawing 94X-3900-F-01431, Rev. A).

Because of the physical nature of Silo 3 material and its high thorium-230 content, control of airborne particulate emissions is a key criterion in designing the emission control and monitoring systems. The air emission control systems for the Silo 3 Project have been designed to Best Available Technology (BAT) in accordance with *Ohio Administrative Code* (OAC), Section 3745-31-05(a)(3), and to meet Applicable or Relevant and Appropriate Requirements, the As Low As Reasonably Achievable (ALARA) requirement, and other applicable requirements.

For radionuclide particulate emission sources at FEMP, the Ohio Environmental Protection Agency (OEPA) has specified that BAT is the use of high-efficiency particulate air (HEPA) filters. The use of HEPA filters is also required for compliance with 40 *Code of Federal Regulations* (CFR) 61, Subpart H. HEPA filters, pre-filters, and housing assemblies will be obtained in accordance with Silo 3 Project Technical Specifications and Project Quality Procedure 7.1, "Control of Purchased Items and Services."

Emission of radionuclide particulate materials, excluding radon, will meet the requirements of 40 CFR Part 61, Subpart H, National Emission Standards for Hazardous Air Pollutants (NESHAP). 40 CFR Part 61.92 states that emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent (EDE) of 10 millirem (mrem)/year or greater. NESHAP Subpart H also specifies continuous monitoring for certain point sources (stacks or vents).

Radon emissions will be monitored during the Silo 3 Project to verify that the site fence line's radon concentration will not exceed the annual background average of 0.5 picocuries per liter (pCi/L).

The Silo 3 air emission control systems are depicted by drawings 94X-3900-F-01429 (Rev. A), 94X-3900-F-01431 (Rev. A), and 94X-3900-H-01349 (Rev. A). The major components of the emission control systems are detailed in the following sections.

2.1 AIR EMISSIONS CONTROLS

The primary components of the air emission control strategy for the Silo 3 Project are as follows:

- Ventilation of radon emissions during initial silo access,
- Mitigation of particulate and radon emissions during retrieval of Silo 3 material by vacuum and mechanical means,

- Mitigation of emissions during transfer of Silo 3 material to the process building,
- Collection and filtration of emissions from the packaging equipment and facility, and
- Monitored discharge of emissions after filtration.

The Silo 3 air emission control systems consists of filter modules, ductwork, fans, and air distribution and control devices. The process flow of the air emission control equipment is depicted on drawings 94X-3900-F-01429 and 94X-3900-F-01431. Refer to Sections 4 and 5.1 of the Process Description (Doc. No. 40430-RP-0003) for additional detail.

2.1.1 Emission Control During Initial Silo Access

The headspace above the waste material in Silo 3 is known to contain elevated radon concentrations. The Operable Unit (OU) 4 Remedial Investigation (RI) document reports the Silo 3 headspace radon concentration at the 95 percent upper confidence limit (UCL) at 239,000 pCi/L. The OU4 RI reports the Silo 3 headspace volume at between 17,100 ft^3 and 17,754 ft^3.

Before the silo is accessed initially, airflow from the Silo 3 headspace to the Process Vessel Vent System (PVS) will be established to produce a slightly negative pressure in the silo, thereby assuring that any emissions are routed through the PVS. This air stream is HEPA-filtered to control particulate emissions and is monitored for both particulate radionuclides and radon. Airflow will be controlled during the initial establishment of airflow from the Silo 3 headspace to the PVS so that exhaust stack emissions and resultant fence line air quality impacts are within the steady-state emission estimates reported in the Stack Release document (Doc. No. 40430-CA-0003). Weather conditions will be evaluated before the start of the radon release to assure that atmospheric stability and inversion conditions are consistent with the ALARA principle.

2.1.2 Emission Control During Retrieval, Transfer, and Packaging

Particulate and radon emissions from retrieval, transfer, and packaging operations are collected by the PVS, pneumatic retrieval, and HVAC, which are described in the Process Description (Doc. No. 40430-RP-0003). The expected emissions from these operations and the resulting off-site impact are summarized in Section 2.2 of this document.

The total design airflow for the PVS is approximately 5,500 standard cubic ft per minute (scfm). Gases from the following sources are transferred to the PVS:

- Silo 3,
- Vacuum Wand Management System (ENC-10-5020),
- Retrieval Bin Hood (EAR-11-5052),
- Inclined Conveyor (DFC-11-5056), and

- Packaging Stations A & B Exhaust Hoods (EAR-25-5290A&B).

Each of these sources is described in Section 4.2 of the Process Description (Doc. No. 40430-RP-0003).

2.1.3 Ambient Monitoring

As detailed in Section 3.1 of Fluor Fernald's *Silos Project Environmental Monitoring Plan*, monitoring and reporting of emissions from the Silo 3 Project will be accomplished through a combination of ambient radon and particulate monitoring and project-specific stack monitoring.

2.2 ESTIMATED POINT SOURCE AIR EMISSION DATA

The *Stack Release Considerations for the Silo 3 Project* calculation (Doc. No. 40430-CA-0003) provides estimates of the anticipated air emissions from operation of the Silo 3 Project. As described in the preceding sections, the emissions from various sources within the Silo 3 facilities are collected and discharged through the monitored exhaust stack after filtration. Table 2-1 summarizes expected emissions from the Silo 3 exhaust stack. The Silo 3 exhaust stack is equipped with an air particulate monitor and a continuous radon monitor.

Table 2-1: Estimate of Release from the Silo 3 Exhaust Stack

Exhaust stack flow	10,900 ft^3/minuteOff-gas
Temperature	100°F
Stack exit velocity	3,500 ft/minute
Stack diameter	2 ft (at discharge)
Stack height	125 ft
Max. particulate emission (uncontrolled)	115 lb/hr
Max. particulate emission (controlled)	1.11 X 10^{-4} lb/hr
Radionuclide emission (radon not included)	2.37 X 10^{-4} pCi/L
Radon emission	213 pCi/L

Dispersion modeling (*Stack Release Considerations for the Silo 3 Project*, Doc. No. 40430-CA-0003) was performed to quantify the impact of estimated emissions from the Silo 3 exhaust stack. The dispersion modeling for the Silo 3 exhaust stack emissions used the FEMP site-specific meteorological data and the CAP88-PC computer software modeling package to be consistent with the requirements of 40 CFR 61, Subpart H. The results of the dispersion modeling for the Silo 3 exhaust sack emissions are summarized in Table 2-2.

Table 2-2: Results of Dispersion Modeling for Releases from the Silo 3 Treatment Facility Exhaust Stack

Maximum EDE to off-site receptor (excluding radon) uncontrolled	2830 mrem/yr.
Maximum EDE to off-site receptor (excluding radon) controlled	2.74 X 10^{-3} mrem/yr.
Maximum annual average FEMP fence line radon concentration	0.0012 pCi/L
Maximum hourly average FEMP fence line radon concentration	3.96 pCi/L

Modeling of radionuclide emissions, not including radon, without credit for control equipment, predicted a maximum EDE off the site of 2,830 mrem/year; therefore, as required by 40 CFR 61.93, the exhaust stack has a continuous isokinetic stack sampler. Modeling of radon emissions predicts a fence line impact significantly below the 0.5 pCi/L annual average criterion. The exhaust stack will, however, include a continuous radon monitor. See drawing 94X-3900-G-01298 (G3105).

3.0 EROSION AND STORMWATER CONTROL PLAN

This section describes the Erosion and Stormwater Control Plan that will be used during the construction phase of the Silo 3 Project, including erosion control practices and surface water management. This plan addresses surface water management and erosion control practices that will be used throughout the construction of the Silo 3 process facilities and the Silo 3 enclosure and is consistent with the construction drawings and Silo 3 specifications. See drawing 94X-3900-G-01298 (G3105).

3.1 FUNCTIONAL REQUIREMENTS OF THE PLAN

The functional requirements of this Erosion and Stormwater Control Plan will satisfy the criteria outlined below:

- Route surface water to designated locations where it can be appropriately managed;
- Protect the Infrastructure Road, 2nd Street, Silo 3, and construction areas from damage caused by precipitation and stormwater run-on and runoff;
- Discharge surface water into existing watercourses in accordance with applicable Ohio Department of Natural Resources (ODNR), OEPA, and DOE directives and requirements; and
- Segregate clean area runoff from potentially contaminated area runoff. Contaminated stormwater will not be discharged with "clean" stormwater.

Functional requirements will be met by constructing the run-on/runoff control features outlined below. Erosion control features will be installed prior to any disturbance of soil in work areas. The Civil Grading, Drainage and Erosion Control Plan, drawing 94X-3900-G-01298 (G3105), illustrates the location and limits of the control features. These include, but are not limited to, the following six control features:

- Installation of silt fences on the downslope sides of the construction areas;
- Installation of silt fences below sump discharges where applicable;
- Installation of check dams in drainage channels and swales as required;
- Maintenance, repair, or replacement of existing surface water and erosion control features as required;
- Excavations that are expected to be inactive for 45 days or more will be stabilized within 7 days of their final use; and
- Dewatering.

The type and location of erosion control features will be subject to adjustment depending on field conditions. The Contractor will routinely inspect and evaluate (in accordance with Section 3.2) the effectiveness of, and need for maintenance of, the control measures that are in place.

3.2 RUN-ON/RUNOFF CONTROL STRUCTURAL PRACTICES

Process design and operation will minimize the potential for generation of contaminated stormwater, including any run-on and runoff. A description of the construction, inspection, and maintenance of the run-on/runoff control features is presented in this section. These features may include, but will not be limited to:

- Drainage channels and swales,
- Riprap check dams,
- Culverts,
- Silt fences, and
- Diversions.

Details of silt fences, check dams, and diversions can be seen in Appendix A. Any repairs to the erosion and stormwater control measures will be performed within 24 hours of a problem being discovered. Areas of excavation and all erosion control measures will be inspected to verify that they are installed in accordance with the Silo 3 specifications and are still functioning properly. An inspection checklist will be developed in support of the inspection schedule. Disturbed areas will also be inspected for evidence of excessive erosion or siltation. These inspections will occur, at a minimum, at the following frequency:

- Weekly for general inspections;
- Daily after each rain event exceeding 0.5 inches; and
- At least once per day during prolonged rainfall events.

Inspections will be documented in the daily reports at the Silo 3 Project site. These records will be made available for review upon request. This inspection frequency is in addition to any specific requirements identified in the Inspection and Maintenance requirements for each control measure below.

3.2.1 Temporary Drainage Channels and Swales

If necessary, temporary drainage channel and swales will be constructed between control points on predefined lines and grades. Temporary drainage channels and swales will be stabilized in accordance with the Silo 3 specifications.

Inspection and Maintenance

Drainage channels and swales will be inspected and maintained in accordance with the following, as a minimum:

- The criteria stipulated in Section 3.2. Any necessary repairs to drainage channels will begin within 24 hours of the discovery of a problem.
- Drainage channels and swales shall be kept clear of debris at all times. The protective lining, vegetation, or erosion-resistant materials will be maintained as built to prevent undermining, scour, or deterioration.
- Silt fence placement requirements as stated in the Silo 3 specifications.

Inspection and repair activities will be documented in the daily reports and available for review upon request.

3.2.2 Check Dams

Check dams will be used in channels that have a design flow equal to or greater than 3 ft per second or as needed. Check dams will be incorporated to enhance water quality benefits by maximizing the detention time within the swale and to increase channel stability by decreasing flow velocities.

Check dams will be installed in accordance with the requirements of ODNR, "Rainwater and Land Development" manual, at the necessary spacing.

Check dams will be constructed of 4–8-in.-diameter stone to a height of 2 ft over the entire channel width. The top of the check dam will be constructed so that the center is approximately 6 in. lower than the outer edges, so that water will flow across the center and not around the ends of the dam. The maximum height of the check dam at the center of the weir will not exceed 3 ft. A detail of the check dam is provided in Appendix A.

Inspection and Maintenance

Check dams will be inspected and maintained in accordance with the following, as a minimum:

- The criteria stipulated in Section 3.2,
- Maintained as constructed, and
- Frequently inspected to ensure that the structures have not been damaged by high-energy flows.

Inspection and repair activities will be documented in the daily reports and available for review upon request.

3.2.3 Riprap

Where required, properly sized riprap will be placed in the designated work area. Ohio Department of Transportation Type "D" riprap will be installed in the temporary drainage channel as check dams at appropriate locations.

Inspection and Maintenance

Riprap will be inspected and maintained according to the following, as a minimum:

- The criteria stipulated in Section 3.2.
- To determine whether high flows have caused scour beneath the riprap or dislodged any of the stone. If repairs are needed, ensure that those repairs are accomplished within the same workday of their discovery.

Inspection and repair activities will be documented in the daily reports and available for review upon request.

3.2.4 Silt Fences

Silt fences will be installed in accordance with ODNR requirements, the construction drawings, and the Silo 3 specifications. Silt fences will be constructed before upslope land disturbance begins. Silt fences will be installed as close to the contours as possible so that water will not concentrate at low points in the fence. Silt fences will be installed on the downslope side of disturbed areas, perpendicular to where run-off occurs as sheet flow or where flow through small rill can be converted to sheet flow. Appropriate equipment and personnel will be used to install the silt fence at locations shown on the construction drawings. The silt fence will be placed in a trench cut to a minimum of 9 in. deep, staked, and backfilled accordingly. The height of the silt fence will be a minimum of 16 in. above the original ground surface. To prevent water from flowing around the ends of the silt fence, each end will be constructed upslope so that the ends are at a higher elevation. Seams between sections of silt fencing will be overlapped with the end stakes of each section wrapped together before being driven into the ground. Breaks and overlaps will be installed as necessary to allow equipment access to the construction area. Silt fences will remain in place until the disturbed area has been stabilized. Appropriate equipment will be available to maintain silt fencing.

Inspection and Maintenance

Proper application of silt fencing will allow the intercepted runoff to pass as diffused flow through the geotextile. If diffused flow does not occur, the layout of the silt fence will be changed, accumulated sediment will be removed, and other practices will be implemented.

Silt fences will be inspected and maintained according to the following, as a minimum:

- The criteria stipulated in Section 3.2.

- Any sediment and debris that have been deposited and trapped will be removed from the silt fence and relocated and stockpiled as directed by the Construction Manager.

Inspection and repair activities will be documented in the daily reports and available for review upon request.

3.2.5 Temporary Diversions

If required by changing site conditions, the Contractor shall construct temporary diversions. Earthen material cut out for the channel will be used to build the berm on the opposite side. The temporary diversion will be similar to the one shown in Appendix A. Check dams will be installed to slow flow velocity.

Inspection and Maintenance

Temporary diversions will be regularly inspected and maintained as follows, as a minimum:

- The criteria stipulated in Section 3.2
- Repair damage and remove deposits or sediment from the diversion.
- Restabilize as needed.
- Check for points of scour, bank failure, rubbish, channel construction, rodent holes, breaching or settling of the berm, and excessive wear from pedestrian traffic and construction traffic on a regular schedule.

Inspection and repair activities will be documented in the daily reports and be available for review upon request.

4.0 FUGITIVE DUST CONTROL PLAN

The section describes the methods that will be used for controlling fugitive dust emissions and ensuring compliance with the required standards and site-specific limits for the Silo 3 Project. Dust releases from field activities will be proactively suppressed by applying BAT dust control materials and/or implementing BAT work practices at the beginning and during field activities. RM-0047, *Fugitive Dust Control Requirements,* will be used as the appropriate site-specific definition of BAT for fugitive dust control together with OAC 3745-17-07 and OAC 3745-17-08 to minimize the creation and dispersion of fugitive dust.

4.1 SITE-SPECIFIC LIMITS

The following site-specific limits will be applied:

- Visible particulate emission from any paved roadway or paved parking area should not exceed 1 minute during any 60-minute observation period.
- Visible particulate emissions from any unpaved roadway, unpaved parking area, project field activities, or wind erosion from storage piles should not exceed 3 minutes during any 60-minute observation period.

Personnel using 40 CFR Part 60, Appendix A, Method 22, "Visual Determination of Fugitive Emission from Material Sources and Smoke Emissions for Flares," will verify compliance with these limits. Fluor Fernald will provide Method 22 training to qualify Contractor personnel.

4.2 SUPPRESSION EQUIPMENT

Because of the radiological issues associated with the Silo 3 Project, dedicated equipment will be used in radiological work zones to avoid having to decontaminate equipment. If required by site conditions, the Contractor may switch equipment and systems between areas after decontamination and radiological scanning verifies no contamination. The proposed equipment list to suppress dust releases includes, but is not limited to, the following:

- Motor grader,
- Backhoe,
- Miscellaneous hand tools (shovels, brooms),
- Miscellaneous pumps and hoses,
- Skid steer loader with broom attachment (for road crossing only if water flushing and wet brooming by hand is ineffective.
- Water wagon, and
- Smooth drum roller.

4.3 METHODS AND MATERIALS

At the beginning of each day and periodically throughout that day, project personnel will tour the Silo 3 Project site, applying BAT fugitive dust controls and/or other work practices to identify and thereby minimize dust generation. If the visible limit is exceeded, (i.e., visible particulate emissions from any paved roadway or paved parking area exceed 1 minute during any 60-minute observation period or visible particulate emissions from any unpaved roadway, unpaved parking area, project field activities, or wind erosion from storage piles exceed 3 minutes during any 60-minute period), mechanical dust-generating activities must cease immediately. BAT dust controls and/or work practices will be instigated or increased to bring the fugitive emission, as a minimum, below the visible limit during the dust-generating activities. Additionally, BAT dust controls and/or work practices will be implemented at the end of each day to minimize dust alerts during off-hours. Specific materials and methods may include the following:

- Water,
- Crusting agents such as Pine Sap Emulsion® or equivalent (as approved by Fluor Fernald),
- Plastic sheeting or tarps, and/or
- Revegetation materials.

4.4 WORK PRACTICES

Project field activities will be monitored for visible emissions. The contractor shall implement, direct and coordinate BAT work practices to monitor project field activities for visible emissions. Specific work practices may include the following:

- Effective "wheel washing" before vehicles and/or equipment are brought onto the paved area and/or as required by contamination control.
- Applying dust suppression materials (mainly water) to active work areas or other areas where dust is likely to be generated.
- Before the end of shift, sealing off (by rolling, grading, or compacting) work area stockpiles, working piles, etc. where fugitive emissions are likely to occur if not sealed.
- During dry conditions or as needed, initiating dust control prior to start of shift and continuing throughout the day, as needed, to minimize fugitive dust emission.
- Wet sweep, blade or otherwise removing any clods, clumps, tracks, or other deposits of soil or mud from paved roadways and parking area; applying appropriate dust control measures to suppress the generation of visible dust that may result from the removal process.
- Using alternative routing for hauling materials.
- Changing method of excavation when feasible, including reducing the rate of excavation.

- Maintaining roadway shoulders.
- Minimizing unnecessary traffic.
- Adhering to site-specific speed limits of 15 mph on paved surfaces and 10 mph on unpaved surfaces and, if necessary, further reduce the speed of equipment and haul/other site vehicles.
- Applying water or other appropriate dust suppression agents to material being transported and covering truck beds when material is still likely to become airborne.
- Covering loads during equipment movement, regardless of whether truck is empty or full.
- Minimizing configuration of material being hauled (i.e., place less material in haul vehicle).
- Minimizing drop height during loading and unloading.
- If practical, covering small storage piles with tarps or plastic sheeting.
- For extended periods of planned inactivity, vegetating, as a last resort, if protective cover or periodic application of surfactants or crusting agents prove ineffective.
- Repairing or resurfacing roadways/parking areas as needed or using an alternative road surface as a last resort.

4.5 MONITORING

All personnel who have been briefed on this plan will report suspected fugitive dust emissions to the appropriate personnel, who will then direct the implementation of BAT work practices and fugitive dust control. As outlined earlier, field conditions will be monitored for visible dust emission. When required, BAT material will be applied and BAT work practices will be implemented to limit fugitive dust emissions.

4.6 RECORD KEEPING

The record keeping process will begin with field supervisors and managers, who will brief those workers applying BAT materials pursuant to the required record keeping. The form to be filled out can be found in Appendix B. Appropriate personnel will complete these forms. Completed forms will be part of the Silo 3 Project daily reports and will be filed in the permanent project files and transmitted to Fluor Fernald when requested. Additional blank copies of the forms will be kept in the field trailer. Completed forms will be turned over to the Silo 3 Project Field Supervisors on a daily basis. Forms will be reviewed for completeness, and incomplete forms will be returned to the appropriate individual for corrections.

4.8 OFF-HOURS FUGITIVE DUST ALERT NOTIFICATION

A "Dust Alert" is defined as excessive or visible dust emanating from anywhere within the Work Area during non-working periods. "Non-Work" periods are defined as hours when neither the Contractor nor any subcontractor is performing Silo 3 construction activities on site. However, the FEMP remains staffed by Fluor Fernald Security personnel 24 hours per day. Silo 3 Project trained personnel will be on-call during non-work periods, 7 days per week (including holidays), to respond to any off-hours fugitive dust alert. Therefore, if visible dust is observed within the Work Area during project non-work periods, Fluor Fernald will notify the Contractor. Dust suppression will begin within 2 hours of notification by Fluor Fernald.

4.8.1 Notification Procedure

During a Dust Alert, Fluor Fernald will refer to the "Off-Hours Dust Alert Schedule" that will be provided by the Contractor prior to initiation of construction activities. If Fluor Fernald cannot contact the Designated Primary Contact (DPC) within a reasonable time frame, Fluor Fernald will attempt to reach the designated alternative contact. Similarly, if the alternative cannot be expeditiously contacted, the second alternative will be contacted. In the unlikely event that all three of these individuals cannot be reached, Fluor Fernald will attempt to contact any other person identified on the Contractor-approved contact list.

Upon receiving notification from Fluor Fernald, the Contractor DPC will then contact qualified personnel, as appropriate, to respond to the Dust Alert. The Contractor DPC must verify that those responding to the "Off-Hours Dust Alert" are able to gain access to a controlled area if required. Only those personnel who meet the appropriate training and medical requirements for this work should be contacted. The Contractor DPC, as well as those personnel contacted, will go to the site to direct the work and implement the necessary corrective actions. Because dust suppression is defined as a Limited Scope Work, the Contractor is not required to have the Site Health and Safety Officer respond to these Dust Alerts. Fluor Fernald will provide any necessary safety coverage.

4.8.2 The Contractor Site Response

Contractor personnel will use adequate BAT dust control methods to bring any fugitive dust emissions to below the site-specific limit during dust-generating activities. Designated Contractor personnel will not leave the Silo 3 Project site without concurrence from Fluor Fernald that sufficient controls are in place or until Fluor Fernald has signed the Dust Alert Work Order included in Appendix C.

4.8.3 Schedule and Contacts

The Off-Hours Dust Alert Schedule and Contact List will be provided to Fluor Fernald prior to the start of the Contractor's Silo 3 Project construction activities.

5.0 WASTE MANAGEMENT PLAN

The purpose of this section is to describe the materials and methodology for removal and disposition of relevant waste materials. Management of secondary wastes generated as a result of the Silo 3 Project construction and operational activities will be consistent with site procedures and applicable regulatory drivers.

5.1 WASTE TYPES

It is expected that construction activities will generate three main groups of secondary waste materials (i.e., clean construction debris, radiologically contaminated construction debris, including soil and clean excavated soil). Smaller quantities of additional solid waste, [e.g., personnel protection equipment (PPE), wood, and potentially some drums] are anticipated. Clean construction debris is material that as a result of construction has been brought onto the Silo 3 Project site or is created by construction activities and has been surveyed or characterized and released as non-radioactive and non-hazardous waste. Radiologically contaminated construction debris is material that has been contaminated during construction inside the Controlled Area. Excess excavated soil will be generated by earthwork.

The following waste types are estimated to be generated during waste transfer and containerizing operations. A more detailed description with estimated quantities is included in the *Timed Estimate of Secondary Waste* document.

- Spent HEPA filters
- Spent roughing filters
- Spent Ultra Low Penetration Air (ULPA) filters
- Used PPE
- Damaged waste containers
- Damaged baghouse filter bags
- Containerizing and labeling waste
- Container cleaning waste

There is also the potential that some unknown debris will be encountered during soil excavation. This material may be manufactured objects or natural solid waste. These items will be dealt with on an item-by-item basis at the time of discovery. Fluor Fernald will be responsible for characterizing and approving the ultimate disposition of this material.

Waste oils, engine coolants, hydraulic fluids, and other lubricants from the servicing of equipment have not been identified as a "waste stream" as these items will not be stored on the site. Vehicle and construction equipment maintenance will be performed off the site. On-site failure of equipment or vehicles will be managed on an item-by-item basis following approval by Fluor Fernald and in accordance with Fluor Fernald ACR-007, *Waste Material Handling Criteria for Construction Projects*. Any accidental spill of these materials will be subject to Fluor Fernald spill notification requirements. The Contractor will conduct weekly inspections of fuel storage tanks and equipment. An estimate of the amount of each type of waste stream is given in Appendix E.

5.2 WASTE MINIMIZATION

Every effort will be made to minimize waste generation by limiting the amount of material that enters the Controlled Area. Material wrapping and packaging will be minimized on the site by requesting that suppliers provide material with as little packaging as possible. Where feasible, assembly of equipment modules will be done off the site. Pre-job planning will be used to ensure that the number of tools identified and the equipment needed to complete the job are minimized. No hazardous materials will be brought into the Controlled Area unless absolutely necessary and only with the prior approval of Fluor Fernald.

It is expected that only small quantities of "hazardous" materials (e.g., pipe sealants, concrete sealants, marking paints, caulking materials) will be required for the Silo 3 Project construction activities. To minimize the amount of this type of waste, only that quantity that is required to complete the job will be brought on the site.

5.3 CONSTRUCTION DEBRIS MANAGEMENT

Construction debris will be staged at predetermined locations that include controlled boundaries to define each area as well as limit access to them. The debris will be surveyed to verify that it meets the free-release criteria specified by Fluor Fernald Site Procedure RP-0009, *Radiological Requirements for the Release of Materials at the FEMP.* The waste will be segregated as either radiologically contaminated, hazardous, or clean construction waste.

Construction wastes such as fencing that are awaiting radiological survey will be cleaned of soils to ensure that they meet the free-release criteria.

Construction debris that does not meet the free-release criteria for the site will be segregated and containerized by waste streams. Project personnel will be briefed on the waste segregation and size-reduction criteria for the Silo 3 Project prior to mobilization. The estimated volume of secondary waste from construction activities, underground material, soft waste, concrete rubble and rebar from the Silo 3 opening, and caulking/sealants is estimated to be no greater than 87 yd^3. The estimated amount of each waste type is given in the table in Appendix E.

5.4 SOIL MANAGEMENT

During site preparation it is estimated that the Contractor will generate approximately 100 yd^3 of "cut" volume and 100 yd^3 of "raw fill" soil. The "cut" volume will be monitored and dispositioned as directed by the Fluor Fernald Waste Acceptance Organization (WAO). Earthwork and related activities will not be performed during unfavorable weather conditions, e.g., rain, snow, or high winds. Soil management will comply with the Silo 3 Project Health and Safety Plan, the

Erosion and Stormwater Control Plan, and the Fugitive Dust Control Plan. Excess soil will be dispositioned as soon as practical after excavation. The schedule for soil transportation will depend on the OSDF availability and the OSDF subcontractor's transportation schedules. It is expected that transportation of excess soil to the OSDF will be completed within 45 days of completing excavation.

Excavations will be monitored by a WAO representative to ensure that OSDF waste acceptance criteria (WAC) are met as described in DOE's WAC Attainment Plan for the OSDF. Excess "cut" will be characterized as either Category 1 (soil and soil-like material), Category 2 (debris), or Category 4 (organic or highly compressible). Materials will be segregated by OSDF category within the work area before being transported Separate stockpiles of each category will be maintained as directed by the Construction Manager. The final volume of excess material generated will be reported to Fluor Fernald at the end of each normal working day. These excess materials will be tracked by the WAO through the Field Tracking Log (FTL). Additionally, the WAO will track with the FTL any interim material movements (whether soil or debris) between Material Tracking Locations established by the WAO.

During construction and excavation, materials may be encountered that may not meet the OSDF WAC. Upon discovery of these materials, the Fluor Fernald Construction Manager shall be notified and will require further evaluation through Fluor Fernald's real-time monitoring and OSDF WAC Attainment Plan.

5.5 UNKNOWN DEBRIS MANAGEMENT

During excavation, the Contractor may encounter debris, e.g., conduit, piping, concrete. Before beginning earthwork, the contractor will determine the location of all existing underground utilities in the work areas. In the event that unknown debris is unearthed, the contractor will stop work and notify Fluor Fernald immediately of any non-soil debris requiring special handling or disposition. Unexpected debris will be managed in accordance with Fluor Fernald Safe Work Plan requirements (ACR-002). The Contractor will develop a Safe Work Plan for handling unknown debris that will include the criteria that must be met prior to resumption of excavation. Fluor Fernald will arrange for container delivery, debris characterization, any sampling tasks that may be required, and ultimate transportation of the container to the appropriate facility. Fluor Fernald will track the volume of such debris.

5.6 WASTE CONTAINER MANAGEMENT

Fluor Fernald will provide the appropriate waste containers for the various waste categories identified in the Waste Management Plan. The Contractor will use the Material Segregation and Containerization Criteria form, Attachment D, to identify categories of waste. These containers may include, but are not limited to, the following:

- Large metal boxes
- International Standards Organization containers
- Small metal boxes

- 55-gallon drums with lids
- Roll-off boxes
- Dumpsters.

Waste containers staged inside the Controlled Area will be lockable and will be kept locked unless authorized loading is taking place. Fluor Fernald Radiological Control personnel will be present to survey waste before authorized loading operations. Unfilled waste containers will be secured when no loading is in progress to prevent the addition of unknown materials. Fluor Fernald will provide and maintain the locks and keys to clean waste containers.

Designated personnel will be responsible for supervising container operations, including inspection of empty containers upon receipt and during waste loading activities. They will be responsible for ensuring that containers, boxes, and drums are filled so that the interior volume is as efficiently and compactly loaded as practical, either up to the maximum gross weight limit of that container or until full by volume.

Containers will be checked for free liquid before being loaded. Containers with free liquids will not be transported until it is proven that the container no longer contains free liquid. Ice is considered a free liquid. Containers will be protected from the weather, particularly when the lid is not secured, to prevent entry of snow and rain.

Clean construction waste will be surveyed and loaded into dumpsters provided by the Contractor or its subcontractors on a daily basis to prevent an excessive amount of material from piling up near the container staging area. These dumpsters will remain locked when they are not being loaded.

Fluor Fernald will visibly inspect full containers prior to final securing of their lids and container disposition.

The Contractor will follow the requirements of Fluor Fernald ACR-007, *Waste Material Handling Criteria for Construction Projects,* Rev. 2 (June 1998).

5.7 WASTEWATER CONTROL

Wastewater generated during construction will be collected in sumps or by other means and pumped through silt fence or check dams prior to discharge to the existing drainage features near the site. Any contaminated wastewater encountered will be collected and disposed of at the direction of the Construction Manager and this plan. Wastewater generated during operation will be collected and treated according to the *Process Description for the Silo 3 Project.*

6.0 REFERENCES

1. Fluor Fernald, PL-3088, *Stormwater Pollution Prevention Plan,* Rev. 0, October 1999.

2. OEPA, Chapter 3745-17-08 of the OAC, *Restriction of Emission of Fugitive Dust*, July 1997.

3. Fluor Fernald, ACR-007, *Waste Material Handling Criteria for Construction Projects*, Rev. 2, June 1998.

4. Fluor Fernald, RM-0047, *Fugitive Dust Control Requirements,* Rev. 0, August 1997.

5. 40 CFR Part 60, Appendix A, Method 22, *Visual Determination of Fugitive Emission for Material Sources and Smoke Emissions for Flares.*

6. Fluor Fernald Administrative Contractor Requirements, ACR-002, *Contract Safe Work Plan Format Requirements,* Rev. 2, November 1994.

7. Fluor Fernald, RP-0009, *Radiological Requirements for the Release of Materials at the FEMP.*

8. *Stack Release Considerations for the Silo 3 Project* document (Doc. No. 40430-CA-0003)

9. Process Description for the Silo 3 Project (Doc. No. 40430-RP-0003)

10. Silo 3 Project Technical Specifications and Project Quality Procedure 7.1, "Control of Purchased Items and Services

11. Operable Unit (OU) 4 Remedial Investigation (RI) document

12. Fluor Fernald's *Silos Project Environmental Monitoring Plan*

13. ODNR, "Rainwater and Land Development" manual

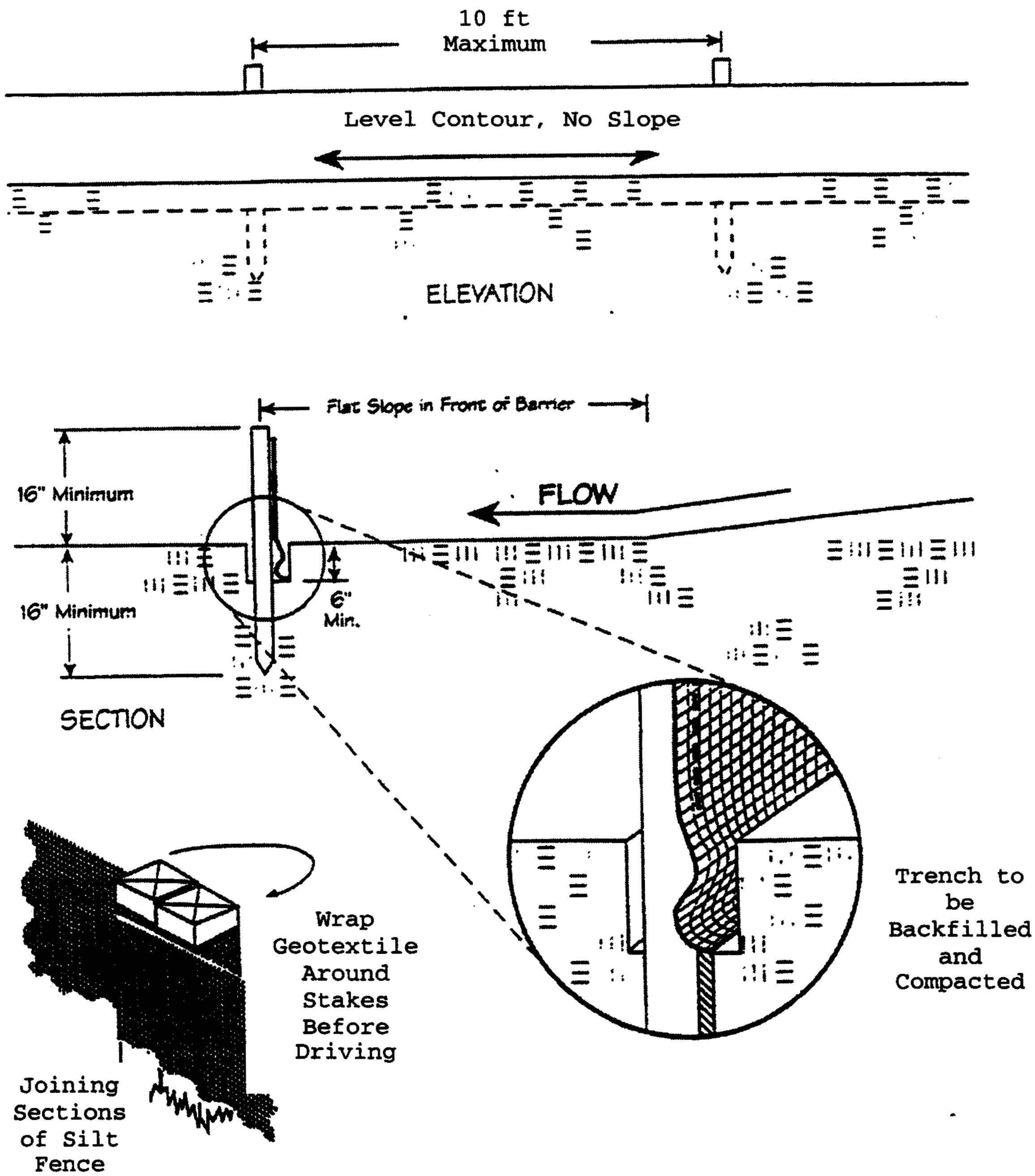
14. *Timed Estimate of Secondary Waste* document

15. Silo 3 Project Health and Safety Plan

16. Fluor Fernald's OSDF WAC Attainment Plan.

APPENDIX A
DETAILS OF EROSION AND STORMWATER CONTROL FEATURES

Silt Fence


10 ft
Maximum
Level Contour, No Slope
ELEVATION
Flat Slope in Front of Barrier
16" Minimum
FLOW
16" Minimum
6"
Min.
SECTION
Wrap
Geotextile
Around
Stakes
Before
Driving
Trench to
be
Backfilled
and
Compacted
Joining
Sections
of Silt
Fence

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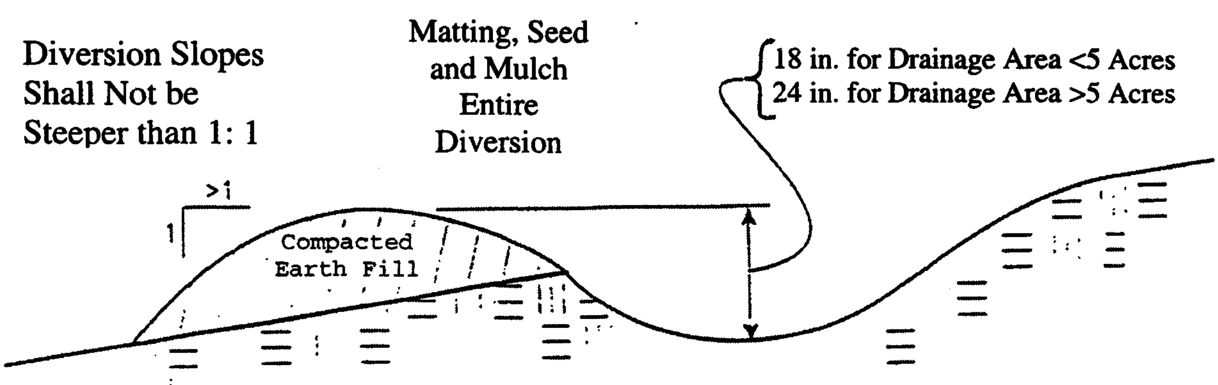
Silo 3 Environmental Control Plan
40430-PL-0005, Rev. B
Jacobs Project Number 35H19605
April 30, 2002

Temporary Diversion



1. Diversion shall be compacted by traversing with tracked earthmoving equipment.
2. Diversions shall not be breached or lowered to allow construction traffic to cross; instead, the top width may be made wider and side slopes made flatter than specified above.
3. Diversions shall be stabilized with check dams.

Specifications for Check Dam

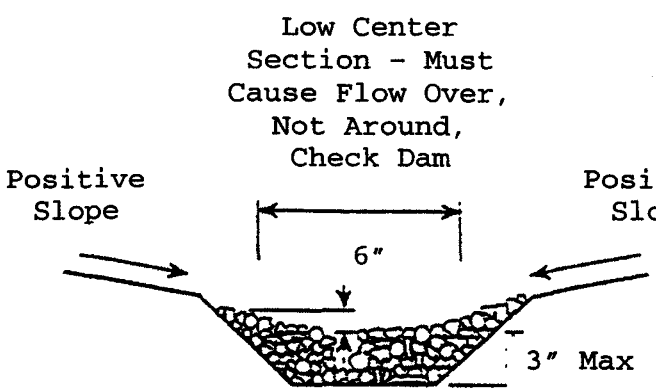
1. The check dam shall be constructed of 4—8-in.-diameter stone, placed so that it completely covers the width of the channel.

2. The top of the check dam shall be constructed so that the center is approximately 6 in. lower than the outer edges, so water will flow across the center and not around the ends.

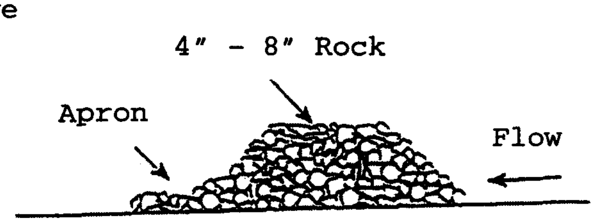
3. The maximum height of the check dam at the center of the weir shall not exceed 3 ft.

4. Spacing between dams shall be as shown in the plans or by the following table:

Check Dam Spacing				
Dam Height (ft)	Channel Slope			
	<5%	5–10%	10–15%	15–20%
1	65 ft	30 ft	20 ft	15 ft
2	130 f	65 ft	40 ft	30 ft
3	200 ft	100 ft	65 ft	50 ft



Cross Section



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APPENDIX B
DAILY RECORDS OF FUGITIVE EMISSIONS CONTROL

CONTROL OF FUGITIVE EMISSIONS
DAILY RECORD

Date________________

TIME	AREA TREATED (see sketch)	TREATMENT METHOD	APPLICATION RATE	TOTAL WATER VOLUME	EQUIPMENT OPERATOR/ SUPERINTENDENT	COMMENTS

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APPENDIX C
OFF-HOURS DUST CONTROL PROCEDURE

OFF-HOURS DUST CONTROL PROCEDURE
SILO 3 CONSTRUCTION

1. Contractor personnel or their subcontractors with responsibilities for off-hour dust control coverage will retain a copy of the Off-Hour Dust Alert Schedule and a Employee Contact Sheet at the Fluor Fernald Site Office and in their vehicle or home, i.e., the schedule and contact sheet should be readily available at all reasonable times.

2. Contractor personnel or their subcontractors working on Silo 3 Project construction activities are responsible for being aware of their duties and responsibilities regarding off-hour dust control.

3. If a scheduling conflict arises, personal or otherwise, the affected person is responsible for making the required revisions to the Off-Hour Dust Alert Schedule to ensure that adequate personnel coverage is maintained at all times. The responsible person for the Contractor or his/her designee must approve all revisions to this schedule. A copy of the modified schedule must be distributed to all affected Contractor and Fluor Fernald personnel no later than the Thursday before the affected week in the schedule.

4. Each week the Contractor will designate one person as the qualified water wagon operator and one person as the sprinkler system operator. The Contractor-DPC and the designated operators must be fully trained and medically cleared to operate in a Controlled Area.

5. When the Contractor is notified by Fluor Fernald that off-hour dust control is required, the Contractor DPC or his/her equivalent will contact the designated operators and coordinate the implementation of this dust control procedure, as detailed in the approved Fugitive Dust Control Plan.

6. If either of the designated operators have not responded within 15 minutes of initial attempts to contact them, alternative operators will be contacted until available operators can be found. These operators must also be fully trained and medically cleared to operate in a Controlled Area.

7. It is the responsibility of the Contractor DPC to keep the designated Fluor Fernald Management Contact informed of all efforts to contact operators and to give details concerning their estimated arrival times at the Silo 3 Project site.

8. Once on the site, the Contractor DPC and operators, together with the designated Fluor Fernald contact, will implement the emergency dust control measures including, but not necessarily limited to, the Fugitive Dust Control Plan and the preparation of a Safe Work Plan.

9. The Contractor DPC is responsible for documenting Contractor's efforts, including contacts and response times, and communicating the same to Fluor Fernald and the Silo 3 Project Management. The Off-Hour Dust Alert Work Order must be filled out by the Contractor and countersigned by the designated Fluor Fernald representative prior to the Contractor leaving the Silo 3 Project site. Note: Off-hours dust control is an additive unit pay item to the Silo 3 Project contract and must be properly documented for payment.

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OFF-HOURS DUST ALERT WORK ORDER

Date of Response: ______________________

Time of First Contact by Fluor Fernald: ______________________

Management Person Responding: ______________________

Operators/Laborers Contacted

Operators/Laborers Responding

Time Manager on Site: ______________________

Time Operator/Laborer on Site: ______________________

Time Suppression Activities End: ______________________

Total Elapsed Time: ______________________

Description of Situation Causing Alert:

Suppression Material and Equipment Utilized (including quantities):

Describe Area Treated (attach sketch if necessary):

By: Contractor's Representative

Concurrence of Response Completion by Fluor Fernald

APPENDIX D
MATERIAL SEGREGATION AND CONTAINERIZATION CRITERIA

Material Segregation and Containerization Criteria
SWIFTS Project # ______________ .Revision # ________

Task	Waste Stream	Preferred Containers								Size Criteria
		Large Metal Box (top loader)	Small Metal Box		ISO	Drum	Roll-off Box	Dumpster	No Containers	
			B-12	B-25						

Categories:
A – Accessible metals
B – Inaccessible metals
C – Process-related metals
D – Painted, light gauge material
E – Concrete
F – Acid brick
G – Non-regulated Asbestos-Containing Materials
H – Regulated Asbestos-Containing Materials
I – Miscellaneous materials
J – Special materials

Size Criteria:
1 – Maximum size = 10 ft long x 4 ft wide x 1 ft high (including projections)
2 – Maximum size = 10 ft long with 1 ft projection (max height: 1.5 ft including projections)
3 – Maximum size = 6 ft long x 4 ft wide x 1.5 ft high
4 – Transit bundles 8 ft long x 4 ft wide x 1.5 ft high
5 – Piping w/> 12-in. diameter must be split in half lengthwise
6 – Cut tires in half radially
7 – Leave intact

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APPENDIX E
ESTIMATED AMOUNTS OF WASTE STREAMS

ESTIMATE OF WASTE DURING CONSTRUCTION

Waste Type	Estimated Volume (yd^3)
Soft waste	13
Construction debris	16
Soil	100^R
Caulking, sealers	3
Concrete rubble & rebar (Silo 3 opening)	25^R
Underground debris	30^R

^{R}Denotes potential radiological contamination.

ESTIMATE OF WASTE DURING OPERATIONS

Waste Type	Estimated Volume (yd^3)
Spent HEPA filters	13^R
Spent roughing filters	5^R
Spent ULPA filters	4^R
PPE	12^R
Sampling waste	1^R
Containerizing and labeling waste	$< 1^R$
Container cleaning waste	2^R

^{R}Denotes potential radiological contamination.

SILO 3 PROJECT CHEMICAL-SPECIFIC ARAR / TBC REQUIREMENT COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Radionuclide Emissions (Except Airborne Radon-222)	Title 40 of the Code of Federal Regulations (CFR) Part 61, Subpart H. Emissions of radionuclides to ambient air from a US Department of Energy (DOE) facility shall not exceed an amount that might cause a member of the public to receive an effective dose equivalent (EDE) of 10 mrem/yr. Monitoring is required at release points having potential to discharge radionuclides that could cause an EDE in excess of 1% of standard (0.1 mrem/year), without taking credit for control equipment, to any member of the public.	Silo 3 activities will generate radionuclide emissions could contribute to the dose to members of the public from the air pathway.	Particulate emissions will be collected and controlled in accordance with Best Available technology and other applicable requirements. Dispersion modeling of estimated emissions will be conducted to verify that the impact of emissions to the environment is below the NESHAP Subpart H standard. Emissions from Silo 3 Project facilities will be discharged to the environment through a monitored exhaust stack. The stack will have an isokinetic sampling system for radionuclide particulate. Stack alarms are also provided.	40430-PL-0005, Environmental Control Plan 40430-CA-0003, Radioactive Particulate and Radon-222 Stack Release Considerations 94X-3900-F-01431, Process Flow Diagram – Process Vent and Packaging Systems
Radon-222 Emissions	40 CFR 61, Subpart Q. No source at a DOE facility shall emit more than 20 pCi/m^2 –s of radon-222, as an average for the entire source, into the air.	NESHAP Subpart Q defines a source as "any building, structure, pile, impoundment, or area used for interim storage or disposal that emits radon in excess of the flux standard prior to remedial action.	Short-term staging of Silo 3 material during the packaging / transportation process does not constitute interim storage for the purposes of NESHAP subpart Q. No "sources", as defined by NESHAP Subpart Q, will exist as part of the Silo 3 Project.	*N/A*

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SILO 3 PROJECT CHEMICAL-SPECIFIC ARAR / TBC REQUIREMENT COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Protection of Air from Residual Radioactive Material	DOE Order 5400.5, Chapter IV, 6.b (Proposed 10 CFR 834). ***Interim Storage:*** The above-background concentration of radon-222 in air above an interim storage facility must not exceed 100 pCi/L at any point, an annual average of 30 pCi/L over the facility, or an annual average of 3 pCi/L at or above any location outside the site.	Portions of DOE Order 5400.5 were selected as TBCs to ensure adequate protection of the public during and following remediation. Management of radium and thorium bearing wastes might result in the release of radon gas to the environment.	The stack has an isokinetic sampling system and is continuously monitored for radon and particulate radionuclides. Stack alarms are also provided. The monitoring data will be used to verify compliance with these limits.	40430-RP-0003, Process Description 40430-PL-0005, Environmental Control Plan 94X-3900-F-01431, Process Flow Diagram – Process Vent and Packaging Systems 94X-3900-N-01440, Piping & Instrument Diagram – Process Vent System
Ohio Water Quality Standards Use Designation and Criteria	OAC 3745-1-07. All pollutants or combinations of pollutants shall not exceed, outside the mixing zone, the Numerical and Narrative Criteria for Aquatic Life Habitat and Water Supply Use Designation listed in Tables 7-1 through 7-15 of this rule.	This requirement is met by compliance with the FEMP National Pollutant Discharge Elimination System (NPDES) permit.	Waste water (expected to be limited to miscellaneous housekeeping, cleanup & equipment decon) will be collected, sampled, and transferred to the AWWT for discharge in accordance with the NPDES permit. Projected wastewater generation from the Silo 3 project is specifically included in the NPDES Permit renewal application submitted to OEPA in may 2002.	40430-RP-0003, Process Description 40430-PL-0005, Environmental Control Plan

SILO 3 PROJECT CHEMICAL-SPECIFIC ARAR / TBC REQUIREMENT COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Ohio Water Quality Standards "six Freedoms" for Surface Water	OAC 3745-1-04. All surface waters of the state shall be free from: Objectionable suspended solids; Floating debris, oil and scum; Materials that create a nuisance; Toxic, harmful or lethal substances; and Nutrients that create nuisance growth.	Requires compliance with the FEMP NPDES permit.	See discussion on compliance with NPDES permit	40430-RP-0003, Process Description 40430-PL-0005, Environmental Control Plan
OEPA NPDES Permit No. 1I000004*FD	Wastewater associated with the SILO 3 project wastes must be treated if necessary to ensure compliance with the terms and conditions of the FEMP NPDES permit. DOE is required to notify the Ohio Environmental Protection Agency (OEPA) of any activities or changes at the site which have the potential to significantly alter the character of the wastewater streams being discharged under its existing NPDES permit. A NPDES permit modification is required if the discharge is deemed significant enough to cause a change in the character of the wastewater stream. The existing NPDES permit must also be modified to reflect the addition of any new point source discharges of process wastewaters and storm waters.	Requires compliance with the FEMP NPDES permit.	Waste water (expected to be limited to miscellaneous housekeeping, cleanup & equipment decon) will be collected, sampled, and transferred to the AWWT for discharge in accordance with the NPDES permit. Projected wastewater generation from the Silo 3 project is specifically included in the NPDES Permit renewal application submitted to OEPA in may 2002.	40430-RP-0003, Process Description 40430-PL-0005, Environmental Control Plan

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SILO 3 PROJECT LOCATION-SPECIFIC ARARs / (TBC) REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Endangered Species Protection	50 CFR Part 402; Ohio Revised Code (ORC) 1518, 1513.25; and OAC 1501-18-1-01. Federal agencies must not jeopardize the continued existence of any endangered or threatened species, or destroy and adversely modify critical habitat of such species.	Although the FEMP is located within the range of the Indiana bat, a federally listed endangered species, no sighting has occurred on the FEMP. Therefore, this requirement is relevant and appropriate. Any potential impacts of the remedial actions on this species must be evaluated and appropriate actions taken.	No existing structures or areas potentially used as Indiana Bat roosts are expected to be impacted as part of the Silo 3 project.	*N/A*
Compliance with Floodplains/ Wetlands Environmental Review Requirements	10 CFR Part 1022; and Executive Order 11990. DOE actions in a wetland must first evaluate the potential adverse effects those actions might have on the wetland and consider the natural and beneficial values served by the wetlands.	This requirement is applicable because the FEMP is a DOE facility. Several alternatives might result in destruction or modification of wetland areas.	Wetlands are not being impacted by the project. All work occurs in areas that have been historically used for OU 4 construction and operations.	40430-PL-0005, Environmental Control Plan 94X-3900-G-01297, Site Plan 94X-3900-G-01298, Grading, Drainage, & Erosion Control

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
National Environmental Policy Act (NEPA) Evaluations	10 CFR 1021.2. DOE actions must be subjected to NEPA evaluation as outlined by Council on Environmental Quality regulations in 40 CFR 1500-1508.	NEPA requirements for the Operable Unit 4 remediation were originally met by the OU4 FS/PP/EIS, approved through issuance of the ROD on December 7, 1994.	NEPA requirements for the revised Silo 3 remedy were addressed by the Silo ESD, approved March, 1998.	N/A
Nationwide Permit Program	33 CFR 330. The US Army Corps of Engineers (USACE) can issue a Nationwide Permit (NWP) as a general permit for certain classes of actions that involve dredge or fill activities in wetlands or navigable waters. Discharges of dredged or fill material into wetlands may require wetland delineation.	This requirement is applicable to remediation activities that may require construction of access roads and utility lines resulting in minor wetland disturbances. All dredge and fill activities related to construction of these access roads and utility lines will be conducted in accordance with the substantive terms and conditions of NWP 14 (Road Crossing) and NWP 12 (Utility Line Backfill and Bedding). OEPA has been granted Section 401 State Water Quality Certification for NWP 12 and NWP14.	All of the intrusive work for the Silo 3 Project takes place within the perimeter road already constructed. No wetlands are to be disturbed. No trees are to be removed. All work occurs in areas that have historically been used for OU 4 construction and operations, and therefore, permitting is not required.	94X-3900-G-01297, Site Plan 94X-3900-G-01298, Grading, Drainage, & Erosion Control
Discharge of Storm Water Runoff	40 CFR 122.26; and OAC 3745-38. Storm water runoff from landfills, construction sites, and industrial activities must be monitored and controlled. A Storm Water Pollution Prevention Plan (SWPPP) is required for construction activities, which result in a total land disturbance of 5 or more acres.	This requirement is applicable to industrial sites and construction site of greater than 5 acres that discharge storm water runoff to the waters of the US. This requirement is applied through the FEMP NPDES Permit.	Stormwater and erosion controls will be implemented in accordance with PL-3083, FEMP Stormwater Pollution Prevention Plan	40430-PL-0005, Environmental Control Plan 94X-3900-G-01297, Site Plan 94X-3900-G-01298, Grading, Drainage, & Erosion Control

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Discharge of Treatment System Effluent	40 CFR 125.100; and 40 CFR 125.104. <u>Best Management Practices</u>: Develop and implement a BMP program to prevent the releases of toxic or hazardous pollutants to waters of the US. Development and implementation of a site-wide BMP Program is also required as a condition of the FEMP NPDES Permit. The BMP program must: • Establish specific objectives for the control of toxic and hazardous pollutants; and • Include a prediction of direction, rate of flow, and total quantity of toxic and hazardous pollutants where experience indicates a reasonable potential for equipment failure.	The purpose of BMP requirements is to prevent release from spills or runoff during implementation of remedial actions. The current FEMP NPDES permit does not contain a BMP Plan requirement. BMP requirements are addressed by SWPPP.	BMP requirements for management of hazardous materials stored or used in the SILO 3 Project (e.g., storage of fuel for an emergency generator) are implemented through the PL-3083, FEMP SWPPP.	*PL-3083,* *Stormwater Pollution Prevention Plan (referenced in 40430-PL-0005)*
Ohio Water Well Standards	OAC 3745-9-10. Abandonment of Test Holes and Wells Upon completion of testing, a test hole or well shall be either completely filled with grout or such materials as will prevent contaminants from entering groundwater.	This requirement is applicable to any test borings and wells that might be installed and/or closed as part of these remedial alternatives.	No Test holes or monitoring wells are to be abandoned as part of the Silo 3 Project	N/A

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Hazardous Waste Determinations	40 CFR 262.11; and OAC 3745-52-11. Any generator of waste must determine whether or not the waste is hazardous. The procedures to be followed include: • To identify whether a particular material of concern is a "solid waste"; • To identify whether a particular exclusion applies to the material eliminating if from definition as a "solid waste"; • To identify whether a particular solid waste might be classified as a hazardous waste; and • To determine if a material otherwise classified as a "hazardous waste" might be excluded from Resource and Conservation Recovery Act (RCRA) regulation.	Procedures are established to determine whether wastes are subject to the requirements of RCRA. Silo 3 material is specifically exempt from regulation as a hazardous waste under RCRA. Secondary wastes generated during implementation of the Silo 3 project must be characterized to identify whether it the wastes are classified as a hazardous waste.	The generation of secondary waste for the Silo Project is to be minimized as much as possible. Secondary waste will be characterized and identified, as necessary, according to the requirements of 40 CFR 261. The characterization, and appropriate disposition of each waste stream will be determined, documented, and tracked through the Project waste Identification and Determination (PWID) process.	40430-PL-0005, Environmental Control Plan

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Empty Containers	40 CFR 261.7; and OAC 3745-51-7. Containers that have held hazardous wastes are "empty" and exempt from further RCRA regulations if one or more of the following are met: No more than 2.5 cm (1 in) of residue remains on bottom of inner liner; Less than 3% by weight of total capacity remains (≤ 110-gal container); and Less than 0.3% by weight of total capacity remains (> 110-gal container). Exemption requirements for containers that have held acutely hazardous ("P" listed) wastes are somewhat more restrictive.	These requirements will be applicable to non-excluded solid waste that exhibits a hazardous characteristic.	Hazardous waste containers are not planned to be emptied / reused as part of the work scope under the Silo 3 Project.	N/A
Generators Who Transport Hazardous Waste for Off-site Treatment, Storage, or Disposal	40 CFR 262.20 – 262.33; 40 CFR 263.20 – 263.31; OAC 3745-52-20 through 33; and OAC 3745-53-20 through 31. Any generator who transports hazardous waste for off-site treatment, storage or disposal must originate and follow-up the manifest for off-site shipments.	This requirement will be applicable to non-excluded solid waste that exhibits a hazardous characteristic. Any wastes determined to be RCRA hazardous waste removed from this operable unit for off-site treatment, storage, or disposal are subject to the manifest requirement.	Manifest requirements will be met for shipment of untreated Silo 3 material.	40430-PL-0008, Transportation and Disposal Plan

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Treatment, Storage, or Disposal Facility Standards	40 CFR 264, Subpart B; and OAC 3745-54-13 through 16. ***General Standards:*** These include: ***Waste Analysis (OAC 3745-54-13)*** Operators of a facility must obtain a detailed chemical and physical analysis of a representative sample of each hazardous waste to be treated, stored, or disposed of at the facility prior to treatment, storage, or disposal. ***Security (OAC 3745-54-14)*** Operators of a facility must prevent the unknowing or unauthorized entry of persons or livestock into the active portions of the facility, maintain a 24-hr surveillance system, or surround the facility with a controlled access barrier and maintain appropriate warning signs at facility approaches. ***Inspections (OAC 3745-54-15)*** Operators of a facility must develop a schedule for regular inspections.	Untreated Silo 3 Material or any secondary waste, characterized as hazardous waste, must be managed in accordance with these requirements.	RCRA TSD facility standards are relevant and appropriate to the design and operation of the Silo 3 Project, and as such, has been reflected in appropriate design drawings and specifications, as well as operating and maintenance procedures. Representative samples will be collected in accordance with the Sampling and Analysis plan, security provided through 24-hr surveillance system, and inspections performed, as appropriate, of processing systems while attention to ALARA principles is applied to all appropriate Silo 3 Project activities.	40430-PL-0009, Rev A, Sampling & Analysis Plan for Silo 3 Material

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Treatment, Storage or Disposal (TSD) Facility Preparedness and Prevention	40 CFR 264, Subpart C; OAC 3745-54-31 through 35; and OAC 3745-54-17. ***OAC 3745-54-31*** – TSD operators must design, construct, maintain, and operate facilities to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste to air, soil, or surface water which might threaten human health or the environment. ***OAC 3745-54-32*** – All facilities must be equipped with an internal communication or alarm system, a telephone, or a 2-way radio for calling outside emergency assistance, fire control, spill control, and decontamination equipment and water at an adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers, or water spray systems. ***OAC 3745-54-33*** – All fire protection and spill control and decontamination equipment and communication and alarm systems must be tested and maintained as necessary to assure proper emergency operation.	Waste removed from this operable unit which exhibits a hazardous characteristic must be treated, stored, or disposed in accordance with the relevant and appropriate TSD facility standards.	RCRA TSD facility standards are relevant and appropriate to the design and operation of the Silo 3 Project, and as such, has been reflected in appropriate design drawings and specifications, as well as operating and maintenance procedures. Representative samples of waste are to be collected, security provided through 24-hr surveillance system, and inspections performed, as appropriate, of processing systems while attention to ALARA principles are applied to all appropriate Silo 3 Project activities. Applicable OAC requirements for emergency preparedness and prevention have also been incorporated into the design of the Silo 3 Project facilities, as well as the operating and maintenance procedures for the SILO 3 Project. These procedures included the testing and maintenance of emergency systems.	40430-RP-0003, Process Description 94X-3900-G-01297, Site Plan

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Treatment, Storage, or Disposal Facility Contingency Plan and Emergency Procedures	40 CFR 264, Subpart D; OAC 3745-54-51 through 52; and OAC 3745-54-55 though 56. *OAC 3745-54-51* Each facility operator must have a contingency plan designed to minimize hazards to human health or the environment due to fire, explosions, or any unplanned releases of hazardous waste constituents to the air, soil, or surface/groundwater. *OAC 3745-54-52* Contingency plans should address procedures to implement a response to incidents involving hazardous waste, and provide for internal and external communications, arrangements with local emergency authorities, and emergency coordinator list, a facility emergency equipment list indicating equipment descriptions and locations, and a facility personnel evacuation plan. *OAC 3745-54-55 through 56* Each facility must have an emergency coordinator who has responsibility for coordinating all emergency response measures.	Silo 3 material, or any secondary waste exhibiting a hazardous waste characteristic, must be managed in accordance with these requirements.	RCRA TSD facility standards are relevant and appropriate to the design and operation of the Silo 3 Project, and as such, has been reflected in appropriate design drawings and specifications, as well as operating and maintenance procedures. Representative samples of waste are to be collected, security provided through 24-hr surveillance system, and inspections performed, as appropriate, of processing systems while attention to ALARA principles are applied to all appropriate SILO 3 Project activities. Applicable OAC requirements for emergency preparedness and prevention have also been incorporated into the design of the Silo 3 Project facilities, as well as the operating and maintenance procedures for the Silo 3 Project. These procedures included the testing and maintenance of emergency systems.	40000-PL-0014, Rev A Silos Project Health & Safety Controls

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Closure	40 CFR 264, Subpart G; OAC 3745-55-11; OAC 3745-55-14; and OAC 3745-55-16. Operators must close the facility in a manner that: • Minimizes the need for further maintenance; • Minimizes post-closure escape of hazardous constituents; and • Complies with specific unit type closure requirements. All contaminated equipment, structures and soils must be properly disposed or decontaminated. Following closure, a survey plot showing the location of hazardous waste disposal units with respect to surveyed benchmarks must be filed with the legal total zoning authority.	These procedures are relevant and appropriate to closure of the Silo 3 remediation facilities.	Closure and D&D of the Silo 3 structure and Silo 3 remediation facilities will be conducted within the scope of OU3 D&D activities and is outside the scope of this RD Package	N/A

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Container Storage	40 CFR 264, Subpart I; and OAC 3745-55-71 through 78. Containers of RCRA hazardous waste must be: Maintained in good condition; Compatible with hazardous waste to be stored; Closed during storage (except to add or remove waste); and Managed in a manner that will not cause the container to rupture or leak. Storage areas must be inspected weekly for leaking and deteriorated containers and containment systems. Place containers on a sloped, crack-free base, and protect from contact with accumulated liquid. Provide a containment system with a capacity of 10% of the volume of the largest container of free liquids. Remove spilled or leaked waste in a timely manner.	These requirements would be relevant and appropriate for alternatives utilizing containers for temporary storage or storage before disposal of untreated Silo 3 material, or secondary waste characterized as hazardous waste.	Containers of untreated Silo 3 material will be managed in accordance with these requirements prior to shipment. No hazardous waste is expected to be newly generated from the Silo 3 Project. All secondary waste is handled per the Environmental Control Plan, Section 5.	40430-PL-0005, Environmental Control Plan, Section 5

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS
COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Tank Systems	40 CFR Part 264, Subpart J; and OAC 3745-55-91 through 96. Design, operating standards, and inspection requirement for tank units within which hazardous waste is stored or treated. • Tank design must be compatible with the material being stored; • Tank must be designed and have sufficient strength to store or treat waste to ensure it will not rupture or collapse; and • Tank must have secondary containment that is capable of detecting and collecting releases to prevent migration of wastes or accumulated liquids to the environment.	Design criteria, operating standards, and inspections for tank treatment units will be relevant and appropriate for alternatives utilizing treatment or storage in a tank prior to disposal.	No tanks subject to these requirements are included in the Silo 3 project facilities.	N/A

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Closure Requirements for Tanks	40 CFR 264.197; and OAC 3745-55-97. At closure, the facility owner must do the following: • Remove all waste residues; • Remove or decontaminate all tank system components; • Remove or decontaminate all contaminated soils and structures; and • Manage all of the above as hazardous wastes. If all contaminated soils cannot be removed, the landfill requirements of 40 CFR 264.310 apply.	These requirements would be relevant and appropriate for alternatives utilizing treatment or storage in a tank prior to disposal.	No tanks subject to these requirements are included in the Silo 3 project facilities.	N/A
Miscellaneous Units	40 CFR 264, Subpart X; and OAC 3745-57-91 through 92. Environmental performance standard, monitoring, inspection, and post-closure care for treatment in miscellaneous units as defined in 40 CFR 260.10.	This requirement would be relevant and appropriate to alternatives using Miscellaneous units to stabilize waste that is sufficiently similar to hazardous waste.	The use of RCRA miscellaneous units is not proposed for the Silo 3 Project, and therefore, this requirement does not apply.	N/A

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Corrective Action for Solid Waste Management Units (SWMUs)	40 CFR 264, Subpart S; and 40 CFR 264.552 and 264.553. Corrective Action Management Units might be designated at the site as areas where remediation wastes (solid, hazardous, or contaminated media and debris) might be placed during the process of remediation. Temporary units consisting of tanks and container storage units might be used to store and treat hazardous waste during the process of corrective action.	The material in Silo 3 is specifically exempt from the applicability of RCRA requirements. However, these procedures are relevant and appropriate.	No Corrective Action Management Units or Temporary Units are to be created or utilized as part of the Silo 3 Project.	N/A

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Containment Building	40 CFR 264, Subpart DD. Hazardous waste and debris might be placed in units known as containment buildings for the purpose of interim storage or treatment. Containment buildings must be fully enclosed to prevent exposure to the elements and ensure containment of managed wastes. Floor and containment walls must be designed and constructed of material of sufficient strength and thickness to support themselves, the waste contents, and any personnel and heavy equipment that operate within the operable unit. All surfaces coming in contact with hazardous waste must be chemically compatible with the waste. Primary barriers must be constructed to prevent migration of hazardous constituents into the barrier. Secondary containment systems including secondary barrier and leak detection systems must also be constructed for containment buildings used to manage wastes containing free liquids.	The material in the silos is specifically exempt from the applicability of RCRA requirements. However, these procedures are relevant and appropriate.	No Containment Buildings subject to these requirements are utilized as part of the Silo 3 Project.	N/A

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Radiation Dose Limit (All Pathways)	DOE Order 5400.5, Chap. II, Sec. 1.a (Proposed 10 CFR 834). The exposure of members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater than 100 mrem from all exposure pathways.	Portions of DOE Order 5400.5 were selected as TBCs to ensure adequate protection of public during and following remediation. Radiation sources within this operable unit might contribute to the total dose to members of the public from this DOE facility.	The wastes to be handled as part of the Silo 3 Project exhibit radiological characteristics; however, appropriate design controls, including shielding and layers of containment of the waste features that isolate workers and the public from these wastes, have been applied to the design of the appropriate systems. As Low as Reasonably Achievable (ALARA). principles are accomplished by radiological protection practices such as maximizing distance between the workers and the radiation source, shielding the workers from the radiation source, or minimizing the time or duration of the workers' exposure to the radiation source.	40430-RP-0003, Process Description 40430-PL-0005, Environmental Control Plan 94X-3900-G-01297, Site Plan

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Control of Fugitive Dust	OAC 3745-17-08. Requires the minimization or elimination of visible emissions of fugitive dust generated during grading, loading, or construction operations and other practices, which emit fugitive dust.	The implementation of remedial action alternatives may require the movement of dirt and other material likely to result in fugitive dust emissions. This requirement is relevant and appropriate because the FEMP is not located in an area subject to this regulation.	Potential dust-generating activities that are conducted as part of the Silo 3 Project are to be closely monitored for visible emissions, while being controlled using best management practices (BMPs) as necessary. For example, the use of water or other suitable dust suppression chemicals are to be used for controlling dust from activities associated with demolition, construction operations, grading roads, or clearing land. Open trucks are covered when transporting materials likely to become airborne. Also, soil stockpile areas are covered with canvas, plastic, or other suitable material during stockpiling and staging operations. RM-0047 contains the BAT determination for the FEMP site, including the applicable emission standards.	40430-PL-0005, Environmental Control Plan

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SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Prevention of Air Pollution Nuisance	ORC 3704.01-.05; and OAC 3745-15-07. Measures shall be taken to adopt and maintain a program for the prevention, control, and abatement of air pollution in order to protect and enhance the quality of the state's air resource so as to promote the public health, welfare, and economic vitality of the people of the state. The emission or escape into open air from any source whatsoever of smoke, ashes, dust, dirt, grime, acids, fumes, gases, vapors, odors, and combinations of the above in such a manner or in such amounts as to endanger the health, safety, or welfare of the public or to cause unreasonable injury or damage to property shall be declared a public nuisance and is prohibited.	This requirement is applicable to Silo 3 Project activities. Some potential exists for emissions of radionuclides and toxic chemicals to the air, which might endanger individuals or damage property.	The Silo 3 Project design incorporates Best Available Technology (BAT) for control of air emissions.	40430-PL-0005, Environmental Control Plan

SILO 3 PROJECT ACTION-SPECIFIC ARARS / TBC REQUIREMENTS COMPLIANCE MATRIX

Category	ARAR/TBC Requirement	Requirement Assessment	Compliance Strategy	Cross Reference Index
Control of Visible Particulate Emissions from Stationary Sources	OAC 3745-17-07. Discharge of particulate emissions into ambient air from any stack of a shade or density greater than 20% opacity is prohibited. Transient exceedence limits are included in this regulation.	This requirement is applicable to Silo 3 Project activities.	Particulate emissions greater than 20% opacity are not anticipated for the SILO 3 Project.	40430-PL-0005, Environmental Control Plan
Permit to Install (PTI)	OAC 3745-31-05 (A)(3). The Director of Ohio Environmental Protection Agency (EPA) shall issue a permit to install if he determines that the installation or modification and operation of the air contaminant source will employ the best available technology, not prevent or interfere with the attainment or maintenance of ambient air quality standards, and not result in a violation of any applicable air pollution control laws.	PTI approval is not required for the Silo 3 Project. However, the substantive requirements of this section must be met by employing Best Available Technology for treating particulate and off-gas emissions during treatment operations. Ohio EPA may also require stack performance testing to evaluate controls.	The Silo 3 Project design incorporates Best Available Technology (BAT) for control of air emissions. In addition, performance tests of air pollution control systems will be conducted as required to demonstrate compliance.	40430-PL-0005, Environmental Control Plan
Ohio EPA Air Toxics Policy [used in conjunction with OAC 3745-31-05 (A)(3)]	The current PTI regulations provide the Director of Ohio EPA with a mechanism to require the evaluation of toxic air contaminants from new sources. The Ohio EPA Air Toxics Policy provides a mechanism for calculating the Maximum Acceptable Ground-Level Concentration for a toxic substance. This value at the site boundary will be modeled to the stack to determine a stack limit. All toxic compounds that will exceed the stack limit shall be controlled administratively or by BAT to lower emissions to below the calculated stack limit.	For toxic compound emissions that are calculated to exceed the established stack limit, administrative controls shall be implemented or emissions shall be controlled by implementing BAT for toxic emissions. Performance of these control measures may be verified through performance testing during operation.	No emissions of air toxics are anticipated as part of the Silo 3 project.	*N/A*

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RADIOACTIVE PARTICULATE AND RADON-222 STACK RELEASE CONSIDERATIONS FOR THE SILO 3 PROJECT

Document No. 40430-CA-0003

March 15, 2002

Revision A

FERNALD

Environmental Management Project

Fernald Project Number 40430

Revision	A					
Date	3/15/02					
Prepared By	Douglas E Gonzales					
Checked By	Kenneth J. Eger					
Reviewed By	Scott Labuy					
Approved By	[illegible]					

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Engineers and Constructors

Calculation Cover Sheet	Calculation No: 40430-CA-0003	Page:1 of 8
	Rev. No.: A	Revision Date: 3/11/02
	Previous Revision Date: N/A	Current Revision Date: 3/11/02
Issuing Department: *Oak Ridge Design Engineering*	Supersedes: N/A	
Client: Flour Femald Project Title:Silo 3 Project Number: 35H19605 System:	Engineering Discipline: Nuclear Engineering	

Calculation Title:
Radioactive Particulate and Radon-222 Stack Release Considerations for the Silo 3 Remedial Action Project

Purpose:

The purpose of this calculation is to assess the radiological dose to the maximum exposed receptor due to the release of radiological particulates and radon-222 from a stack associated with the Silo 3 remedial action project. The released activity was based on measured concentrations of relevant radionuclides in the Silo 3 waste and the assumed remedial action waste processing scheme.

Prepared by: Douglas E. Gonzales Date: 3/11/02
Checked by: Kenneth J. Egan Date: 3/12/02
Engineering Managers Approval: [signature] Date: 3/12/02

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Engineers and Constructors

Project: 35H19605
Calculation Number: 40430 - CA - 0003

Revision History		
Pages Affected By Revision	Revised/Added/Deleted	Description of Revision
A	All	Initial Issue

Description of Calculation:

This calculation determines the maximum dose rate and where that dose would occur in the vicinity of the Silo 3 Exhaust Stack due to the release of radioactive particulates and radon-222 associated with the Silo 3 remedial action operations. Silo 3, the equipment, and the process building associated with the remedial action project will be ventilated and the captured radon discharged to the atmosphere through an elevated stack system. In addition, the pneumatic processing of the Silo 3 waste entails the vacuuming of the powdered waste from Silo 3 and subsequent removal of the air-entrained waste by capturing the waste in bags for final off-site disposal. The air discharged from the bag capture process subsequently is filtered after the bulk of the waste has been bagged. This post process filtration would remove most of the particulate activity prior to venting the process air through an elevated stack and subsequent atmospheric dispersion of the residual radioactive particulates and radon to the environment. The computer calculation of the dose rate (mrem/year) from particulates is based on the activity emitted by the pneumatic excavator. The result was then corrected by adding (by proportion) the effect from the mechanical excavator area and the building ventilation. The radioactive material released from the stack and the dose to potential human receptors depends on:

- The radioactive particulate and radon-222 concentrations in the stack discharge
- The stack height and diameter
- The rate of discharge and its temperature.
- Meteorological parameters, and
- Potential receptor locations and exposure scenarios.

An EPA atmospheric dispersion code, CAP88 - PC, was used to estimate atmospheric dispersion of radioactive particulates and radon-222 released and to determine the dose at the location of maximum dose. This computer code is based on Gaussian dispersion of gases and airborne particulates from area or stack sources, and uses site-specific meteorological data and source design considerations.

Assumptions:

- The joint-frequency distribution of wind speed and atmospheric stability as a function of 16 directions contained in *Feasibility Study Report for Operable Unit 2, Vol.4, Appendix D, Fernald Environmental Management Project*, (March 1995) is indicative of average climatic conditions in the vicinity of Silo 3 (Attachment A).
- Stack height and outlet diameter of 125' and 24", respectively.
- Discharge rate of 10,900 cfm at 100 °F
- 1000 m atmospheric mixing height (Lid)
- Estimates of radioactive particulate and radon concentrations in the stack discharge provided by Hazard Category Calculations for Silo 3, 40430-RP-0006 and Drawing 94x-3900-F-01428 Sheet F-001, Rev A 3900, respectively:

95% Upper Confidence Limit on the Mean Silo 3 Radionuclide Concentrations

Radionuclide	Concentration, 95% Upper Confidence Level (pCi/g)
Ac-277	925
Ac-228	406

95% Upper Confidence Limit on the Mean Silo 3 Radionuclide Concentrations)cont'd)

Radionuclide	Concentration, 95% Upper Confidence Level (pCi/g)
Bi-210	3,480
Fr-223	13
Pa-231	627
Pa-234	2
Pa-234m	1,778
Pb-210	3,480
Po-210	3,480
Ra-223	925
Ra-224	367
Ra-226	3,870
Ra-228	406
Th-227	92
Th-228	747
Th-230	60,200
Th-231	117
Th-232	842
Th-234	1,780
U-234	1,730
U-235/236	117
U-238	1,780

- Filtration efficiency of cascade filtration system for particulate removal from process air stream: 95%, 99% and 97%.
- Standard exposure and default assumptions of CAP88-PC.

Calculation Inputs:

- Joint frequency of wind speed as a function of direction and stability class (Attachment A)
- Stack height and outlet diameter of 125' and 24", respectively and a momentum discharge velocity of 3470 ft/min, corresponding to a discharge rate of 10,900 ft^3/min.
- Rural exposure condition.
- Radiological properties and annual radioactive particulate and radon-222 activity discharge per year calculated from initial waste concentrations as follow:

Particulate Release Rate

Pneumatic excavator release rate (Ci/yr) = Project through put rate (10 yd^3/hr) x bulk density (42.4 lbs/ft^3) x activity per radionuclide in waste (8.72×10^4 pCi/g) x bag retention fraction (0.005) x cartridge filter retention factor (0.001) x HEPA filter retention factor (0.0003) x conversion factors = 1.89×10^{-13} Ci/sec

Total release rate (Ci/yr) = 11.5 lbs/hour (Heat and Material Balance) x (8.72×10^4 pCi/g) x conversion factors = 1.22×10^{-12} Ci/sec

Radon Release Rate

Release rate (Ci/year) = 213 pCi/l at 10,900 ft^3/min x (28.3 l/ft^3) x (min/60 sec) x 3.15 $\times 10^7$ sec/yr

= 3.47×10^1 Ci/yr

Source input release rates are as follows:

SOURCE RELEASE RATE

Nuclide	Class	Size	Source Release Rate (Ci/yr)
Rn-222	*	0.00	3.5E+01
Ac-227	D	1.00	6.3E-08
Ac-228	W	1.00	2.8E-08
Bi-210	W	1.00	2.4E-07
Fr-223	D	1.00	8.8E-10
Pa-231	W	1.00	4.3E-08
Pa-234	W	1.00	1.4E-10
Pa-234m	W	1.00	1.2E-07
Pb-210	D	1.00	2.4E-07
Po-210	W	1.00	2.4E-07
Ra-223	W	1.00	6.3E-08
Ra-224	W	1.00	2.5E-08
Ra-226	W	1.00	2.6E-07
Ra-228	W	1.00	2.8E-08
Th-227	W	1.00	6.3E-09

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Project: 35H19605
Calculation Number: 40430 - CA - 0003

SOURCE RELEASE RATE (Cont'd)

Nuclide	Class	Size	Source Release Rate (Ci/yr)
Th-228	Y	1.00	5.1E-08
Th-230	W	1.00	4.1E-06
Th-231	W	1.00	8.0E-09
Th-232	W	1.00	5.7E-08
Th-234	Y	1.00	1.2E-07
U-234	W	1.00	1.2E-07
U-235	W	1.00	8.0E-09
U-236	W	1.00	8.0E-09
U-238	Y	1.00	1.2E-07

- Exposure locations to evaluate air dispersed radioactive particulates and radon-222 concentrations and dose: 300m, 500m, 700m, 1000m, 1300 m, 1500 m, 2000 m, 2300 m, 2400 m, 2600 m, 2900 m, and 3500 m for 16 uniformly distributed directions relative to the Silo 3 stack.

Calculation Section:

The atmospheric release/dispersion/exposure calculations were performed using the annual estimate release rates for the major radionuclide in the Silo 3 waste. Radionuclide concentrations and doses were calculated as a function of 16 uniformly distributed directions and potential receptor locations of 300m, 500m, 700m, 1000m, 1300 m, 1500 m, 2000 m, 2300 m, 2400 m, 2600 m, 2900 m, and 3500 mm from the stack. The location of maximum dose was determined, as well. The calculated results are detailed in Attachment B.

Conclusions/Recommendations:

For a 125' stack 24" in diameter discharging particulates and radon-222 at a rate of 10,900 ft^3/min corresponding to a discharge velocity of 3470 ft/min, the maximum exposure/dose occurs at a distance 1000 m from the stack location and in the north-easterly direction. Exposure of a rural receptor at that location to particulates and radon-222 resulting from the pneumatic extraction and packaging of Silo 3 waste would yield an estimated dose of 4.25×10^{-4} mrem/yr.

The total dose was found by proportion ($1.22 \times 10^{-12}/1.89 \times 10^{-13}$) to be 2.74×10^{-3} mrem/year.

The total dose from radon 1000m to the northeast was found to be 0.79 mrem/year.

Reference:

Feasibility Study Report for Operable Unit 2, Vol.4, Appendix D, Fernald Environmental Management Project, (March 1995)

Hazard Category Calculations for Silo 3, 40430-RP-0006

Drawing 94x-3900-F-01428 Sheet F-001, Rev A 3900

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Engineers and Constructors

Project: 35H19605
Calculation Number: 40430 - CA - 0003
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ATTACHMENT A

Fernald Environmental Management Project Joint Frequency Distribution

ATTACHMENT A

Fernald Environmental Management Project Joint Frequency Distribution

Wind Direction	Wind Speed (kts) </= 3	</= 6	</= 10	</= 16	</= 21	> 21
Stability Class A						
N	0.00026	0.00090	0.00090	0.00006	0.00000	0.00000
NNE	0.00029	0.00155	0.00067	0.00000	0.00000	0.00000
NE	0.00082	0.00289	0.00120	0.00003	0.00000	0.00000
ENE	0.00143	0.00443	0.00204	0.00012	0.00000	0.00000
E	0.00105	0.00201	0.00020	0.00015	0.00000	0.00000
ESE	0.00070	0.00080	0.00006	0.00000	0.00000	0.00000
SE	0.00047	0.00044	0.00000	0.00000	0.00000	0.00000
SSE	0.00058	0.00055	0.00000	0.00000	0.00000	0.00000
S	0.00070	0.00158	0.00120	0.00000	0.00000	0.00000
SSW	0.00102	0.00435	0.00380	0.00015	0.00000	0.00000
SW	0.00128	0.00508	0.00476	0.00055	0.00000	0.00000
WSW	0.00175	0.00476	0.00365	0.00020	0.00000	0.00000
W	0.00099	0.00388	0.00327	0.00047	0.00000	0.00000
WNW	0.00061	0.00181	0.00263	0.00053	0.00000	0.00000
NW	0.00058	0.00158	0.00140	0.00012	0.00000	0.00000
NNW	0.00035	0.00131	0.00128	0.00006	0.00000	0.00000
Stability Class B						
N	0.00003	0.00082	0.00070	0.00012	0.00000	0.00000
NNE	0.00012	0.00053	0.00050	0.00006	0.00000	0.00000
NE	0.00035	0.00096	0.00061	0.00006	0.00000	0.00000
ENE	0.00032	0.00146	0.00055	0.00015	0.00000	0.00000
E	0.00047	0.00067	0.00018	0.00003	0.00000	0.00000
ESE	0.00026	0.00026	0.00003	0.00000	0.00000	0.00000
SE	0.00023	0.00020	0.00003	0.00000	0.00000	0.00000
SSE	0.00026	0.00047	0.00009	0.00003	0.00000	0.00000
S	0.00041	0.00114	0.00032	0.00000	0.00000	0.00000
SSW	0.00053	0.00155	0.00131	0.00018	0.00000	0.00000
SW	0.00061	0.00204	0.00207	0.00023	0.00000	0.00000
WSW	0.00061	0.00169	0.00128	0.00018	0.00000	0.00000
W	0.00067	0.00117	0.00123	0.00015	0.00000	0.00000
WNW	0.00023	0.00079	0.00088	0.00020	0.00000	0.00000
NW	0.00026	0.00067	0.00102	0.00020	0.00000	0.00000
NNW.	0.00015	0.00064	0.00090	0.00009	0.00000	0.00000

ATTACHMENT A

Fernald Environmental Management Project Joint Frequency Distribution (cont'd)

Stability Class C

Wind Direction	Wind Speed (kts) </= 3	</= 6	</= 10	</= 16	</= 21	> 21
N	0.00020	0.00085	0.00108	0.00023	0.00000	0.00000
NNE	0.00018	0.00131	0.00078	0.00006	0.00000	0.00000
NE	0.00041	0.00149	0.00102	0.00009	0.00000	0.00000
ENE	0.00070	0.00172	0.00044	0.00026	0.00000	0.00000
E	0.00105	0.00088	0.00020	0.00006	0.00000	0.00000
ESE	0.00067	0.00058	0.00006	0.00000	0.00000	0.00000
SE	0.00032	0.00047	0.00009	0.00000	0.00000	0.00000
SSE	0.00015	0.00047	0.00006	0.00006	0.00000	0.00000
S	0.00032	0.00117	0.00055	0.00006	0.00000	0.00000
SSW	0.00055	0.00175	0.00158	0.00006	0.00003	0.00000
SW	0.00090	0.00274	0.00175	0.00018	0.00000	0.00000
WSW	0.00076	0.00242	0.00125	0.00020	0.00000	0.00000
W	0.00079	0.00128	0.00114	0.00032	0.00000	0.00000
WNW	0.00032	0.00134	0.00125	0.00020	0.00000	0.00000
NW	0.00023	0.00134	0.00114	0.00012	0.00003	0.00000
NNW	0.00023	0.00108	0.00096	0.00003	0.00000	0.00000

Stability Class D

Wind Direction	</= 3	</= 6	</= 10	</= 16	</= 21	> 21
N	0.00210	0.00872	0.00922	0.00108	0.00000	0.00000
NNE	0.00283	0.01053	0.00826	0.00114	0.00000	0.00000
NE	0.00446	0.01342	0.00750	0.00050	0.00000	0.00000
ENE	0.00633	0.01783	0.00916	0.00204	0.00000	0.00000
E	0.00449	0.00613	0.00108	0.00009	0.00000	0.00000
ESE	0.00324	0.00298	0.00012	0.00000	0.00000	0.00000
SE	0.00263	0.00263	0.00035	0.00000	0.00000	0.00000
SSE	0.00280	0.00362	0.00111	0.00020	0.00000	0.00000
S	0.00306	0.00659	0.00289	0.00032	0.00000	0.00000
SSW	0.00581	0.01409	0.00744	0.00181	0.00000	0.00000
SW	0.00785	0.01447	0.00802	0.00105	0.00006	0.00000
WSW	0.00837	0.01120	0.00627	0.00116	0.00000	0.00000
W	0.00706	0.01155	0.00948	0.00143	0.00000	0.00000
WNW	0.00479	0.01042	0.01062	0.00155	0.00000	0.00000
NW	0.00373	0.00904	0.00726	0.00096	0.00009	0.00000
NNW	0.00298	0.00884	0.00563	0.00105	0.00006	0.00000

ATTACHMENT A

Fernald Environmental Management Project Joint Frequency Distribution (cont'd)

Stability Class E

Wind Direction	Wind Speed (kts) </= 3	</= 6	</= 10	</= 16	</= 21	> 21
N	0.00362	0.00388	0.00076	0.00003	0.00000	0.00000
NNE	0.00260	0.00309	0.00079	0.00018	0.00000	0.00000
NE	0.00298	0.00347	0.00044	0.00000	0.00000	0.00000
ENE	0.00869	0.00922	0.00181	0.00000	0.00000	0.00000
E	0.00820	0.00274	0.00023	0.00000	0.00000	0.00000
ESE	0.00479	0.00125	0.00015	0.00000	0.00000	0.00000
SE	0.00484	0.00172	0,00029	0.00000	0.00000	0.00000
SSE	0.00557	0.00341	0.00128	0.00020	0.00000	0.00000
S	0.00697	0.00767	0.00336	0.00064	0.00000	0.00000
SSW	0.01158	0.01403	0.00680	0.00169	0.00000	0.00000
SW	0.01850	0.01826	0.00741	0.00064	0.00000	0.00000
WSW	0.01780	0.01033	0.00330	0.00064	0.00000	0.00000
W	0.01249	0.01001	0.00414	0.00015	0.00000	0.00000
WNW	0.00948	0.00761	0.00330	0.00058	0.00000	0.00000
NW	0.00834	0.00467	0.00111	0.00018	0.00000	0.00000
NNW	0.00621	0.00382	0.00108	0.00026	0.00000	0.00000

Stability Class F

Wind Direction	</= 3	</= 6	</= 10	</= 16	</= 21	> 21
N	0.00499	0.00012	0.00000	0.00000	0.00000	0.00000
NNE	0.00525	0.00009	0.00003	0.00000	0.00000	0.00000
NE	0.00508	0.00012	0.00000	0.00000	0.00000	0.00000
ENE	0.00910	0.00161	0.00012	0.00000	0.00000	0.00000
E	0.01336	0.00090	0.00000	0.00000	0.00000	0.00000
ESE	0.00893	0.00006	0.00000	0.00000	0.00000	0.00000
SE	0.00592	0.00032	0.00000	0.00000	0.00000	0.00000
SSE	0.00546	0.00018	0.00000	0.00000	0.00000	0.00000
S	0.00700	0.00047	0.00000	0.00000	0.00000	0.00000
SSW	0.01182	0.00120	0.00026	0.00000	0.00000	0.00000
SW	0.01958	0.00210	0.00003	0.00000	0.00000	0.00000
WSW	0.02681	0.00187	0.00006	0.00000	0.00000	0.00000
W	0.02976	0.00067	0.00003	0.00000	0.00000	0.00000
WNW	0.02932	0.00023	0.00003	0.00000	0.00000	0.00000
NW	0.02279	0.00076	0.00006	0.00000	0.00000	0.00000
NNW	0.01152	0.00088	0.00006	0.00000	0.00000	0.00000

JACOBS ENGINEERING
Engineers and Constructors

Project: 35H19605
Calculation Number: 40430 - CA - 0003
Page

ATTACHMENT B

CAP-PC Output

This attachment includes the CAP88-PC output for a 125' stack 24" in diameter discharging radiologically contaminated air (radioactive particulates and radon-222) at a 10,900 ft^3/min rate, corresponding to a discharge velocity of 3470 ft/min.

CAP88-PC Output includes the following pages:

Synopsis report	Cover Page plus Page 2
General Data	Cover Page plus Pages 1 through 10
Weather Data	Cover Page plus Pages1 and 2
Concentration Tables	Cover Page plus Pages 1 through125
Chi/Q Tables	Cover Page plus Pages 1 through 24

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S   R E P O R T

Radon Individual Assessment
Mar 11, 2002 02:42 pm

Facility: Fernald Silo 3 Particulates/Radon Stack Release
Address: Fernald
City: Fernald
State: OH   Zip:

Source Category:
Source Type: Stack
Emission Year: 2002

Comments:

Effective Dose Equivalent
(mrem/year)

4.25E-04

At This Location: 1000 Meters Northeast
Dataset Name: Fernald Silo 3
Dataset Date: Mar 11, 2002 02:42 pm
Wind File: C:\CAP88PC2\WNDFILES\NEWFREDB.WND

Mar 11, 2002 02:42 pm

RN-222 MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1000 Meters Northeast
Radon Concentration (pCi/l): 1.20E-03
Decay Product Concentration (WL): 3.73E-06
Lifetime Fatal Cancer Risk: 4.91E-06

RADIONUCLIDE EMISSIONS DURING THE YEAR 2002

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
RN-222	*	0.00	3.5E+01	3.5E+01
AC-227	D	1.00	6.3E-08	6.3E-08
AC-228	W	1.00	2.8E-08	2.8E-08
BI-210	W	1.00	2.4E-07	2.4E-07
FR-223	D	1.00	8.8E-10	8.8E-10
PA-231	W	1.00	4.3E-08	4.3E-08
PA-234	W	1.00	1.4E-10	1.4E-10
PA-234M	W	1.00	1.2E-07	1.2E-07
PB-210	D	1.00	2.4E-07	2.4E-07
PO-210	W	1.00	2.4E-07	2.4E-07
RA-223	W	1.00	6.3E-08	6.3E-08
RA-224	W	1.00	2.5E-08	2.5E-08
RA-226	W	1.00	2.6E-07	2.6E-07
RA-228	W	1.00	2.8E-08	2.8E-08
TH-227	W	1.00	6.3E-09	6.3E-09
TH-228	Y	1.00	5.1E-08	5.1E-08
TH-230	W	1.00	4.1E-06	4.1E-06
TH-231	W	1.00	8.0E-09	8.0E-09
TH-232	W	1.00	5.7E-08	5.7E-08
TH-234	Y	1.00	1.2E-07	1.2E-07
U-234	W	1.00	1.2E-07	1.2E-07
U-235	W	1.00	8.0E-09	8.0E-09
U-236	W	1.00	8.0E-09	8.0E-09
U-238	Y	1.00	1.2E-07	1.2E-07

SITE INFORMATION

Temperature: 12 degrees C
Precipitation: 104 cm/y
Mixing Height: 1000 m

CAP88-PC

Version 2.00

Clean Air Act Assessment Package - 1988

GENERAL DATA

Radon Individual Assessment
Mar 11, 2002 02:42 pm

Facility: Fernald Silo 3 Particulates/Radon Stack Release
Address: Fernald
City: Fernald
State: OH Zip:

Source Category:
Source Type: Stack
Emission Year: 2002

Comments:

Dataset Name: Fernald Silo 3
Dataset Date: Mar 11, 2002 02:42 pm
Wind File: C:\CAP88PC2\WNDFILES\NEWFREDB.WND

VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

Nuclide	Clearance Class	Particle Size (microns)	Scavenging Coefficient (per second)	Dry Deposition Velocity (m/s)
RN-222	*	0.0	0.00E+00	0.00E+00
AC-227	D	1.0	1.04E-05	1.80E-03
AC-228	W	1.0	1.04E-05	1.80E-03
BI-210	W	1.0	1.04E-05	1.80E-03
FR-223	D	1.0	1.04E-05	1.80E-03
PA-231	W	1.0	1.04E-05	1.80E-03
PA-234	W	1.0	1.04E-05	1.80E-03
PA-234M	W	1.0	1.04E-05	1.80E-03
PB-210	D	1.0	1.04E-05	1.80E-03
PO-210	W	1.0	1.04E-05	1.80E-03
RA-223	W	1.0	1.04E-05	1.80E-03
RA-224	W	1.0	1.04E-05	1.80E-03
RA-226	W	1.0	1.04E-05	1.80E-03
RA-228	W	1.0	1.04E-05	1.80E-03
TH-227	W	1.0	1.04E-05	1.80E-03
TH-228	Y	1.0	1.04E-05	1.80E-03
TH-230	W	1.0	1.04E-05	1.80E-03
TH-231	W	1.0	1.04E-05	1.80E-03
TH-232	W	1.0	1.04E-05	1.80E-03
TH-234	Y	1.0	1.04E-05	1.80E-03
U-234	W	1.0	1.04E-05	1.80E-03
U-235	W	1.0	1.04E-05	1.80E-03
U-236	W	1.0	1.04E-05	1.80E-03
U-238	Y	1.0	1.04E-05	1.80E-03

VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

	DECAY CONSTANT (PER DAY)			TRANSFER COEFFICIENT	
Nuclide	Radio-active (1)	Surface	Water	Milk (2)	Meat (3)
RN-222	1.81E-01	5.48E-05	0.00E+00	0.00E+00	0.00E+00
AC-227	0.00E+00	5.48E-05	0.00E+00	2.00E-05	2.50E-05
AC-228	2.71E+00	5.48E-05	0.00E+00	2.00E-05	2.50E-05
BI-210	1.38E-01	5.48E-05	0.00E+00	5.00E-04	4.00E-04
FR-223	4.58E+01	5.48E-05	0.00E+00	2.00E-02	2.50E-03
PA-231	0.00E+00	5.48E-05	0.00E+00	5.00E-06	1.00E-05
PA-234	2.48E+00	5.48E-05	0.00E+00	5.00E-06	1.00E-05
PA-234M	8.53E+02	5.48E-05	0.00E+00	5.00E-06	1.00E-05
PB-210	0.00E+00	5.48E-05	0.00E+00	2.50E-04	3.00E-04
PO-210	0.00E+00	5.48E-05	0.00E+00	3.50E-04	9.50E-05
RA-223	6.06E-02	5.48E-05	0.00E+00	4.50E-04	2.50E-04
RA-224	1.91E-01	5.48E-05	0.00E+00	4.50E-04	2.50E-04
RA-226	0.00E+00	5.48E-05	0.00E+00	4.50E-04	2.50E-04
RA-228	0.00E+00	5.48E-05	0.00E+00	4.50E-04	2.50E-04
TH-227	3.70E-02	5.48E-05	0.00E+00	5.00E-06	6.00E-06
TH-228	0.00E+00	5.48E-05	0.00E+00	5.00E-06	6.00E-06
TH-230	0.00E+00	5.48E-05	0.00E+00	5.00E-06	6.00E-06
TH-231	6.52E-01	5.48E-05	0.00E+00	5.00E-06	6.00E-06
TH-232	0.00E+00	5.48E-05	0.00E+00	5.00E-06	6.00E-06
TH-234	2.88E-02	5.48E-05	0.00E+00	5.00E-06	6.00E-06
U-234	0.00E+00	5.48E-05	0.00E+00	6.00E-04	2.00E-04
U-235	0.00E+00	5.48E-05	0.00E+00	6.00E-04	2.00E-04
U-236	0.00E+00	5.48E-05	0.00E+00	6.00E-04	2.00E-04
U-238	0.00E+00	5.48E-05	0.00E+00	6.00E-04	2.00E-04

FOOTNOTES: (1) Effective radioactive decay constant in plume; set to zero if less than 1.0E-2

(2) Fraction of animal's daily intake of nuclide which appears in each L of milk (days/L)

(3) Fraction of animal's daily intake of nuclide which appears in each kg of meat (days/kg)

VALUES FOR RADIONUCLIDE-DEPENDENT PARAMETERS

	CONCENTRATION UPTAKE FACTOR		GI UPTAKE FRACTION	
Nuclide	Forage (1)	Edible (2)	Inhalation	Ingestion
RN-222	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AC-227	3.50E-03	1.50E-04	1.00E-03	1.00E-03
AC-228	3.50E-03	1.50E-04	1.00E-03	1.00E-03
BI-210	3.50E-02	2.14E-03	5.00E-02	5.00E-02
FR-223	3.00E-02	3.42E-03	9.50E-01	9.50E-01
PA-231	2.50E-03	1.07E-04	1.00E-03	1.00E-03
PA-234	2.50E-03	1.07E-04	1.00E-03	1.00E-03
PA-234M	2.50E-03	1.07E-04	1.00E-03	1.00E-03
PB-210	4.50E-02	3.85E-03	2.00E-01	2.00E-01
PO-210	2.50E-03	1.71E-04	1.00E-01	1.00E-01
RA-223	1.50E-02	6.42E-04	2.00E-01	2.00E-01
RA-224	1.50E-02	6.42E-04	2.00E-01	2.00E-01
RA-226	1.50E-02	6.42E-04	2.00E-01	2.00E-01
RA-228	1.50E-02	6.42E-04	2.00E-01	2.00E-01
TH-227	8.50E-04	3.64E-05	2.00E-04	2.00E-04
TH-228	8.50E-04	3.64E-05	2.00E-04	2.00E-04
TH-230	8.50E-04	3.64E-05	2.00E-04	2.00E-04
TH-231	8.50E-04	3.64E-05	2.00E-04	2.00E-04
TH-232	8.50E-04	3.64E-05	2.00E-04	2.00E-04
TH-234	8.50E-04	3.64E-05	2.00E-04	2.00E-04
U-234	8.50E-03	1.71E-03	2.00E-03	2.00E-01
U-235	8.50E-03	1.71E-03	2.00E-03	2.00E-01
U-236	8.50E-03	1.71E-03	2.00E-03	2.00E-01
U-238	8.50E-03	1.71E-03	2.00E-03	2.00E-01

FOOTNOTES: (1) Concentration factor for uptake of nuclide from soil for pasture and forage (in pCi/kg dry weight per pCi/kg dry soil)

(2) Concentration factor for uptake of nuclide from soil by edible parts of crops (in pCi/kg wet weight per pCi/kg dry soil)

VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

HUMAN INHALATION RATE	
Cubic centimeters/hr	9.17E+05
SOIL PARAMETERS	
Effective surface density (kg/sq m, dry weight) (Assumes 15 cm plow layer)	2.15E+02
BUILDUP TIMES	
For activity in soil (years)	1.00E+02
For radionuclides deposited on ground/water (days)	3.65E+04
DELAY TIMES	
Ingestion of pasture grass by animals (hr)	0.00E+00
Ingestion of stored feed by animals (hr)	2.16E+03
Ingestion of leafy vegetables by man (hr)	3.36E+02
Ingestion of produce by man (hr)	3.36E+02
Transport time from animal feed-milk-man (day)	2.00E+00
Time from slaughter to consumption (day)	2.00E+01
WEATHERING	
Removal rate constant for physical loss (per hr)	2.90E-03
CROP EXPOSURE DURATION	
Pasture grass (hr)	7.20E+02
Crops/leafy vegetables (hr)	1.44E+03
AGRICULTURAL PRODUCTIVITY	
Grass-cow-milk-man pathway (kg/sq m)	2.80E-01
Produce/leafy veg for human consumption (kg/sq m)	7.16E-01
FALLOUT INTERCEPTION FRACTIONS	
Vegetables	2.00E-01
Pasture	5.70E-01
GRAZING PARAMETERS	
Fraction of year animals graze on pasture	4.00E-01
Fraction of daily feed that is pasture grass when animal grazes on pasture	4.30E-01

VALUES FOR RADIONUCLIDE-INDEPENDENT PARAMETERS

ANIMAL FEED CONSUMPTION FACTORS	
Contaminated feed/forage (kg/day, dry weight)	1.56E+01
DAIRY PRODUCTIVITY	
Milk production of cow (L/day)	1.10E+01
MEAT ANIMAL SLAUGHTER PARAMETERS	
Muscle mass of animal at slaughter (kg)	2.00E+02
Fraction of herd slaughtered (per day)	3.81E-03
DECONTAMINATION	
Fraction of radioactivity retained after washing for leafy vegetables and produce	5.00E-01
FRACTIONS GROWN IN GARDEN OF INTEREST	
Produce ingested	1.00E+00
Leafy vegetables ingested	1.00E+00
INGESTION RATIOS:	
IMMEDIATE SURROUNDING AREA/TOTAL WITHIN AREA	
Vegetables	7.60E-02
Meat	8.00E-03
Milk	0.00E+00
MINIMUM INGESTION FRACTIONS FROM OUTSIDE AREA	
(Minimum fractions of food types from outside area listed below are actual fixed values.)	
Vegetables	0.00E+00
Meat	0.00E+00
Milk	0.00E+00
HUMAN FOOD UTILIZATION FACTORS	
Produce ingestion (kg/y)	1.76E+02
Milk ingestion (L/y)	1.12E+02
Meat ingestion (kg/y)	8.50E+01
Leafy vegetable ingestion (kg/y)	1.80E+01
SWIMMING PARAMETERS	
Fraction of time spent swimming	0.00E+00
Dilution factor for water (cm)	1.00E+00

EXPOSURE LEVELS FOR SHORT-LIFE PROGENY OF RN-222
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (Meters)	Exposure Level (Person WL) (.7 EQF)	Adjusted Equilibrium Fraction	Adjusted Exposure Level
N	300	2.370E-06	0.28	9.412E-07
N	500	2.449E-06	0.29	1.011E-06
N	700	3.020E-06	0.30	1.284E-06
N	1000	3.412E-06	0.31	1.516E-06
N	1300	3.048E-06	0.32	1.406E-06
N	1500	2.784E-06	0.33	1.317E-06
N	1700	2.539E-06	0.34	1.227E-06
N	2000	2.222E-06	0.35	1.108E-06
N	2300	1.966E-06	0.36	1.009E-06
N	2400	1.891E-06	0.36	9.798E-07
N	2600	1.758E-06	0.37	9.270E-07
N	2700	1.697E-06	0.37	9.029E-07
N	3500	1.309E-06	0.40	7.442E-07
NNW	300	1.171E-06	0.28	4.651E-07
NNW	500	1.354E-06	0.29	5.589E-07
NNW	700	1.809E-06	0.30	7.688E-07
NNW	1000	2.162E-06	0.31	9.604E-07
NNW	1300	1.976E-06	0.32	9.118E-07
NNW	1500	1.824E-06	0.33	8.623E-07
NNW	1700	1.675E-06	0.34	8.095E-07
NNW	2000	1.479E-06	0.35	7.374E-07
NNW	2300	1.317E-06	0.36	6.758E-07
NNW	2400	1.270E-06	0.36	6.578E-07
NNW	2600	1.184E-06	0.37	6.247E-07
NNW	2700	1.146E-06	0.37	6.095E-07
NNW	3500	8.923E-07	0.40	5.073E-07
NW	300	9.479E-07	0.28	3.764E-07
NW	500	1.075E-06	0.29	4.439E-07
NW	700	1.347E-06	0.30	5.726E-07
NW	1000	1.588E-06	0.31	7.057E-07
NW	1300	1.475E-06	0.32	6.804E-07
NW	1500	1.376E-06	0.33	6.509E-07
NW	1700	1.280E-06	0.34	6.183E-07
NW	2000	1.151E-06	0.35	5.737E-07
NW	2300	1.044E-06	0.36	5.355E-07
NW	2400	1.012E-06	0.36	5.243E-07
NW	2600	9.551E-07	0.37	5.038E-07
NW	2700	9.290E-07	0.37	4.942E-07
NW	3500	7.441E-07	0.40	4.231E-07
WNW	300	1.395E-06	0.28	5.542E-07
WNW	500	1.435E-06	0.29	5.923E-07
WNW	700	1.625E-06	0.30	6.905E-07
WNW	1000	1.763E-06	0.31	7.834E-07
WNW	1300	1.598E-06	0.32	7.372E-07
WNW	1500	1.478E-06	0.33	6.989E-07

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EXPOSURE LEVELS FOR SHORT-LIFE PROGENY OF RN-222
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (Meters)	Exposure Level (Person WL) (.7 EQF)	Adjusted Equilibrium Fraction	Adjusted Exposure Level
WNW	1700	1.367E-06	0.34	6.605E-07
WNW	2000	1.226E-06	0.35	6.113E-07
WNW	2300	1.115E-06	0.36	5.720E-07
WNW	2400	1.083E-06	0.36	5.611E-07
WNW	2600	1.027E-06	0.37	5.414E-07
WNW	2700	1.001E-06	0.37	5.326E-07
WNW	3500	8.149E-07	0.40	4.633E-07
W	300	2.653E-06	0.28	1.053E-06
W	500	2.646E-06	0.29	1.092E-06
W	700	2.894E-06	0.30	1.230E-06
W	1000	3.061E-06	0.31	1.360E-06
W	1300	2.750E-06	0.32	1.269E-06
W	1500	2.541E-06	0.33	1.201E-06
W	1700	2.351E-06	0.34	1.136E-06
W	2000	2.113E-06	0.35	1.054E-06
W	2300	1.925E-06	0.36	9.879E-07
W	2400	1.871E-06	0.36	9.694E-07
W	2600	1.774E-06	0.37	9.358E-07
W	2700	1.730E-06	0.37	9.205E-07
W	3500	1.405E-06	0.40	7.988E-07
WSW	300	4.403E-06	0.28	1.749E-06
WSW	500	4.978E-06	0.29	2.055E-06
WSW	700	5.828E-06	0.30	2.477E-06
WSW	1000	5.945E-06	0.31	2.641E-06
WSW	1300	5.122E-06	0.32	2.363E-06
WSW	1500	4.611E-06	0.33	2.181E-06
WSW	1700	4.163E-06	0.34	2.011E-06
WSW	2000	3.608E-06	0.35	1.799E-06
WSW	2300	3.169E-06	0.36	1.626E-06
WSW	2400	3.044E-06	0.36	1.577E-06
WSW	2600	2.818E-06	0.37	1.486E-06
WSW	2700	2.716E-06	0.37	1.445E-06
WSW	3500	2.073E-06	0.40	1.178E-06
SW	300	3.037E-06	0.28	1.206E-06
SW	500	3.529E-06	0.29	1.457E-06
SW	700	3.945E-06	0.30	1.677E-06
SW	1000	3.696E-06	0.31	1.642E-06
SW	1300	3.051E-06	0.32	1.408E-06
SW	1500	2.683E-06	0.33	1.269E-06
SW	1700	2.374E-06	0.34	1.147E-06
SW	2000	2.003E-06	0.35	9.988E-07
SW	2300	1.722E-06	0.36	8.834E-07
SW	2400	1.643E-06	0.36	8.510E-07
SW	2600	1.504E-06	0.37	7.932E-07
SW	2700	1.442E-06	0.37	7.673E-07

EXPOSURE LEVELS FOR SHORT-LIFE PROGENY OF RN-222
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (Meters)	Exposure Level (Person WL) (.7 EQF)	Adjusted Equilibrium Fraction	Adjusted Exposure Level
SW	3500	1.074E-06	0.40	6.107E-07
SSW	300	1.647E-06	0.28	6.543E-07
SSW	500	2.456E-06	0.29	1.014E-06
SSW	700	2.968E-06	0.30	1.261E-06
SSW	1000	2.888E-06	0.31	1.283E-06
SSW	1300	2.413E-06	0.32	1.113E-06
SSW	1500	2.133E-06	0.33	1.009E-06
SSW	1700	1.896E-06	0.34	9.160E-07
SSW	2000	1.611E-06	0.35	8.033E-07
SSW	2300	1.395E-06	0.36	7.156E-07
SSW	2400	1.334E-06	0.36	6.911E-07
SSW	2600	1.227E-06	0.37	6.473E-07
SSW	2700	1.180E-06	0.37	6.278E-07
SSW	3500	8.918E-07	0.40	5.070E-07
S	300	1.522E-06	0.28	6.044E-07
S	500	2.218E-06	0.29	9.158E-07
S	700	2.695E-06	0.30	1.145E-06
S	1000	2.725E-06	0.31	1.211E-06
S	1300	2.327E-06	0.32	1.074E-06
S	1500	2.081E-06	0.33	9.840E-07
S	1700	1.866E-06	0.34	9.014E-07
S	2000	1.601E-06	0.35	7.984E-07
S	2300	1.395E-06	0.36	7.160E-07
S	2400	1.337E-06	0.36	6.927E-07
S	2600	1.234E-06	0.37	6.507E-07
S	2700	1.188E-06	0.37	6.318E-07
S	3500	9.022E-07	0.40	5.130E-07
SSE	300	1.850E-06	0.28	7.347E-07
SSE	500	2.402E-06	0.29	9.915E-07
SSE	700	2.954E-06	0.30	1.255E-06
SSE	1000	3.159E-06	0.31	1.403E-06
SSE	1300	2.781E-06	0.32	1.283E-06
SSE	1500	2.534E-06	0.33	1.198E-06
SSE	1700	2.316E-06	0.34	1.119E-06
SSE	2000	2.049E-06	0.35	1.021E-06
SSE	2300	1.842E-06	0.36	9.453E-07
SSE	2400	1.784E-06	0.36	9.241E-07
SSE	2600	1.680E-06	0.37	8.859E-07
SSE	2700	1.633E-06	0.37	8.687E-07
SSE	3500	1.306E-06	0.40	7.427E-07
SE	300	2.383E-06	0.28	9.465E-07
SE	500	2.896E-06	0.29	1.196E-06
SE	700	3.501E-06	0.30	1.488E-06
SE	1000	3.781E-06	0.31	1.680E-06
SE	1300	3.359E-06	0.32	1.550E-06

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EXPOSURE LEVELS FOR SHORT-LIFE PROGENY OF RN-222 AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (Meters)	Exposure Level (Person WL) (.7 EQF)	Adjusted Equilibrium Fraction	Adjusted Exposure Level
SE	1500	3.082E-06	0.33	1.457E-06
SE	1700	2.838E-06	0.34	1.371E-06
SE	2000	2.548E-06	0.35	1.270E-06
SE	2300	2.332E-06	0.36	1.197E-06
SE	2400	2.273E-06	0.36	1.177E-06
SE	2600	2.169E-06	0.37	1.144E-06
SE	2700	2.123E-06	0.37	1.129E-06
SE	3500	1.762E-06	0.40	1.002E-06
ESE	300	2.810E-06	0.28	1.116E-06
ESE	500	3.598E-06	0.29	1.486E-06
ESE	700	4.560E-06	0.30	1.938E-06
ESE	1000	4.982E-06	0.31	2.213E-06
ESE	1300	4.396E-06	0.32	2.028E-06
ESE	1500	4.006E-06	0.33	1.894E-06
ESE	1700	3.663E-06	0.34	1.770E-06
ESE	2000	3.253E-06	0.35	1.622E-06
ESE	2300	2.949E-06	0.36	1.513E-06
ESE	2400	2.867E-06	0.36	1.485E-06
ESE	2600	2.722E-06	0.37	1.436E-06
ESE	2700	2.659E-06	0.37	1.414E-06
ESE	3500	2.189E-06	0.40	1.244E-06
E	300	4.528E-06	0.28	1.798E-06
E	500	4.930E-06	0.29	2.035E-06
E	700	5.895E-06	0.30	2.505E-06
E	1000	6.354E-06	0.31	2.823E-06
E	1300	5.604E-06	0.32	2.586E-06
E	1500	5.108E-06	0.33	2.415E-06
E	1700	4.667E-06	0.34	2.255E-06
E	2000	4.130E-06	0.35	2.059E-06
E	2300	3.721E-06	0.36	1.909E-06
E	2400	3.608E-06	0.36	1.869E-06
E	2600	3.407E-06	0.37	1.797E-06
E	2700	3.317E-06	0.37	1.765E-06
E	3500	2.684E-06	0.40	1.526E-06
ENE	300	5.623E-06	0.28	2.233E-06
ENE	500	5.491E-06	0.29	2.267E-06
ENE	700	6.456E-06	0.30	2.744E-06
ENE	1000	7.192E-06	0.31	3.195E-06
ENE	1300	6.471E-06	0.32	2.986E-06
ENE	1500	5.957E-06	0.33	2.817E-06
ENE	1700	5.485E-06	0.34	2.650E-06
ENE	2000	4.887E-06	0.35	2.436E-06
ENE	2300	4.411E-06	0.36	2.264E-06
ENE	2400	4.275E-06	0.36	2.214E-06
ENE	2600	4.030E-06	0.37	2.125E-06

EXPOSURE LEVELS FOR SHORT-LIFE PROGENY OF RN-222
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (Meters)	Exposure Level (Person WL) (.7 EQF)	Adjusted Equilibrium Fraction	Adjusted Exposure Level
ENE	2700	3.919E-06	0.37	2.085E-06
ENE	3500	3.139E-06	0.40	1.785E-06
NE	300	5.965E-06	0.28	2.369E-06
NE	500	6.070E-06	0.29	2.506E-06
NE	700	7.410E-06	0.30	3.149E-06
NE	1000	8.401E-06	0.31	3.732E-06
NE	1300	7.547E-06	0.32	3.482E-06
NE	1500	6.925E-06	0.33	3.274E-06
NE	1700	6.344E-06	0.34	3.065E-06
NE	2000	5.594E-06	0.35	2.789E-06
NE	2300	4.985E-06	0.36	2.558E-06
NE	2400	4.808E-06	0.36	2.491E-06
NE	2600	4.488E-06	0.37	2.367E-06
NE	2700	4.343E-06	0.37	2.310E-06
NE	3500	3.385E-06	0.40	1.925E-06
NNE	300	4.679E-06	0.28	1.858E-06
NNE	500	4.921E-06	0.29	2.032E-06
NNE	700	6.019E-06	0.30	2.558E-06
NNE	1000	6.592E-06	0.31	2.929E-06
NNE	1300	5.810E-06	0.32	2.681E-06
NNE	1500	5.280E-06	0.33	2.497E-06
NNE	1700	4.799E-06	0.34	2.318E-06
NNE	2000	4.187E-06	0.35	2.088E-06
NNE	2300	3.697E-06	0.36	1.897E-06
NNE	2400	3.555E-06	0.36	1.842E-06
NNE	2600	3.300E-06	0.37	1.741E-06
NNE	2700	3.185E-06	0.37	1.695E-06
NNE	3500	2.448E-06	0.40	1.392E-06

SOURCE INFORMATION

Source Number: 1

Stack Height (m): 38.
Diameter (m): 1.

Plume Rise
Momentum (m/s): 18.
(Exit Velocity)

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

300 500 700 1000 1300 1500 1700 2000 2300 2400
2600 2700 3500

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

W E A T H E R   D A T A

Radon Individual Assessment
Mar 11, 2002 02:42 pm

Facility: Fernald Silo 3 Particulates/Radon Stack Release
Address: Fernald
City: Fernald
State: OH   Zip:

Source Category:
Source Type: Stack
Emission Year: 2002

Comments:

Dataset Name: Fernald Silo 3
Dataset Date: Mar 11, 2002 02:42 pm
Wind File: C:\CAP88PC2\WNDFILES\NEWFREDB.WND

HARMONIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class

Dir	A	B	C	D	E	F	G	Wind Freq
N	1.938	1.785	2.092	1.778	1.448	0.807	0.000	0.046
NNW	1.170	1.561	1.852	1.453	1.180	0.789	0.000	0.026
NW	1.166	1.202	1.424	1.244	0.978	0.800	0.000	0.021
WNW	1.275	1.236	1.183	1.177	0.920	0.775	0.000	0.025
W	1.543	1.475	1.246	1.393	0.951	0.807	0.000	0.044
WSW	1.976	2.195	1.820	2.018	1.292	0.870	0.000	0.079
SW	2.004	2.031	2.218	2.024	1.297	0.784	0.000	0.048
SSW	2.218	2.497	2.507	2.319	1.394	0.784	0.000	0.041
S	2.352	3.121	2.713	2.522	1.300	0.785	0.000	0.041
SSE	2.373	2.689	2.442	2.123	1.158	0.815	0.000	0.049
SE	2.160	2.502	2.600	2.076	1.108	0.791	0.000	0.068
ESE	2.569	2.514	2.487	2.121	1.304	0.777	0.000	0.089
E	2.387	1.980	1.931	1.843	1.273	0.784	0.000	0.102
ENE	2.080	2.129	2.067	1.607	1.148	0.810	0.000	0.106
NE	2.431	2.368	2.096	1.768	1.364	0.829	0.000	0.120
NNE	2.388	2.211	2.248	1.947	1.532	0.838	0.000	0.093

ARITHMETIC AVERAGE WIND SPEEDS (WIND TOWARDS)

Pasquill Stability Class

Dir	A	B	C	D	E	F	G
N	2.831	2.486	2.894	2.657	2.374	0.885	0.000
NNW	1.648	2.366	2.708	2.292	1.917	0.829	0.000
NW	1.642	1.789	2.102	1.840	1.376	0.864	0.000
WNW	1.843	1.819	1.734	1.686	1.223	0.784	0.000
W	2.316	2.283	1.993	2.085	1.287	0.885	0.000
WSW	2.775	3.004	2.787	2.969	1.944	1.079	0.000
SW	2.737	2.941	3.068	2.868	1.908	0.813	0.000
SSW	2.845	3.355	3.148	3.221	2.201	0.822	0.000
S	3.240	3.609	3.670	3.403	1.967	0.814	0.000
SSE	3.218	3.552	3.201	3.100	1.860	0.916	0.000
SE	3.116	3.615	3.404	3.104	1.717	0.839	0.000
ESE	3.639	3.546	3.392	3.203	2.163	0.789	0.000
E	3.288	3.089	3.147	2.932	2.036	0.815	0.000
ENE	2.987	3.102	2.952	2.620	1.845	0.896	0.000
NE	3.315	3.306	2.988	2.742	2.189	0.951	0.000
NNE	3.180	3.186	3.160	2.944	2.537	1.005	0.000

FREQUENCIES OF STABILITY CLASSES (WIND TOWARDS)

Pasquill Stability Class

Dir	A	B	C	D	E	F	G
N	0.0750	0.0403	0.0452	0.2770	0.4016	0.1609	0.0000
NNW	0.0426	0.0320	0.0279	0.2911	0.3940	0.2124	0.0000
NW	0.0434	0.0220	0.0420	0.2678	0.3270	0.2979	0.0000
WNW	0.0633	0.0220	0.0525	0.2540	0.2480	0.3602	0.0000
W	0.0772	0.0306	0.0496	0.2669	0.2529	0.3228	0.0000
WSW	0.1008	0.0312	0.0392	0.4446	0.2480	0.1362	0.0000
SW	0.1031	0.0413	0.0628	0.5403	0.1438	0.1086	0.0000
SSW	0.0615	0.0296	0.0571	0.5573	0.1631	0.1315	0.0000
S	0.0521	0.0411	0.0580	0.5193	0.2038	0.1256	0.0000
SSE	0.0606	0.0360	0.0465	0.3752	0.2298	0.2519	0.0000
SE	0.0544	0.0318	0.0423	0.3115	0.2113	0.3488	0.0000
ESE	0.0629	0.0237	0.0351	0.3086	0.2364	0.3334	0.0000
E	0.0843	0.0315	0.0346	0.2890	0.2623	0.2982	0.0000
ENE	0.0972	0.0353	0.0434	0.2534	0.3010	0.2697	0.0000
NE	0.0971	0.0412	0.0464	0.2617	0.3729	0.1807	0.0000
NNE	0.0998	0.0382	0.0425	0.3121	0.3651	0.1422	0.0000
TOTAL	0.0803	0.0339	0.0440	0.3335	0.2792	0.2289	0.0000

ADDITIONAL WEATHER INFORMATION

Average Air Temperature: 11.5 degrees C
284.66 K
Precipitation: 104.0 cm/y
Lid Height: 1000 meters
Surface Roughness Length: 0.010 meters
Height Of Wind Measurements: 10.0 meters
Average Wind Speed: 2.210 m/s

Vertical Temperature Gradients:
STABILITY E 0.073 k/m
STABILITY F 0.109 k/m
STABILITY G 0.146 k/m

CAP88-PC

Version 2.00

Clean Air Act Assessment Package - 1988

CONCENTRATION TABLES

Radon Individual Assessment
Mar 11, 2002 02:42 pm

Facility: Fernald Silo 3 Particulates/Radon Stack Release
Address: Fernald
City: Fernald
State: OH Zip:

Source Category:
Source Type: Stack
Emission Year: 2002

Comments:

Dataset Name: Fernald Silo 3
Dataset Date: Mar 11, 2002 02:42 pm
Wind File: C:\CAP88PC2\WNDFILES\NEWFREDB.WND

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	300	RN-222	3.4E-04	0.0E+00	0.0E+00	0.0E+00
N	300	AC-227	6.1E-13	1.1E-16	5.8E-16	6.9E-16
N	300	AC-228	2.7E-13	4.8E-17	2.5E-16	3.0E-16
N	300	BI-210	2.3E-12	4.2E-16	2.2E-15	2.6E-15
N	300	FR-223	7.9E-15	1.4E-18	7.2E-18	8.6E-18
N	300	PA-231	4.2E-13	7.5E-17	3.9E-16	4.7E-16
N	300	PA-234	1.3E-15	2.4E-19	1.2E-18	1.5E-18
N	300	PA-234M	3.5E-13	6.3E-17	2.1E-16	2.8E-16
N	300	PB-210	2.3E-12	4.2E-16	2.2E-15	2.6E-15
N	300	PO-210	2.3E-12	4.2E-16	2.2E-15	2.6E-15
N	300	RA-223	6.1E-13	1.1E-16	5.8E-16	6.9E-16
N	300	RA-224	2.4E-13	4.4E-17	2.3E-16	2.7E-16
N	300	RA-226	2.6E-12	4.6E-16	2.4E-15	2.9E-15
N	300	RA-228	2.7E-13	4.8E-17	2.5E-16	3.0E-16
N	300	TH-227	6.1E-14	1.1E-17	5.7E-17	6.8E-17
N	300	TH-228	4.9E-13	8.9E-17	4.6E-16	5.5E-16
N	300	TH-230	4.0E-11	7.2E-15	3.8E-14	4.5E-14
N	300	TH-231	7.7E-14	1.4E-17	7.3E-17	8.7E-17
N	300	TH-232	5.6E-13	1.0E-16	5.2E-16	6.2E-16
N	300	TH-234	1.2E-12	2.1E-16	1.1E-15	1.3E-15
N	300	U-234	1.1E-12	2.1E-16	1.1E-15	1.3E-15
N	300	U-235	7.7E-14	1.4E-17	7.3E-17	8.7E-17
N	300	U-236	7.7E-14	1.4E-17	7.3E-17	8.7E-17
N	300	U-238	1.2E-12	2.1E-16	1.1E-15	1.3E-15
N	500	RN-222	3.5E-04	0.0E+00	0.0E+00	0.0E+00
N	500	AC-227	6.3E-13	1.1E-16	3.5E-16	4.6E-16
N	500	AC-228	2.8E-13	5.0E-17	1.5E-16	2.0E-16
N	500	BI-210	2.4E-12	4.3E-16	1.3E-15	1.7E-15
N	500	FR-223	7.7E-15	1.4E-18	4.0E-18	5.4E-18
N	500	PA-231	4.3E-13	7.7E-17	2.3E-16	3.1E-16
N	500	PA-234	1.4E-15	2.4E-19	7.4E-19	9.8E-19
N	500	PA-234M	1.9E-13	3.4E-17	6.8E-17	1.0E-16
N	500	PB-210	2.4E-12	4.3E-16	1.3E-15	1.7E-15
N	500	PO-210	2.4E-12	4.3E-16	1.3E-15	1.7E-15
N	500	RA-223	6.3E-13	1.1E-16	3.5E-16	4.6E-16
N	500	RA-224	2.5E-13	4.5E-17	1.4E-16	1.8E-16
N	500	RA-226	2.6E-12	4.8E-16	1.4E-15	1.9E-15
N	500	RA-228	2.8E-13	5.0E-17	1.5E-16	2.0E-16
N	500	TH-227	6.3E-14	1.1E-17	3.4E-17	4.6E-17
N	500	TH-228	5.1E-13	9.2E-17	2.8E-16	3.7E-16
N	500	TH-230	4.1E-11	7.4E-15	2.2E-14	3.0E-14
N	500	TH-231	8.0E-14	1.4E-17	4.3E-17	5.8E-17
N	500	TH-232	5.8E-13	1.0E-16	3.1E-16	4.2E-16
N	500	TH-234	1.2E-12	2.2E-16	6.6E-16	8.8E-16
N	500	U-234	1.2E-12	2.1E-16	6.5E-16	8.6E-16
N	500	U-235	8.0E-14	1.4E-17	4.4E-17	5.8E-17
N	500	U-236	8.0E-14	1.4E-17	4.4E-17	5.8E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	500	U-238	1.2E-12	2.2E-16	6.6E-16	8.8E-16
N	700	RN-222	4.3E-04	0.0E+00	0.0E+00	0.0E+00
N	700	AC-227	7.8E-13	1.4E-16	2.5E-16	3.9E-16
N	700	AC-228	3.4E-13	6.1E-17	1.1E-16	1.7E-16
N	700	BI-210	2.9E-12	5.3E-16	9.3E-16	1.5E-15
N	700	FR-223	8.9E-15	1.6E-18	2.6E-18	4.2E-18
N	700	PA-231	5.3E-13	9.5E-17	1.7E-16	2.6E-16
N	700	PA-234	1.7E-15	3.0E-19	5.2E-19	8.2E-19
N	700	PA-234M	1.3E-13	2.4E-17	2.9E-17	5.3E-17
N	700	PB-210	2.9E-12	5.3E-16	9.3E-16	1.5E-15
N	700	PO-210	2.9E-12	5.3E-16	9.3E-16	1.5E-15
N	700	RA-223	7.8E-13	1.4E-16	2.5E-16	3.9E-16
N	700	RA-224	3.1E-13	5.6E-17	9.8E-17	1.5E-16
N	700	RA-226	3.3E-12	5.9E-16	1.0E-15	1.6E-15
N	700	RA-228	3.4E-13	6.1E-17	1.1E-16	1.7E-16
N	700	TH-227	7.7E-14	1.4E-17	2.4E-17	3.8E-17
N	700	TH-228	6.3E-13	1.1E-16	2.0E-16	3.1E-16
N	700	TH-230	5.1E-11	9.1E-15	1.6E-14	2.5E-14
N	700	TH-231	9.8E-14	1.8E-17	3.1E-17	4.9E-17
N	700	TH-232	7.1E-13	1.3E-16	2.2E-16	3.5E-16
N	700	TH-234	1.5E-12	2.7E-16	4.7E-16	7.4E-16
N	700	U-234	1.5E-12	2.6E-16	4.6E-16	7.2E-16
N	700	U-235	9.8E-14	1.8E-17	3.1E-17	4.9E-17
N	700	U-236	9.8E-14	1.8E-17	3.1E-17	4.9E-17
N	700	U-238	1.5E-12	2.7E-16	4.7E-16	7.4E-16
N	1000	RN-222	4.9E-04	0.0E+00	0.0E+00	0.0E+00
N	1000	AC-227	8.8E-13	1.6E-16	1.7E-16	3.3E-16
N	1000	AC-228	3.8E-13	6.8E-17	7.4E-17	1.4E-16
N	1000	BI-210	3.3E-12	5.9E-16	6.5E-16	1.2E-15
N	1000	FR-223	9.0E-15	1.6E-18	1.6E-18	3.3E-18
N	1000	PA-231	5.9E-13	1.1E-16	1.2E-16	2.2E-16
N	1000	PA-234	1.9E-15	3.3E-19	3.6E-19	7.0E-19
N	1000	PA-234M	7.6E-14	1.4E-17	1.1E-17	2.4E-17
N	1000	PB-210	3.3E-12	5.9E-16	6.5E-16	1.2E-15
N	1000	PO-210	3.3E-12	5.9E-16	6.5E-16	1.2E-15
N	1000	RA-223	8.8E-13	1.6E-16	1.7E-16	3.3E-16
N	1000	RA-224	3.5E-13	6.3E-17	6.8E-17	1.3E-16
N	1000	RA-226	3.7E-12	6.6E-16	7.2E-16	1.4E-15
N	1000	RA-228	3.8E-13	6.9E-17	7.5E-17	1.4E-16
N	1000	TH-227	8.7E-14	1.6E-17	1.7E-17	3.3E-17
N	1000	TH-228	7.1E-13	1.3E-16	1.4E-16	2.7E-16
N	1000	TH-230	5.7E-11	1.0E-14	1.1E-14	2.1E-14
N	1000	TH-231	1.1E-13	2.0E-17	2.2E-17	4.1E-17
N	1000	TH-232	8.0E-13	1.4E-16	1.6E-16	3.0E-16
N	1000	TH-234	1.7E-12	3.0E-16	3.3E-16	6.3E-16
N	1000	U-234	1.6E-12	3.0E-16	3.2E-16	6.2E-16
N	1000	U-235	1.1E-13	2.0E-17	2.2E-17	4.2E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	1000	U-236	1.1E-13	2.0E-17	2.2E-17	4.2E-17
N	1000	U-238	1.7E-12	3.0E-16	3.3E-16	6.3E-16
N	1300	RN-222	4.4E-04	0.0E+00	0.0E+00	0.0E+00
N	1300	AC-227	7.8E-13	1.4E-16	1.3E-16	2.7E-16
N	1300	AC-228	3.3E-13	6.0E-17	5.6E-17	1.2E-16
N	1300	BI-210	2.9E-12	5.3E-16	4.9E-16	1.0E-15
N	1300	FR-223	7.3E-15	1.3E-18	1.1E-18	2.4E-18
N	1300	PA-231	5.3E-13	9.5E-17	8.9E-17	1.8E-16
N	1300	PA-234	1.6E-15	3.0E-19	2.8E-19	5.7E-19
N	1300	PA-234M	3.8E-14	6.8E-18	4.6E-18	1.1E-17
N	1300	PB-210	2.9E-12	5.3E-16	4.9E-16	1.0E-15
N	1300	PO-210	2.9E-12	5.3E-16	4.9E-16	1.0E-15
N	1300	RA-223	7.8E-13	1.4E-16	1.3E-16	2.7E-16
N	1300	RA-224	3.1E-13	5.6E-17	5.2E-17	1.1E-16
N	1300	RA-226	3.3E-12	5.9E-16	5.5E-16	1.1E-15
N	1300	RA-228	3.4E-13	6.2E-17	5.8E-17	1.2E-16
N	1300	TH-227	7.8E-14	1.4E-17	1.3E-17	2.7E-17
N	1300	TH-228	6.3E-13	1.1E-16	1.1E-16	2.2E-16
N	1300	TH-230	5.1E-11	9.1E-15	8.6E-15	1.8E-14
N	1300	TH-231	9.8E-14	1.8E-17	1.6E-17	3.4E-17
N	1300	TH-232	7.1E-13	1.3E-16	1.2E-16	2.5E-16
N	1300	TH-234	1.5E-12	2.7E-16	2.5E-16	5.2E-16
N	1300	U-234	1.5E-12	2.6E-16	2.5E-16	5.1E-16
N	1300	U-235	9.9E-14	1.8E-17	1.7E-17	3.4E-17
N	1300	U-236	9.9E-14	1.8E-17	1.7E-17	3.4E-17
N	1300	U-238	1.5E-12	2.7E-16	2.5E-16	5.2E-16
N	1500	RN-222	4.0E-04	0.0E+00	0.0E+00	0.0E+00
N	1500	AC-227	7.1E-13	1.3E-16	1.1E-16	2.4E-16
N	1500	AC-228	3.0E-13	5.5E-17	4.8E-17	1.0E-16
N	1500	BI-210	2.7E-12	4.8E-16	4.3E-16	9.1E-16
N	1500	FR-223	6.3E-15	1.1E-18	9.1E-19	2.0E-18
N	1500	PA-231	4.8E-13	8.7E-17	7.7E-17	1.6E-16
N	1500	PA-234	1.5E-15	2.7E-19	2.4E-19	5.1E-19
N	1500	PA-234M	2.4E-14	4.3E-18	2.7E-18	7.0E-18
N	1500	PB-210	2.7E-12	4.8E-16	4.3E-16	9.1E-16
N	1500	PO-210	2.7E-12	4.8E-16	4.3E-16	9.1E-16
N	1500	RA-223	7.1E-13	1.3E-16	1.1E-16	2.4E-16
N	1500	RA-224	2.8E-13	5.1E-17	4.5E-17	9.6E-17
N	1500	RA-226	3.0E-12	5.3E-16	4.7E-16	1.0E-15
N	1500	RA-228	3.1E-13	5.6E-17	5.0E-17	1.1E-16
N	1500	TH-227	7.1E-14	1.3E-17	1.1E-17	2.4E-17
N	1500	TH-228	5.7E-13	1.0E-16	9.2E-17	1.9E-16
N	1500	TH-230	4.6E-11	8.3E-15	7.4E-15	1.6E-14
N	1500	TH-231	8.9E-14	1.6E-17	1.4E-17	3.0E-17
N	1500	TH-232	6.5E-13	1.2E-16	1.0E-16	2.2E-16
N	1500	TH-234	1.4E-12	2.5E-16	2.2E-16	4.6E-16
N	1500	U-234	1.3E-12	2.4E-16	2.1E-16	4.5E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	1500	U-235	9.0E-14	1.6E-17	1.4E-17	3.1E-17
N	1500	U-236	9.0E-14	1.6E-17	1.4E-17	3.1E-17
N	1500	U-238	1.4E-12	2.5E-16	2.2E-16	4.6E-16
N	1700	RN-222	3.6E-04	0.0E+00	0.0E+00	0.0E+00
N	1700	AC-227	6.5E-13	1.2E-16	1.0E-16	2.2E-16
N	1700	AC-228	2.7E-13	4.9E-17	4.2E-17	9.2E-17
N	1700	BI-210	2.4E-12	4.4E-16	3.8E-16	8.1E-16
N	1700	FR-223	5.4E-15	9.6E-19	7.5E-19	1.7E-18
N	1700	PA-231	4.4E-13	7.9E-17	6.8E-17	1.5E-16
N	1700	PA-234	1.4E-15	2.4E-19	2.1E-19	4.5E-19
N	1700	PA-234M	1.5E-14	2.7E-18	1.7E-18	4.4E-18
N	1700	PB-210	2.4E-12	4.4E-16	3.8E-16	8.1E-16
N	1700	PO-210	2.4E-12	4.4E-16	3.8E-16	8.1E-16
N	1700	RA-223	6.5E-13	1.2E-16	1.0E-16	2.2E-16
N	1700	RA-224	2.6E-13	4.6E-17	4.0E-17	8.6E-17
N	1700	RA-226	2.7E-12	4.9E-16	4.2E-16	9.0E-16
N	1700	RA-228	2.8E-13	5.1E-17	4.4E-17	9.5E-17
N	1700	TH-227	6.4E-14	1.2E-17	9.9E-18	2.1E-17
N	1700	TH-228	5.2E-13	9.4E-17	8.1E-17	1.7E-16
N	1700	TH-230	4.2E-11	7.6E-15	6.5E-15	1.4E-14
N	1700	TH-231	8.1E-14	1.5E-17	1.2E-17	2.7E-17
N	1700	TH-232	5.9E-13	1.1E-16	9.1E-17	2.0E-16
N	1700	TH-234	1.2E-12	2.2E-16	1.9E-16	4.2E-16
N	1700	U-234	1.2E-12	2.2E-16	1.9E-16	4.0E-16
N	1700	U-235	8.2E-14	1.5E-17	1.3E-17	2.7E-17
N	1700	U-236	8.2E-14	1.5E-17	1.3E-17	2.7E-17
N	1700	U-238	1.2E-12	2.2E-16	1.9E-16	4.2E-16
N	2000	RN-222	3.2E-04	0.0E+00	0.0E+00	0.0E+00
N	2000	AC-227	5.6E-13	1.0E-16	8.4E-17	1.9E-16
N	2000	AC-228	2.4E-13	4.3E-17	3.5E-17	7.8E-17
N	2000	BI-210	2.1E-12	3.8E-16	3.2E-16	7.0E-16
N	2000	FR-223	4.3E-15	7.7E-19	5.7E-19	1.3E-18
N	2000	PA-231	3.8E-13	6.9E-17	5.7E-17	1.3E-16
N	2000	PA-234	1.2E-15	2.1E-19	1.7E-19	3.9E-19
N	2000	PA-234M	7.8E-15	1.4E-18	8.6E-19	2.3E-18
N	2000	PB-210	2.1E-12	3.8E-16	3.2E-16	7.0E-16
N	2000	PO-210	2.1E-12	3.8E-16	3.2E-16	7.0E-16
N	2000	RA-223	5.6E-13	1.0E-16	8.4E-17	1.9E-16
N	2000	RA-224	2.2E-13	4.0E-17	3.4E-17	7.4E-17
N	2000	RA-226	2.3E-12	4.2E-16	3.5E-16	7.8E-16
N	2000	RA-228	2.5E-13	4.4E-17	3.7E-17	8.1E-17
N	2000	TH-227	5.6E-14	1.0E-17	8.4E-18	1.8E-17
N	2000	TH-228	4.5E-13	8.2E-17	6.8E-17	1.5E-16
N	2000	TH-230	3.7E-11	6.6E-15	5.5E-15	1.2E-14
N	2000	TH-231	7.0E-14	1.3E-17	1.1E-17	2.3E-17
N	2000	TH-232	5.1E-13	9.2E-17	7.7E-17	1.7E-16
N	2000	TH-234	1.1E-12	1.9E-16	1.6E-16	3.6E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	2000	U-234	1.1E-12	1.9E-16	1.6E-16	3.5E-16
N	2000	U-235	7.1E-14	1.3E-17	1.1E-17	2.3E-17
N	2000	U-236	7.1E-14	1.3E-17	1.1E-17	2.3E-17
N	2000	U-238	1.1E-12	1.9E-16	1.6E-16	3.6E-16
N	2300	RN-222	2.8E-04	0.0E+00	0.0E+00	0.0E+00
N	2300	AC-227	5.0E-13	8.9E-17	7.3E-17	1.6E-16
N	2300	AC-228	2.1E-13	3.7E-17	3.0E-17	6.8E-17
N	2300	BI-210	1.9E-12	3.4E-16	2.7E-16	6.1E-16
N	2300	FR-223	3.4E-15	6.1E-19	4.5E-19	1.1E-18
N	2300	PA-231	3.4E-13	6.0E-17	5.0E-17	1.1E-16
N	2300	PA-234	1.0E-15	1.8E-19	1.5E-19	3.3E-19
N	2300	PA-234M	4.1E-15	7.3E-19	4.5E-19	1.2E-18
N	2300	PB-210	1.9E-12	3.4E-16	2.7E-16	6.1E-16
N	2300	PO-210	1.9E-12	3.4E-16	2.7E-16	6.1E-16
N	2300	RA-223	5.0E-13	8.9E-17	7.3E-17	1.6E-16
N	2300	RA-224	2.0E-13	3.5E-17	2.9E-17	6.4E-17
N	2300	RA-226	2.1E-12	3.7E-16	3.1E-16	6.8E-16
N	2300	RA-228	2.2E-13	3.9E-17	3.2E-17	7.1E-17
N	2300	TH-227	4.9E-14	8.9E-18	7.3E-18	1.6E-17
N	2300	TH-228	4.0E-13	7.2E-17	5.9E-17	1.3E-16
N	2300	TH-230	3.2E-11	5.8E-15	4.8E-15	1.1E-14
N	2300	TH-231	6.2E-14	1.1E-17	9.1E-18	2.0E-17
N	2300	TH-232	4.5E-13	8.1E-17	6.6E-17	1.5E-16
N	2300	TH-234	9.5E-13	1.7E-16	1.4E-16	3.1E-16
N	2300	U-234	9.3E-13	1.7E-16	1.4E-16	3.0E-16
N	2300	U-235	6.3E-14	1.1E-17	9.2E-18	2.0E-17
N	2300	U-236	6.3E-14	1.1E-17	9.2E-18	2.0E-17
N	2300	U-238	9.5E-13	1.7E-16	1.4E-16	3.1E-16
N	2400	RN-222	2.7E-04	0.0E+00	0.0E+00	0.0E+00
N	2400	AC-227	4.8E-13	8.6E-17	7.0E-17	1.6E-16
N	2400	AC-228	2.0E-13	3.6E-17	2.9E-17	6.5E-17
N	2400	BI-210	1.8E-12	3.2E-16	2.6E-16	5.9E-16
N	2400	FR-223	3.2E-15	5.7E-19	4.2E-19	9.9E-19
N	2400	PA-231	3.2E-13	5.8E-17	4.7E-17	1.1E-16
N	2400	PA-234	9.8E-16	1.8E-19	1.4E-19	3.2E-19
N	2400	PA-234M	3.3E-15	5.9E-19	3.6E-19	9.6E-19
N	2400	PB-210	1.8E-12	3.2E-16	2.6E-16	5.9E-16
N	2400	PO-210	1.8E-12	3.2E-16	2.6E-16	5.9E-16
N	2400	RA-223	4.8E-13	8.6E-17	7.0E-17	1.6E-16
N	2400	RA-224	1.9E-13	3.4E-17	2.8E-17	6.2E-17
N	2400	RA-226	2.0E-12	3.6E-16	2.9E-16	6.5E-16
N	2400	RA-228	2.1E-13	3.8E-17	3.1E-17	6.8E-17
N	2400	TH-227	4.7E-14	8.5E-18	6.9E-18	1.5E-17
N	2400	TH-228	3.8E-13	6.9E-17	5.6E-17	1.3E-16
N	2400	TH-230	3.1E-11	5.6E-15	4.6E-15	1.0E-14
N	2400	TH-231	5.9E-14	1.1E-17	8.7E-18	1.9E-17
N	2400	TH-232	4.3E-13	7.8E-17	6.4E-17	1.4E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	2400	TH-234	9.1E-13	1.6E-16	1.3E-16	3.0E-16
N	2400	U-234	8.9E-13	1.6E-16	1.3E-16	2.9E-16
N	2400	U-235	6.0E-14	1.1E-17	8.8E-18	2.0E-17
N	2400	U-236	6.0E-14	1.1E-17	8.8E-18	2.0E-17
N	2400	U-238	9.1E-13	1.6E-16	1.3E-16	3.0E-16
N	2600	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
N	2600	AC-227	4.4E-13	7.9E-17	6.4E-17	1.4E-16
N	2600	AC-228	1.8E-13	3.3E-17	2.7E-17	6.0E-17
N	2600	BI-210	1.7E-12	3.0E-16	2.4E-16	5.4E-16
N	2600	FR-223	2.8E-15	5.0E-19	3.6E-19	8.6E-19
N	2600	PA-231	3.0E-13	5.4E-17	4.4E-17	9.7E-17
N	2600	PA-234	9.0E-16	1.6E-19	1.3E-19	2.9E-19
N	2600	PA-234M	2.2E-15	3.9E-19	2.4E-19	6.3E-19
N	2600	PB-210	1.7E-12	3.0E-16	2.4E-16	5.4E-16
N	2600	PO-210	1.7E-12	3.0E-16	2.4E-16	5.4E-16
N	2600	RA-223	4.4E-13	7.9E-17	6.4E-17	1.4E-16
N	2600	RA-224	1.7E-13	3.1E-17	2.6E-17	5.7E-17
N	2600	RA-226	1.8E-12	3.3E-16	2.7E-16	6.0E-16
N	2600	RA-228	1.9E-13	3.5E-17	2.8E-17	6.3E-17
N	2600	TH-227	4.4E-14	7.9E-18	6.4E-18	1.4E-17
N	2600	TH-228	3.6E-13	6.4E-17	5.2E-17	1.2E-16
N	2600	TH-230	2.9E-11	5.2E-15	4.2E-15	9.4E-15
N	2600	TH-231	5.5E-14	9.9E-18	8.0E-18	1.8E-17
N	2600	TH-232	4.0E-13	7.2E-17	5.9E-17	1.3E-16
N	2600	TH-234	8.5E-13	1.5E-16	1.2E-16	2.8E-16
N	2600	U-234	8.3E-13	1.5E-16	1.2E-16	2.7E-16
N	2600	U-235	5.6E-14	1.0E-17	8.1E-18	1.8E-17
N	2600	U-236	5.6E-14	1.0E-17	8.1E-18	1.8E-17
N	2600	U-238	8.5E-13	1.5E-16	1.2E-16	2.8E-16
N	2700	RN-222	2.4E-04	0.0E+00	0.0E+00	0.0E+00
N	2700	AC-227	4.2E-13	7.6E-17	6.2E-17	1.4E-16
N	2700	AC-228	1.8E-13	3.2E-17	2.6E-17	5.7E-17
N	2700	BI-210	1.6E-12	2.9E-16	2.3E-16	5.2E-16
N	2700	FR-223	2.6E-15	4.6E-19	3.4E-19	8.0E-19
N	2700	PA-231	2.9E-13	5.2E-17	4.2E-17	9.4E-17
N	2700	PA-234	8.7E-16	1.6E-19	1.3E-19	2.8E-19
N	2700	PA-234M	1.7E-15	3.1E-19	1.9E-19	5.1E-19
N	2700	PB-210	1.6E-12	2.9E-16	2.3E-16	5.2E-16
N	2700	PO-210	1.6E-12	2.9E-16	2.3E-16	5.2E-16
N	2700	RA-223	4.2E-13	7.6E-17	6.2E-17	1.4E-16
N	2700	RA-224	1.7E-13	3.0E-17	2.5E-17	5.5E-17
N	2700	RA-226	1.8E-12	3.2E-16	2.6E-16	5.8E-16
N	2700	RA-228	1.9E-13	3.4E-17	2.7E-17	6.1E-17
N	2700	TH-227	4.2E-14	7.6E-18	6.1E-18	1.4E-17
N	2700	TH-228	3.4E-13	6.2E-17	5.0E-17	1.1E-16
N	2700	TH-230	2.8E-11	5.0E-15	4.0E-15	9.0E-15
N	2700	TH-231	5.3E-14	9.5E-18	7.7E-18	1.7E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
N	2700	TH-232	3.9E-13	7.0E-17	5.6E-17	1.3E-16
N	2700	TH-234	8.2E-13	1.5E-16	1.2E-16	2.7E-16
N	2700	U-234	8.0E-13	1.4E-16	1.2E-16	2.6E-16
N	2700	U-235	5.4E-14	9.7E-18	7.8E-18	1.7E-17
N	2700	U-236	5.4E-14	9.7E-18	7.8E-18	1.7E-17
N	2700	U-238	8.2E-13	1.5E-16	1.2E-16	2.7E-16
N	3500	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
N	3500	AC-227	3.2E-13	5.8E-17	4.7E-17	1.1E-16
N	3500	AC-228	1.3E-13	2.4E-17	1.9E-17	4.3E-17
N	3500	BI-210	1.2E-12	2.2E-16	1.8E-16	4.0E-16
N	3500	FR-223	1.5E-15	2.8E-19	2.1E-19	4.8E-19
N	3500	PA-231	2.2E-13	3.9E-17	3.2E-17	7.1E-17
N	3500	PA-234	6.5E-16	1.2E-19	9.4E-20	2.1E-19
N	3500	PA-234M	3.4E-16	6.1E-20	3.9E-20	1.0E-19
N	3500	PB-210	1.2E-12	2.2E-16	1.8E-16	4.0E-16
N	3500	PO-210	1.2E-12	2.2E-16	1.8E-16	4.0E-16
N	3500	RA-223	3.2E-13	5.8E-17	4.7E-17	1.1E-16
N	3500	RA-224	1.3E-13	2.3E-17	1.9E-17	4.2E-17
N	3500	RA-226	1.4E-12	2.4E-16	2.0E-16	4.4E-16
N	3500	RA-228	1.4E-13	2.6E-17	2.1E-17	4.6E-17
N	3500	TH-227	3.2E-14	5.8E-18	4.7E-18	1.0E-17
N	3500	TH-228	2.6E-13	4.7E-17	3.8E-17	8.5E-17
N	3500	TH-230	2.1E-11	3.8E-15	3.1E-15	6.9E-15
N	3500	TH-231	4.0E-14	7.2E-18	5.8E-18	1.3E-17
N	3500	TH-232	2.9E-13	5.3E-17	4.3E-17	9.6E-17
N	3500	TH-234	6.2E-13	1.1E-16	9.0E-17	2.0E-16
N	3500	U-234	6.1E-13	1.1E-16	8.8E-17	2.0E-16
N	3500	U-235	4.1E-14	7.4E-18	5.9E-18	1.3E-17
N	3500	U-236	4.1E-14	7.4E-18	5.9E-18	1.3E-17
N	3500	U-238	6.2E-13	1.1E-16	9.0E-17	2.0E-16
NNW	300	RN-222	1.7E-04	0.0E+00	0.0E+00	0.0E+00
NNW	300	AC-227	3.0E-13	5.4E-17	4.0E-16	4.6E-16
NNW	300	AC-228	1.3E-13	2.4E-17	1.8E-16	2.0E-16
NNW	300	BI-210	1.1E-12	2.0E-16	1.5E-15	1.7E-15
NNW	300	FR-223	3.8E-15	6.8E-19	4.9E-18	5.6E-18
NNW	300	PA-231	2.1E-13	3.7E-17	2.7E-16	3.1E-16
NNW	300	PA-234	6.5E-16	1.2E-19	8.6E-19	9.8E-19
NNW	300	PA-234M	1.1E-13	2.0E-17	1.0E-16	1.2E-16
NNW	300	PB-210	1.1E-12	2.0E-16	1.5E-15	1.7E-15
NNW	300	PO-210	1.1E-12	2.0E-16	1.5E-15	1.7E-15
NNW	300	RA-223	3.0E-13	5.4E-17	4.0E-16	4.6E-16
NNW	300	RA-224	1.2E-13	2.2E-17	1.6E-16	1.8E-16
NNW	300	RA-226	1.3E-12	2.3E-16	1.7E-15	1.9E-15
NNW	300	RA-228	1.3E-13	2.4E-17	1.8E-16	2.0E-16
NNW	300	TH-227	3.0E-14	5.4E-18	4.0E-17	4.5E-17
NNW	300	TH-228	2.4E-13	4.4E-17	3.2E-16	3.7E-16
NNW	300	TH-230	2.0E-11	3.5E-15	2.6E-14	3.0E-14

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	300	TH-231	3.8E-14	6.9E-18	5.1E-17	5.8E-17
NNW	300	TH-232	2.8E-13	5.0E-17	3.7E-16	4.2E-16
NNW	300	TH-234	5.8E-13	1.0E-16	7.7E-16	8.8E-16
NNW	300	U-234	5.7E-13	1.0E-16	7.5E-16	8.6E-16
NNW	300	U-235	3.8E-14	6.9E-18	5.1E-17	5.8E-17
NNW	300	U-236	3.8E-14	6.9E-18	5.1E-17	5.8E-17
NNW	300	U-238	5.8E-13	1.0E-16	7.7E-16	8.8E-16
NNW	500	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
NNW	500	AC-227	3.5E-13	6.3E-17	2.4E-16	3.0E-16
NNW	500	AC-228	1.5E-13	2.7E-17	1.0E-16	1.3E-16
NNW	500	BI-210	1.3E-12	2.4E-16	9.1E-16	1.1E-15
NNW	500	FR-223	4.1E-15	7.4E-19	2.7E-18	3.4E-18
NNW	500	PA-231	2.4E-13	4.3E-17	1.6E-16	2.1E-16
NNW	500	PA-234	7.5E-16	1.3E-19	5.1E-19	6.5E-19
NNW	500	PA-234M	7.5E-14	1.3E-17	3.2E-17	4.5E-17
NNW	500	PB-210	1.3E-12	2.4E-16	9.1E-16	1.1E-15
NNW	500	PO-210	1.3E-12	2.4E-16	9.1E-16	1.1E-15
NNW	500	RA-223	3.5E-13	6.3E-17	2.4E-16	3.0E-16
NNW	500	RA-224	1.4E-13	2.5E-17	9.6E-17	1.2E-16
NNW	500	RA-226	1.5E-12	2.6E-16	1.0E-15	1.3E-15
NNW	500	RA-228	1.5E-13	2.8E-17	1.1E-16	1.3E-16
NNW	500	TH-227	3.5E-14	6.2E-18	2.4E-17	3.0E-17
NNW	500	TH-228	2.8E-13	5.1E-17	1.9E-16	2.5E-16
NNW	500	TH-230	2.3E-11	4.1E-15	1.6E-14	2.0E-14
NNW	500	TH-231	4.4E-14	7.9E-18	3.0E-17	3.8E-17
NNW	500	TH-232	3.2E-13	5.7E-17	2.2E-16	2.8E-16
NNW	500	TH-234	6.7E-13	1.2E-16	4.6E-16	5.8E-16
NNW	500	U-234	6.5E-13	1.2E-16	4.5E-16	5.7E-16
NNW	500	U-235	4.4E-14	7.9E-18	3.0E-17	3.8E-17
NNW	500	U-236	4.4E-14	7.9E-18	3.0E-17	3.8E-17
NNW	500	U-238	6.7E-13	1.2E-16	4.6E-16	5.8E-16
NNW	700	RN-222	2.6E-04	0.0E+00	0.0E+00	0.0E+00
NNW	700	AC-227	4.7E-13	8.4E-17	1.7E-16	2.6E-16
NNW	700	AC-228	2.0E-13	3.6E-17	7.4E-17	1.1E-16
NNW	700	BI-210	1.8E-12	3.2E-16	6.5E-16	9.6E-16
NNW	700	FR-223	5.0E-15	9.1E-19	1.7E-18	2.6E-18
NNW	700	PA-231	3.2E-13	5.7E-17	1.2E-16	1.7E-16
NNW	700	PA-234	9.9E-16	1.8E-19	3.6E-19	5.4E-19
NNW	700	PA-234M	6.1E-14	1.1E-17	1.5E-17	2.6E-17
NNW	700	PB-210	1.8E-12	3.2E-16	6.5E-16	9.6E-16
NNW	700	PO-210	1.8E-12	3.2E-16	6.5E-16	9.6E-16
NNW	700	RA-223	4.7E-13	8.4E-17	1.7E-16	2.6E-16
NNW	700	RA-224	1.8E-13	3.3E-17	6.8E-17	1.0E-16
NNW	700	RA-226	1.9E-12	3.5E-16	7.2E-16	1.1E-15
NNW	700	RA-228	2.0E-13	3.7E-17	7.5E-17	1.1E-16
NNW	700	TH-227	4.6E-14	8.3E-18	1.7E-17	2.5E-17
NNW	700	TH-228	3.8E-13	6.8E-17	1.4E-16	2.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	700	TH-230	3.0E-11	5.5E-15	1.1E-14	1.7E-14
NNW	700	TH-231	5.9E-14	1.1E-17	2.2E-17	3.2E-17
NNW	700	TH-232	4.2E-13	7.6E-17	1.6E-16	2.3E-16
NNW	700	TH-234	9.0E-13	1.6E-16	3.3E-16	4.9E-16
NNW	700	U-234	8.7E-13	1.6E-16	3.2E-16	4.8E-16
NNW	700	U-235	5.9E-14	1.1E-17	2.2E-17	3.2E-17
NNW	700	U-236	5.9E-14	1.1E-17	2.2E-17	3.2E-17
NNW	700	U-238	9.0E-13	1.6E-16	3.3E-16	4.9E-16
NNW	1000	RN-222	3.1E-04	0.0E+00	0.0E+00	0.0E+00
NNW	1000	AC-227	5.5E-13	1.0E-16	1.2E-16	2.2E-16
NNW	1000	AC-228	2.4E-13	4.3E-17	5.1E-17	9.4E-17
NNW	1000	BI-210	2.1E-12	3.8E-16	4.5E-16	8.3E-16
NNW	1000	FR-223	5.3E-15	9.6E-19	1.1E-18	2.0E-18
NNW	1000	PA-231	3.8E-13	6.8E-17	8.1E-17	1.5E-16
NNW	1000	PA-234	1.2E-15	2.1E-19	2.5E-19	4.6E-19
NNW	1000	PA-234M	4.0E-14	7.2E-18	5.8E-18	1.3E-17
NNW	1000	PB-210	2.1E-12	3.8E-16	4.5E-16	8.3E-16
NNW	1000	PO-210	2.1E-12	3.8E-16	4.5E-16	8.3E-16
NNW	1000	RA-223	5.5E-13	1.0E-16	1.2E-16	2.2E-16
NNW	1000	RA-224	2.2E-13	4.0E-17	4.7E-17	8.7E-17
NNW	1000	RA-226	2.3E-12	4.2E-16	5.0E-16	9.2E-16
NNW	1000	RA-228	2.4E-13	4.4E-17	5.2E-17	9.6E-17
NNW	1000	TH-227	5.5E-14	9.9E-18	1.2E-17	2.2E-17
NNW	1000	TH-228	4.5E-13	8.1E-17	9.7E-17	1.8E-16
NNW	1000	TH-230	3.6E-11	6.5E-15	7.8E-15	1.4E-14
NNW	1000	TH-231	7.0E-14	1.3E-17	1.5E-17	2.8E-17
NNW	1000	TH-232	5.0E-13	9.1E-17	1.1E-16	2.0E-16
NNW	1000	TH-234	1.1E-12	1.9E-16	2.3E-16	4.2E-16
NNW	1000	U-234	1.0E-12	1.9E-16	2.2E-16	4.1E-16
NNW	1000	U-235	7.0E-14	1.3E-17	1.5E-17	2.8E-17
NNW	1000	U-236	7.0E-14	1.3E-17	1.5E-17	2.8E-17
NNW	1000	U-238	1.1E-12	1.9E-16	2.3E-16	4.2E-16
NNW	1300	RN-222	2.8E-04	0.0E+00	0.0E+00	0.0E+00
NNW	1300	AC-227	5.0E-13	9.1E-17	9.2E-17	1.8E-16
NNW	1300	AC-228	2.2E-13	3.9E-17	3.9E-17	7.8E-17
NNW	1300	BI-210	1.9E-12	3.4E-16	3.4E-16	6.9E-16
NNW	1300	FR-223	4.3E-15	7.7E-19	7.1E-19	1.5E-18
NNW	1300	PA-231	3.4E-13	6.2E-17	6.2E-17	1.2E-16
NNW	1300	PA-234	1.1E-15	1.9E-19	1.9E-19	3.8E-19
NNW	1300	PA-234M	2.1E-14	3.8E-18	2.6E-18	6.5E-18
NNW	1300	PB-210	1.9E-12	3.4E-16	3.4E-16	6.9E-16
NNW	1300	PO-210	1.9E-12	3.4E-16	3.4E-16	6.9E-16
NNW	1300	RA-223	5.0E-13	9.1E-17	9.2E-17	1.8E-16
NNW	1300	RA-224	2.0E-13	3.6E-17	3.6E-17	7.2E-17
NNW	1300	RA-226	2.1E-12	3.8E-16	3.8E-16	7.6E-16
NNW	1300	RA-228	2.2E-13	4.0E-17	4.0E-17	8.0E-17
NNW	1300	TH-227	5.0E-14	9.0E-18	9.1E-18	1.8E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	1300	TH-228	4.1E-13	7.3E-17	7.4E-17	1.5E-16
NNW	1300	TH-230	3.3E-11	5.9E-15	6.0E-15	1.2E-14
NNW	1300	TH-231	6.3E-14	1.1E-17	1.1E-17	2.3E-17
NNW	1300	TH-232	4.6E-13	8.3E-17	8.3E-17	1.7E-16
NNW	1300	TH-234	9.7E-13	1.7E-16	1.8E-16	3.5E-16
NNW	1300	U-234	9.5E-13	1.7E-16	1.7E-16	3.4E-16
NNW	1300	U-235	6.4E-14	1.1E-17	1.2E-17	2.3E-17
NNW	1300	U-236	6.4E-14	1.1E-17	1.2E-17	2.3E-17
NNW	1300	U-238	9.7E-13	1.7E-16	1.8E-16	3.5E-16
NNW	1500	RN-222	2.6E-04	0.0E+00	0.0E+00	0.0E+00
NNW	1500	AC-227	4.6E-13	8.4E-17	7.9E-17	1.6E-16
NNW	1500	AC-228	2.0E-13	3.5E-17	3.3E-17	6.9E-17
NNW	1500	BI-210	1.7E-12	3.1E-16	3.0E-16	6.1E-16
NNW	1500	FR-223	3.7E-15	6.6E-19	5.6E-19	1.2E-18
NNW	1500	PA-231	3.1E-13	5.7E-17	5.4E-17	1.1E-16
NNW	1500	PA-234	9.7E-16	1.7E-19	1.6E-19	3.4E-19
NNW	1500	PA-234M	1.4E-14	2.5E-18	1.6E-18	4.1E-18
NNW	1500	PB-210	1.7E-12	3.1E-16	3.0E-16	6.1E-16
NNW	1500	PO-210	1.7E-12	3.1E-16	3.0E-16	6.1E-16
NNW	1500	RA-223	4.6E-13	8.4E-17	7.9E-17	1.6E-16
NNW	1500	RA-224	1.8E-13	3.3E-17	3.1E-17	6.5E-17
NNW	1500	RA-226	1.9E-12	3.5E-16	3.3E-16	6.8E-16
NNW	1500	RA-228	2.0E-13	3.7E-17	3.5E-17	7.1E-17
NNW	1500	TH-227	4.6E-14	8.3E-18	7.9E-18	1.6E-17
NNW	1500	TH-228	3.7E-13	6.7E-17	6.4E-17	1.3E-16
NNW	1500	TH-230	3.0E-11	5.4E-15	5.1E-15	1.1E-14
NNW	1500	TH-231	5.8E-14	1.0E-17	9.9E-18	2.0E-17
NNW	1500	TH-232	4.2E-13	7.6E-17	7.2E-17	1.5E-16
NNW	1500	TH-234	8.9E-13	1.6E-16	1.5E-16	3.1E-16
NNW	1500	U-234	8.7E-13	1.6E-16	1.5E-16	3.0E-16
NNW	1500	U-235	5.9E-14	1.1E-17	1.0E-17	2.1E-17
NNW	1500	U-236	5.9E-14	1.1E-17	1.0E-17	2.1E-17
NNW	1500	U-238	8.9E-13	1.6E-16	1.5E-16	3.1E-16
NNW	1700	RN-222	2.4E-04	0.0E+00	0.0E+00	0.0E+00
NNW	1700	AC-227	4.2E-13	7.6E-17	7.0E-17	1.5E-16
NNW	1700	AC-228	1.8E-13	3.2E-17	2.9E-17	6.1E-17
NNW	1700	BI-210	1.6E-12	2.9E-16	2.6E-16	5.5E-16
NNW	1700	FR-223	3.1E-15	5.6E-19	4.5E-19	1.0E-18
NNW	1700	PA-231	2.9E-13	5.2E-17	4.7E-17	9.9E-17
NNW	1700	PA-234	8.8E-16	1.6E-19	1.4E-19	3.0E-19
NNW	1700	PA-234M	9.1E-15	1.6E-18	1.0E-18	2.6E-18
NNW	1700	PB-210	1.6E-12	2.9E-16	2.6E-16	5.5E-16
NNW	1700	PO-210	1.6E-12	2.9E-16	2.6E-16	5.5E-16
NNW	1700	RA-223	4.2E-13	7.6E-17	7.0E-17	1.5E-16
NNW	1700	RA-224	1.7E-13	3.0E-17	2.8E-17	5.8E-17
NNW	1700	RA-226	1.8E-12	3.2E-16	2.9E-16	6.1E-16
NNW	1700	RA-228	1.9E-13	3.3E-17	3.0E-17	6.4E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	1700	TH-227	4.2E-14	7.6E-18	6.9E-18	1.5E-17
NNW	1700	TH-228	3.4E-13	6.2E-17	5.6E-17	1.2E-16
NNW	1700	TH-230	2.8E-11	5.0E-15	4.5E-15	9.5E-15
NNW	1700	TH-231	5.3E-14	9.6E-18	8.7E-18	1.8E-17
NNW	1700	TH-232	3.9E-13	7.0E-17	6.3E-17	1.3E-16
NNW	1700	TH-234	8.2E-13	1.5E-16	1.3E-16	2.8E-16
NNW	1700	U-234	8.0E-13	1.4E-16	1.3E-16	2.7E-16
NNW	1700	U-235	5.4E-14	9.7E-18	8.8E-18	1.8E-17
NNW	1700	U-236	5.4E-14	9.7E-18	8.8E-18	1.8E-17
NNW	1700	U-238	8.2E-13	1.5E-16	1.3E-16	2.8E-16
NNW	2000	RN-222	2.1E-04	0.0E+00	0.0E+00	0.0E+00
NNW	2000	AC-227	3.7E-13	6.7E-17	5.9E-17	1.3E-16
NNW	2000	AC-228	1.6E-13	2.8E-17	2.4E-17	5.2E-17
NNW	2000	BI-210	1.4E-12	2.5E-16	2.2E-16	4.7E-16
NNW	2000	FR-223	2.4E-15	4.4E-19	3.4E-19	7.8E-19
NNW	2000	PA-231	2.5E-13	4.5E-17	4.0E-17	8.5E-17
NNW	2000	PA-234	7.7E-16	1.4E-19	1.2E-19	2.6E-19
NNW	2000	PA-234M	4.8E-15	8.6E-19	5.2E-19	1.4E-18
NNW	2000	PB-210	1.4E-12	2.5E-16	2.2E-16	4.7E-16
NNW	2000	PO-210	1.4E-12	2.5E-16	2.2E-16	4.7E-16
NNW	2000	RA-223	3.7E-13	6.7E-17	5.9E-17	1.3E-16
NNW	2000	RA-224	1.5E-13	2.7E-17	2.3E-17	5.0E-17
NNW	2000	RA-226	1.6E-12	2.8E-16	2.5E-16	5.3E-16
NNW	2000	RA-228	1.6E-13	2.9E-17	2.6E-17	5.5E-17
NNW	2000	TH-227	3.7E-14	6.7E-18	5.8E-18	1.3E-17
NNW	2000	TH-228	3.0E-13	5.4E-17	4.7E-17	1.0E-16
NNW	2000	TH-230	2.4E-11	4.4E-15	3.8E-15	8.2E-15
NNW	2000	TH-231	4.7E-14	8.4E-18	7.3E-18	1.6E-17
NNW	2000	TH-232	3.4E-13	6.1E-17	5.3E-17	1.1E-16
NNW	2000	TH-234	7.2E-13	1.3E-16	1.1E-16	2.4E-16
NNW	2000	U-234	7.0E-13	1.3E-16	1.1E-16	2.4E-16
NNW	2000	U-235	4.7E-14	8.5E-18	7.4E-18	1.6E-17
NNW	2000	U-236	4.7E-14	8.5E-18	7.4E-18	1.6E-17
NNW	2000	U-238	7.2E-13	1.3E-16	1.1E-16	2.4E-16
NNW	2300	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
NNW	2300	AC-227	3.3E-13	5.9E-17	5.1E-17	1.1E-16
NNW	2300	AC-228	1.4E-13	2.5E-17	2.1E-17	4.6E-17
NNW	2300	BI-210	1.2E-12	2.2E-16	1.9E-16	4.1E-16
NNW	2300	FR-223	1.9E-15	3.4E-19	2.6E-19	6.1E-19
NNW	2300	PA-231	2.2E-13	4.0E-17	3.4E-17	7.5E-17
NNW	2300	PA-234	6.8E-16	1.2E-19	1.0E-19	2.2E-19
NNW	2300	PA-234M	2.5E-15	4.5E-19	2.8E-19	7.3E-19
NNW	2300	PB-210	1.2E-12	2.2E-16	1.9E-16	4.1E-16
NNW	2300	PO-210	1.2E-12	2.2E-16	1.9E-16	4.1E-16
NNW	2300	RA-223	3.3E-13	5.9E-17	5.1E-17	1.1E-16
NNW	2300	RA-224	1.3E-13	2.4E-17	2.0E-17	4.4E-17
NNW	2300	RA-226	1.4E-12	2.5E-16	2.1E-16	4.6E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	2300	RA-228	1.4E-13	2.6E-17	2.2E-17	4.8E-17
NNW	2300	TH-227	3.3E-14	5.9E-18	5.0E-18	1.1E-17
NNW	2300	TH-228	2.7E-13	4.8E-17	4.1E-17	8.9E-17
NNW	2300	TH-230	2.1E-11	3.9E-15	3.3E-15	7.2E-15
NNW	2300	TH-231	4.1E-14	7.4E-18	6.3E-18	1.4E-17
NNW	2300	TH-232	3.0E-13	5.4E-17	4.6E-17	1.0E-16
NNW	2300	TH-234	6.3E-13	1.1E-16	9.8E-17	2.1E-16
NNW	2300	U-234	6.2E-13	1.1E-16	9.5E-17	2.1E-16
NNW	2300	U-235	4.2E-14	7.5E-18	6.4E-18	1.4E-17
NNW	2300	U-236	4.2E-14	7.5E-18	6.4E-18	1.4E-17
NNW	2300	U-238	6.3E-13	1.1E-16	9.8E-17	2.1E-16
NNW	2400	RN-222	1.8E-04	0.0E+00	0.0E+00	0.0E+00
NNW	2400	AC-227	3.2E-13	5.7E-17	4.9E-17	1.1E-16
NNW	2400	AC-228	1.3E-13	2.4E-17	2.0E-17	4.4E-17
NNW	2400	BI-210	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NNW	2400	FR-223	1.8E-15	3.2E-19	2.4E-19	5.6E-19
NNW	2400	PA-231	2.2E-13	3.9E-17	3.3E-17	7.2E-17
NNW	2400	PA-234	6.5E-16	1.2E-19	9.9E-20	2.2E-19
NNW	2400	PA-234M	2.0E-15	3.7E-19	2.2E-19	5.9E-19
NNW	2400	PB-210	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NNW	2400	PO-210	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NNW	2400	RA-223	3.2E-13	5.7E-17	4.9E-17	1.1E-16
NNW	2400	RA-224	1.3E-13	2.3E-17	1.9E-17	4.2E-17
NNW	2400	RA-226	1.3E-12	2.4E-16	2.0E-16	4.4E-16
NNW	2400	RA-228	1.4E-13	2.5E-17	2.1E-17	4.6E-17
NNW	2400	TH-227	3.2E-14	5.7E-18	4.8E-18	1.1E-17
NNW	2400	TH-228	2.6E-13	4.6E-17	3.9E-17	8.5E-17
NNW	2400	TH-230	2.1E-11	3.7E-15	3.2E-15	6.9E-15
NNW	2400	TH-231	4.0E-14	7.1E-18	6.0E-18	1.3E-17
NNW	2400	TH-232	2.9E-13	5.2E-17	4.4E-17	9.6E-17
NNW	2400	TH-234	6.1E-13	1.1E-16	9.3E-17	2.0E-16
NNW	2400	U-234	6.0E-13	1.1E-16	9.1E-17	2.0E-16
NNW	2400	U-235	4.0E-14	7.2E-18	6.1E-18	1.3E-17
NNW	2400	U-236	4.0E-14	7.2E-18	6.1E-18	1.3E-17
NNW	2400	U-238	6.1E-13	1.1E-16	9.3E-17	2.0E-16
NNW	2600	RN-222	1.7E-04	0.0E+00	0.0E+00	0.0E+00
NNW	2600	AC-227	3.0E-13	5.3E-17	4.5E-17	9.8E-17
NNW	2600	AC-228	1.2E-13	2.2E-17	1.8E-17	4.0E-17
NNW	2600	BI-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
NNW	2600	FR-223	1.5E-15	2.7E-19	2.0E-19	4.8E-19
NNW	2600	PA-231	2.0E-13	3.6E-17	3.0E-17	6.6E-17
NNW	2600	PA-234	6.0E-16	1.1E-19	9.0E-20	2.0E-19
NNW	2600	PA-234M	1.3E-15	2.4E-19	1.5E-19	3.9E-19
NNW	2600	PB-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
NNW	2600	PO-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
NNW	2600	RA-223	3.0E-13	5.3E-17	4.5E-17	9.8E-17
NNW	2600	RA-224	1.2E-13	2.1E-17	1.8E-17	3.9E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	2600	RA-226	1.2E-12	2.2E-16	1.9E-16	4.1E-16
NNW	2600	RA-228	1.3E-13	2.3E-17	2.0E-17	4.3E-17
NNW	2600	TH-227	2.9E-14	5.3E-18	4.4E-18	9.7E-18
NNW	2600	TH-228	2.4E-13	4.3E-17	3.6E-17	7.9E-17
NNW	2600	TH-230	1.9E-11	3.5E-15	2.9E-15	6.4E-15
NNW	2600	TH-231	3.7E-14	6.6E-18	5.5E-18	1.2E-17
NNW	2600	TH-232	2.7E-13	4.8E-17	4.1E-17	8.9E-17
NNW	2600	TH-234	5.7E-13	1.0E-16	8.6E-17	1.9E-16
NNW	2600	U-234	5.5E-13	1.0E-16	8.4E-17	1.8E-16
NNW	2600	U-235	3.7E-14	6.7E-18	5.6E-18	1.2E-17
NNW	2600	U-236	3.7E-14	6.7E-18	5.6E-18	1.2E-17
NNW	2600	U-238	5.7E-13	1.0E-16	8.6E-17	1.9E-16
NNW	2700	RN-222	1.6E-04	0.0E+00	0.0E+00	0.0E+00
NNW	2700	AC-227	2.9E-13	5.1E-17	4.3E-17	9.4E-17
NNW	2700	AC-228	1.2E-13	2.1E-17	1.7E-17	3.9E-17
NNW	2700	BI-210	1.1E-12	1.9E-16	1.6E-16	3.5E-16
NNW	2700	FR-223	1.4E-15	2.6E-19	1.9E-19	4.4E-19
NNW	2700	PA-231	1.9E-13	3.5E-17	2.9E-17	6.4E-17
NNW	2700	PA-234	5.8E-16	1.0E-19	8.6E-20	1.9E-19
NNW	2700	PA-234M	1.1E-15	1.9E-19	1.2E-19	3.1E-19
NNW	2700	PB-210	1.1E-12	1.9E-16	1.6E-16	3.5E-16
NNW	2700	PO-210	1.1E-12	1.9E-16	1.6E-16	3.5E-16
NNW	2700	RA-223	2.9E-13	5.1E-17	4.3E-17	9.4E-17
NNW	2700	RA-224	1.1E-13	2.0E-17	1.7E-17	3.7E-17
NNW	2700	RA-226	1.2E-12	2.1E-16	1.8E-16	3.9E-16
NNW	2700	RA-228	1.2E-13	2.2E-17	1.9E-17	4.1E-17
NNW	2700	TH-227	2.8E-14	5.1E-18	4.3E-18	9.4E-18
NNW	2700	TH-228	2.3E-13	4.1E-17	3.5E-17	7.6E-17
NNW	2700	TH-230	1.9E-11	3.3E-15	2.8E-15	6.1E-15
NNW	2700	TH-231	3.5E-14	6.4E-18	5.3E-18	1.2E-17
NNW	2700	TH-232	2.6E-13	4.7E-17	3.9E-17	8.6E-17
NNW	2700	TH-234	5.5E-13	9.9E-17	8.3E-17	1.8E-16
NNW	2700	U-234	5.3E-13	9.6E-17	8.0E-17	1.8E-16
NNW	2700	U-235	3.6E-14	6.5E-18	5.4E-18	1.2E-17
NNW	2700	U-236	3.6E-14	6.5E-18	5.4E-18	1.2E-17
NNW	2700	U-238	5.5E-13	9.9E-17	8.3E-17	1.8E-16
NNW	3500	RN-222	1.3E-04	0.0E+00	0.0E+00	0.0E+00
NNW	3500	AC-227	2.2E-13	3.9E-17	3.3E-17	7.2E-17
NNW	3500	AC-228	8.8E-14	1.6E-17	1.3E-17	2.9E-17
NNW	3500	BI-210	8.2E-13	1.5E-16	1.2E-16	2.7E-16
NNW	3500	FR-223	8.2E-16	1.5E-19	1.1E-19	2.6E-19
NNW	3500	PA-231	1.5E-13	2.7E-17	2.2E-17	4.9E-17
NNW	3500	PA-234	4.3E-16	7.8E-20	6.4E-20	1.4E-19
NNW	3500	PA-234M	2.1E-16	3.8E-20	2.4E-20	6.2E-20
NNW	3500	PB-210	8.2E-13	1.5E-16	1.2E-16	2.7E-16
NNW	3500	PO-210	8.2E-13	1.5E-16	1.2E-16	2.7E-16
NNW	3500	RA-223	2.2E-13	3.9E-17	3.3E-17	7.2E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNW	3500	RA-224	8.7E-14	1.6E-17	1.3E-17	2.9E-17
NNW	3500	RA-226	9.1E-13	1.6E-16	1.4E-16	3.0E-16
NNW	3500	RA-228	9.6E-14	1.7E-17	1.4E-17	3.2E-17
NNW	3500	TH-227	2.2E-14	3.9E-18	3.2E-18	7.2E-18
NNW	3500	TH-228	1.8E-13	3.2E-17	2.6E-17	5.8E-17
NNW	3500	TH-230	1.4E-11	2.6E-15	2.1E-15	4.7E-15
NNW	3500	TH-231	2.7E-14	4.9E-18	4.0E-18	8.9E-18
NNW	3500	TH-232	2.0E-13	3.6E-17	3.0E-17	6.5E-17
NNW	3500	TH-234	4.2E-13	7.6E-17	6.3E-17	1.4E-16
NNW	3500	U-234	4.1E-13	7.4E-17	6.1E-17	1.3E-16
NNW	3500	U-235	2.8E-14	5.0E-18	4.1E-18	9.1E-18
NNW	3500	U-236	2.8E-14	5.0E-18	4.1E-18	9.1E-18
NNW	3500	U-238	4.2E-13	7.6E-17	6.3E-17	1.4E-16
NW	300	RN-222	1.4E-04	0.0E+00	0.0E+00	0.0E+00
NW	300	AC-227	2.4E-13	4.4E-17	3.7E-16	4.1E-16
NW	300	AC-228	1.1E-13	1.9E-17	1.6E-16	1.8E-16
NW	300	BI-210	9.2E-13	1.7E-16	1.4E-15	1.5E-15
NW	300	FR-223	3.0E-15	5.4E-19	4.4E-18	4.9E-18
NW	300	PA-231	1.7E-13	3.0E-17	2.5E-16	2.8E-16
NW	300	PA-234	5.2E-16	9.4E-20	7.8E-19	8.8E-19
NW	300	PA-234M	7.0E-14	1.3E-17	6.1E-17	7.3E-17
NW	300	PB-210	9.2E-13	1.7E-16	1.4E-15	1.5E-15
NW	300	PO-210	9.2E-13	1.7E-16	1.4E-15	1.5E-15
NW	300	RA-223	2.4E-13	4.4E-17	3.7E-16	4.1E-16
NW	300	RA-224	9.7E-14	1.7E-17	1.4E-16	1.6E-16
NW	300	RA-226	1.0E-12	1.8E-16	1.5E-15	1.7E-15
NW	300	RA-228	1.1E-13	1.9E-17	1.6E-16	1.8E-16
NW	300	TH-227	2.4E-14	4.4E-18	3.6E-17	4.1E-17
NW	300	TH-228	2.0E-13	3.6E-17	2.9E-16	3.3E-16
NW	300	TH-230	1.6E-11	2.9E-15	2.4E-14	2.7E-14
NW	300	TH-231	3.1E-14	5.6E-18	4.6E-17	5.2E-17
NW	300	TH-232	2.2E-13	4.0E-17	3.3E-16	3.7E-16
NW	300	TH-234	4.7E-13	8.5E-17	7.0E-16	7.9E-16
NW	300	U-234	4.6E-13	8.3E-17	6.8E-16	7.7E-16
NW	300	U-235	3.1E-14	5.6E-18	4.6E-17	5.2E-17
NW	300	U-236	3.1E-14	5.6E-18	4.6E-17	5.2E-17
NW	300	U-238	4.7E-13	8.5E-17	7.0E-16	7.9E-16
NW	500	RN-222	1.5E-04	0.0E+00	0.0E+00	0.0E+00
NW	500	AC-227	2.8E-13	5.0E-17	2.2E-16	2.7E-16
NW	500	AC-228	1.2E-13	2.2E-17	9.5E-17	1.2E-16
NW	500	BI-210	1.0E-12	1.9E-16	8.2E-16	1.0E-15
NW	500	FR-223	3.2E-15	5.7E-19	2.4E-18	2.9E-18
NW	500	PA-231	1.9E-13	3.4E-17	1.5E-16	1.8E-16
NW	500	PA-234	5.9E-16	1.1E-19	4.7E-19	5.7E-19
NW	500	PA-234M	4.2E-14	7.5E-18	1.6E-17	2.4E-17
NW	500	PB-210	1.0E-12	1.9E-16	8.2E-16	1.0E-15
NW	500	PO-210	1.0E-12	1.9E-16	8.2E-16	1.0E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NW	500	RA-223	2.8E-13	5.0E-17	2.2E-16	2.7E-16
NW	500	RA-224	1.1E-13	2.0E-17	8.7E-17	1.1E-16
NW	500	RA-226	1.2E-12	2.1E-16	9.1E-16	1.1E-15
NW	500	RA-228	1.2E-13	2.2E-17	9.6E-17	1.2E-16
NW	500	TH-227	2.8E-14	5.0E-18	2.2E-17	2.7E-17
NW	500	TH-228	2.2E-13	4.0E-17	1.8E-16	2.2E-16
NW	500	TH-230	1.8E-11	3.2E-15	1.4E-14	1.7E-14
NW	500	TH-231	3.5E-14	6.3E-18	2.8E-17	3.4E-17
NW	500	TH-232	2.5E-13	4.5E-17	2.0E-16	2.4E-16
NW	500	TH-234	5.3E-13	9.6E-17	4.2E-16	5.2E-16
NW	500	U-234	5.2E-13	9.3E-17	4.1E-16	5.0E-16
NW	500	U-235	3.5E-14	6.3E-18	2.8E-17	3.4E-17
NW	500	U-236	3.5E-14	6.3E-18	2.8E-17	3.4E-17
NW	500	U-238	5.3E-13	9.6E-17	4.2E-16	5.2E-16
NW	700	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
NW	700	AC-227	3.5E-13	6.2E-17	1.6E-16	2.2E-16
NW	700	AC-228	1.5E-13	2.7E-17	6.7E-17	9.4E-17
NW	700	BI-210	1.3E-12	2.3E-16	5.9E-16	8.2E-16
NW	700	FR-223	3.6E-15	6.5E-19	1.5E-18	2.2E-18
NW	700	PA-231	2.4E-13	4.2E-17	1.1E-16	1.5E-16
NW	700	PA-234	7.4E-16	1.3E-19	3.3E-19	4.6E-19
NW	700	PA-234M	3.1E-14	5.6E-18	7.5E-18	1.3E-17
NW	700	PB-210	1.3E-12	2.3E-16	5.9E-16	8.2E-16
NW	700	PO-210	1.3E-12	2.3E-16	5.9E-16	8.2E-16
NW	700	RA-223	3.5E-13	6.2E-17	1.6E-16	2.2E-16
NW	700	RA-224	1.4E-13	2.5E-17	6.2E-17	8.7E-17
NW	700	RA-226	1.4E-12	2.6E-16	6.5E-16	9.1E-16
NW	700	RA-228	1.5E-13	2.7E-17	6.8E-17	9.6E-17
NW	700	TH-227	3.4E-14	6.2E-18	1.5E-17	2.2E-17
NW	700	TH-228	2.8E-13	5.0E-17	1.3E-16	1.8E-16
NW	700	TH-230	2.3E-11	4.1E-15	1.0E-14	1.4E-14
NW	700	TH-231	4.4E-14	7.9E-18	2.0E-17	2.7E-17
NW	700	TH-232	3.2E-13	5.7E-17	1.4E-16	2.0E-16
NW	700	TH-234	6.7E-13	1.2E-16	3.0E-16	4.2E-16
NW	700	U-234	6.5E-13	1.2E-16	2.9E-16	4.1E-16
NW	700	U-235	4.4E-14	7.9E-18	2.0E-17	2.8E-17
NW	700	U-236	4.4E-14	7.9E-18	2.0E-17	2.8E-17
NW	700	U-238	6.7E-13	1.2E-16	3.0E-16	4.2E-16
NW	1000	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
NW	1000	AC-227	4.1E-13	7.3E-17	1.1E-16	1.8E-16
NW	1000	AC-228	1.7E-13	3.1E-17	4.6E-17	7.8E-17
NW	1000	BI-210	1.5E-12	2.8E-16	4.1E-16	6.8E-16
NW	1000	FR-223	3.6E-15	6.5E-19	9.0E-19	1.6E-18
NW	1000	PA-231	2.8E-13	5.0E-17	7.4E-17	1.2E-16
NW	1000	PA-234	8.6E-16	1.5E-19	2.3E-19	3.8E-19
NW	1000	PA-234M	1.9E-14	3.5E-18	3.1E-18	6.6E-18
NW	1000	PB-210	1.5E-12	2.8E-16	4.1E-16	6.8E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NW	1000	PO-210	1.5E-12	2.8E-16	4.1E-16	6.8E-16
NW	1000	RA-223	4.1E-13	7.3E-17	1.1E-16	1.8E-16
NW	1000	RA-224	1.6E-13	2.9E-17	4.3E-17	7.2E-17
NW	1000	RA-226	1.7E-12	3.1E-16	4.5E-16	7.6E-16
NW	1000	RA-228	1.8E-13	3.2E-17	4.8E-17	8.0E-17
NW	1000	TH-227	4.0E-14	7.3E-18	1.1E-17	1.8E-17
NW	1000	TH-228	3.3E-13	5.9E-17	8.7E-17	1.5E-16
NW	1000	TH-230	2.6E-11	4.8E-15	7.1E-15	1.2E-14
NW	1000	TH-231	5.1E-14	9.2E-18	1.4E-17	2.3E-17
NW	1000	TH-232	3.7E-13	6.7E-17	9.9E-17	1.7E-16
NW	1000	TH-234	7.8E-13	1.4E-16	2.1E-16	3.5E-16
NW	1000	U-234	7.6E-13	1.4E-16	2.0E-16	3.4E-16
NW	1000	U-235	5.1E-14	9.3E-18	1.4E-17	2.3E-17
NW	1000	U-236	5.1E-14	9.3E-18	1.4E-17	2.3E-17
NW	1000	U-238	7.8E-13	1.4E-16	2.1E-16	3.5E-16
NW	1300	RN-222	2.1E-04	0.0E+00	0.0E+00	0.0E+00
NW	1300	AC-227	3.8E-13	6.8E-17	8.3E-17	1.5E-16
NW	1300	AC-228	1.6E-13	2.9E-17	3.5E-17	6.4E-17
NW	1300	BI-210	1.4E-12	2.5E-16	3.1E-16	5.7E-16
NW	1300	FR-223	2.9E-15	5.2E-19	5.9E-19	1.1E-18
NW	1300	PA-231	2.5E-13	4.6E-17	5.6E-17	1.0E-16
NW	1300	PA-234	7.8E-16	1.4E-19	1.7E-19	3.1E-19
NW	1300	PA-234M	1.1E-14	1.9E-18	1.4E-18	3.3E-18
NW	1300	PB-210	1.4E-12	2.5E-16	3.1E-16	5.7E-16
NW	1300	PO-210	1.4E-12	2.5E-16	3.1E-16	5.7E-16
NW	1300	RA-223	3.8E-13	6.8E-17	8.3E-17	1.5E-16
NW	1300	RA-224	1.5E-13	2.7E-17	3.3E-17	6.0E-17
NW	1300	RA-226	1.6E-12	2.8E-16	3.5E-16	6.3E-16
NW	1300	RA-228	1.6E-13	3.0E-17	3.6E-17	6.6E-17
NW	1300	TH-227	3.7E-14	6.7E-18	8.2E-18	1.5E-17
NW	1300	TH-228	3.0E-13	5.5E-17	6.7E-17	1.2E-16
NW	1300	TH-230	2.4E-11	4.4E-15	5.4E-15	9.8E-15
NW	1300	TH-231	4.7E-14	8.5E-18	1.0E-17	1.9E-17
NW	1300	TH-232	3.4E-13	6.2E-17	7.6E-17	1.4E-16
NW	1300	TH-234	7.2E-13	1.3E-16	1.6E-16	2.9E-16
NW	1300	U-234	7.0E-13	1.3E-16	1.6E-16	2.8E-16
NW	1300	U-235	4.7E-14	8.5E-18	1.0E-17	1.9E-17
NW	1300	U-236	4.7E-14	8.5E-18	1.0E-17	1.9E-17
NW	1300	U-238	7.2E-13	1.3E-16	1.6E-16	2.9E-16
NW	1500	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00
NW	1500	AC-227	3.5E-13	6.3E-17	7.2E-17	1.3E-16
NW	1500	AC-228	1.5E-13	2.7E-17	3.0E-17	5.7E-17
NW	1500	BI-210	1.3E-12	2.4E-16	2.7E-16	5.1E-16
NW	1500	FR-223	2.5E-15	4.4E-19	4.6E-19	9.0E-19
NW	1500	PA-231	2.4E-13	4.3E-17	4.9E-17	9.1E-17
NW	1500	PA-234	7.3E-16	1.3E-19	1.5E-19	2.8E-19
NW	1500	PA-234M	6.9E-15	1.2E-18	8.8E-19	2.1E-18

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NW	1500	PB-210	1.3E-12	2.4E-16	2.7E-16	5.1E-16
NW	1500	PO-210	1.3E-12	2.4E-16	2.7E-16	5.1E-16
NW	1500	RA-223	3.5E-13	6.3E-17	7.2E-17	1.3E-16
NW	1500	RA-224	1.4E-13	2.5E-17	2.8E-17	5.3E-17
NW	1500	RA-226	1.5E-12	2.6E-16	3.0E-16	5.6E-16
NW	1500	RA-228	1.5E-13	2.8E-17	3.1E-17	5.9E-17
NW	1500	TH-227	3.5E-14	6.3E-18	7.1E-18	1.3E-17
NW	1500	TH-228	2.8E-13	5.1E-17	5.8E-17	1.1E-16
NW	1500	TH-230	2.3E-11	4.1E-15	4.7E-15	8.8E-15
NW	1500	TH-231	4.4E-14	7.9E-18	9.0E-18	1.7E-17
NW	1500	TH-232	3.2E-13	5.7E-17	6.5E-17	1.2E-16
NW	1500	TH-234	6.7E-13	1.2E-16	1.4E-16	2.6E-16
NW	1500	U-234	6.5E-13	1.2E-16	1.3E-16	2.5E-16
NW	1500	U-235	4.4E-14	7.9E-18	9.1E-18	1.7E-17
NW	1500	U-236	4.4E-14	7.9E-18	9.1E-18	1.7E-17
NW	1500	U-238	6.7E-13	1.2E-16	1.4E-16	2.6E-16
NW	1700	RN-222	1.8E-04	0.0E+00	0.0E+00	0.0E+00
NW	1700	AC-227	3.2E-13	5.8E-17	6.3E-17	1.2E-16
NW	1700	AC-228	1.4E-13	2.4E-17	2.6E-17	5.1E-17
NW	1700	BI-210	1.2E-12	2.2E-16	2.4E-16	4.6E-16
NW	1700	FR-223	2.1E-15	3.7E-19	3.7E-19	7.4E-19
NW	1700	PA-231	2.2E-13	3.9E-17	4.3E-17	8.2E-17
NW	1700	PA-234	6.7E-16	1.2E-19	1.3E-19	2.5E-19
NW	1700	PA-234M	4.5E-15	8.1E-19	5.6E-19	1.4E-18
NW	1700	PB-210	1.2E-12	2.2E-16	2.4E-16	4.6E-16
NW	1700	PO-210	1.2E-12	2.2E-16	2.4E-16	4.6E-16
NW	1700	RA-223	3.2E-13	5.8E-17	6.3E-17	1.2E-16
NW	1700	RA-224	1.3E-13	2.3E-17	2.5E-17	4.8E-17
NW	1700	RA-226	1.4E-12	2.4E-16	2.6E-16	5.1E-16
NW	1700	RA-228	1.4E-13	2.6E-17	2.8E-17	5.3E-17
NW	1700	TH-227	3.2E-14	5.8E-18	6.3E-18	1.2E-17
NW	1700	TH-228	2.6E-13	4.7E-17	5.1E-17	9.8E-17
NW	1700	TH-230	2.1E-11	3.8E-15	4.1E-15	7.9E-15
NW	1700	TH-231	4.0E-14	7.3E-18	7.9E-18	1.5E-17
NW	1700	TH-232	2.9E-13	5.3E-17	5.7E-17	1.1E-16
NW	1700	TH-234	6.2E-13	1.1E-16	1.2E-16	2.3E-16
NW	1700	U-234	6.1E-13	1.1E-16	1.2E-16	2.3E-16
NW	1700	U-235	4.1E-14	7.4E-18	8.0E-18	1.5E-17
NW	1700	U-236	4.1E-14	7.4E-18	8.0E-18	1.5E-17
NW	1700	U-238	6.2E-13	1.1E-16	1.2E-16	2.3E-16
NW	2000	RN-222	1.6E-04	0.0E+00	0.0E+00	0.0E+00
NW	2000	AC-227	2.9E-13	5.2E-17	5.3E-17	1.1E-16
NW	2000	AC-228	1.2E-13	2.2E-17	2.2E-17	4.4E-17
NW	2000	BI-210	1.1E-12	2.0E-16	2.0E-16	4.0E-16
NW	2000	FR-223	1.6E-15	2.9E-19	2.7E-19	5.6E-19
NW	2000	PA-231	2.0E-13	3.5E-17	3.6E-17	7.1E-17
NW	2000	PA-234	5.9E-16	1.1E-19	1.1E-19	2.2E-19

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NW	2000	PA-234M	2.4E-15	4.3E-19	2.9E-19	7.1E-19
NW	2000	PB-210	1.1E-12	2.0E-16	2.0E-16	4.0E-16
NW	2000	PO-210	1.1E-12	2.0E-16	2.0E-16	4.0E-16
NW	2000	RA-223	2.9E-13	5.2E-17	5.3E-17	1.1E-16
NW	2000	RA-224	1.1E-13	2.1E-17	2.1E-17	4.2E-17
NW	2000	RA-226	1.2E-12	2.2E-16	2.2E-16	4.4E-16
NW	2000	RA-228	1.3E-13	2.3E-17	2.3E-17	4.6E-17
NW	2000	TH-227	2.9E-14	5.2E-18	5.3E-18	1.0E-17
NW	2000	TH-228	2.3E-13	4.2E-17	4.3E-17	8.5E-17
NW	2000	TH-230	1.9E-11	3.4E-15	3.5E-15	6.9E-15
NW	2000	TH-231	3.6E-14	6.5E-18	6.6E-18	1.3E-17
NW	2000	TH-232	2.6E-13	4.7E-17	4.8E-17	9.6E-17
NW	2000	TH-234	5.6E-13	1.0E-16	1.0E-16	2.0E-16
NW	2000	U-234	5.4E-13	9.7E-17	1.0E-16	2.0E-16
NW	2000	U-235	3.7E-14	6.6E-18	6.7E-18	1.3E-17
NW	2000	U-236	3.7E-14	6.6E-18	6.7E-18	1.3E-17
NW	2000	U-238	5.6E-13	1.0E-16	1.0E-16	2.0E-16
NW	2300	RN-222	1.5E-04	0.0E+00	0.0E+00	0.0E+00
NW	2300	AC-227	2.6E-13	4.7E-17	4.6E-17	9.3E-17
NW	2300	AC-228	1.1E-13	1.9E-17	1.9E-17	3.8E-17
NW	2300	BI-210	9.8E-13	1.8E-16	1.7E-16	3.5E-16
NW	2300	FR-223	1.2E-15	2.2E-19	2.0E-19	4.3E-19
NW	2300	PA-231	1.8E-13	3.2E-17	3.1E-17	6.3E-17
NW	2300	PA-234	5.3E-16	9.5E-20	9.3E-20	1.9E-19
NW	2300	PA-234M	1.3E-15	2.3E-19	1.5E-19	3.8E-19
NW	2300	PB-210	9.8E-13	1.8E-16	1.7E-16	3.5E-16
NW	2300	PO-210	9.8E-13	1.8E-16	1.7E-16	3.5E-16
NW	2300	RA-223	2.6E-13	4.7E-17	4.6E-17	9.3E-17
NW	2300	RA-224	1.0E-13	1.9E-17	1.8E-17	3.7E-17
NW	2300	RA-226	1.1E-12	2.0E-16	1.9E-16	3.9E-16
NW	2300	RA-228	1.1E-13	2.1E-17	2.0E-17	4.1E-17
NW	2300	TH-227	2.6E-14	4.7E-18	4.6E-18	9.2E-18
NW	2300	TH-228	2.1E-13	3.8E-17	3.7E-17	7.5E-17
NW	2300	TH-230	1.7E-11	3.1E-15	3.0E-15	6.0E-15
NW	2300	TH-231	3.2E-14	5.8E-18	5.7E-18	1.2E-17
NW	2300	TH-232	2.4E-13	4.3E-17	4.2E-17	8.5E-17
NW	2300	TH-234	5.0E-13	9.0E-17	8.8E-17	1.8E-16
NW	2300	U-234	4.9E-13	8.8E-17	8.6E-17	1.7E-16
NW	2300	U-235	3.3E-14	5.9E-18	5.8E-18	1.2E-17
NW	2300	U-236	3.3E-14	5.9E-18	5.8E-18	1.2E-17
NW	2300	U-238	5.0E-13	9.0E-17	8.8E-17	1.8E-16
NW	2400	RN-222	1.4E-04	0.0E+00	0.0E+00	0.0E+00
NW	2400	AC-227	2.5E-13	4.5E-17	4.4E-17	8.9E-17
NW	2400	AC-228	1.0E-13	1.9E-17	1.8E-17	3.7E-17
NW	2400	BI-210	9.5E-13	1.7E-16	1.7E-16	3.4E-16
NW	2400	FR-223	1.2E-15	2.1E-19	1.8E-19	3.9E-19
NW	2400	PA-231	1.7E-13	3.1E-17	3.0E-17	6.1E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NW	2400	PA-234	5.1E-16	9.2E-20	8.9E-20	1.8E-19
NW	2400	PA-234M	1.0E-15	1.8E-19	1.2E-19	3.0E-19
NW	2400	PB-210	9.5E-13	1.7E-16	1.7E-16	3.4E-16
NW	2400	PO-210	9.5E-13	1.7E-16	1.7E-16	3.4E-16
NW	2400	RA-223	2.5E-13	4.5E-17	4.4E-17	8.9E-17
NW	2400	RA-224	1.0E-13	1.8E-17	1.7E-17	3.5E-17
NW	2400	RA-226	1.1E-12	1.9E-16	1.8E-16	3.7E-16
NW	2400	RA-228	1.1E-13	2.0E-17	1.9E-17	3.9E-17
NW	2400	TH-227	2.5E-14	4.5E-18	4.4E-18	8.9E-18
NW	2400	TH-228	2.0E-13	3.7E-17	3.5E-17	7.2E-17
NW	2400	TH-230	1.6E-11	3.0E-15	2.9E-15	5.8E-15
NW	2400	TH-231	3.1E-14	5.6E-18	5.5E-18	1.1E-17
NW	2400	TH-232	2.3E-13	4.1E-17	4.0E-17	8.1E-17
NW	2400	TH-234	4.8E-13	8.7E-17	8.5E-17	1.7E-16
NW	2400	U-234	4.7E-13	8.5E-17	8.2E-17	1.7E-16
NW	2400	U-235	3.2E-14	5.7E-18	5.6E-18	1.1E-17
NW	2400	U-236	3.2E-14	5.7E-18	5.6E-18	1.1E-17
NW	2400	U-238	4.8E-13	8.7E-17	8.5E-17	1.7E-16
NW	2600	RN-222	1.4E-04	0.0E+00	0.0E+00	0.0E+00
NW	2600	AC-227	2.4E-13	4.3E-17	4.0E-17	8.3E-17
NW	2600	AC-228	9.6E-14	1.7E-17	1.6E-17	3.4E-17
NW	2600	BI-210	8.9E-13	1.6E-16	1.5E-16	3.1E-16
NW	2600	FR-223	9.8E-16	1.8E-19	1.5E-19	3.3E-19
NW	2600	PA-231	1.6E-13	2.9E-17	2.7E-17	5.6E-17
NW	2600	PA-234	4.8E-16	8.6E-20	8.1E-20	1.7E-19
NW	2600	PA-234M	6.6E-16	1.2E-19	8.1E-20	2.0E-19
NW	2600	PB-210	8.9E-13	1.6E-16	1.5E-16	3.1E-16
NW	2600	PO-210	8.9E-13	1.6E-16	1.5E-16	3.1E-16
NW	2600	RA-223	2.4E-13	4.3E-17	4.0E-17	8.3E-17
NW	2600	RA-224	9.4E-14	1.7E-17	1.6E-17	3.3E-17
NW	2600	RA-226	9.9E-13	1.8E-16	1.7E-16	3.5E-16
NW	2600	RA-228	1.0E-13	1.9E-17	1.8E-17	3.6E-17
NW	2600	TH-227	2.4E-14	4.2E-18	4.0E-18	8.3E-18
NW	2600	TH-228	1.9E-13	3.4E-17	3.3E-17	6.7E-17
NW	2600	TH-230	1.5E-11	2.8E-15	2.6E-15	5.4E-15
NW	2600	TH-231	2.9E-14	5.3E-18	5.0E-18	1.0E-17
NW	2600	TH-232	2.2E-13	3.9E-17	3.7E-17	7.6E-17
NW	2600	TH-234	4.6E-13	8.2E-17	7.8E-17	1.6E-16
NW	2600	U-234	4.4E-13	8.0E-17	7.6E-17	1.6E-16
NW	2600	U-235	3.0E-14	5.4E-18	5.1E-18	1.1E-17
NW	2600	U-236	3.0E-14	5.4E-18	5.1E-18	1.1E-17
NW	2600	U-238	4.6E-13	8.2E-17	7.8E-17	1.6E-16
NW	2700	RN-222	1.3E-04	0.0E+00	0.0E+00	0.0E+00
NW	2700	AC-227	2.3E-13	4.1E-17	3.9E-17	8.0E-17
NW	2700	AC-228	9.3E-14	1.7E-17	1.6E-17	3.2E-17
NW	2700	BI-210	8.7E-13	1.6E-16	1.5E-16	3.0E-16
NW	2700	FR-223	9.1E-16	1.6E-19	1.4E-19	3.1E-19

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NW	2700	PA-231	1.6E-13	2.8E-17	2.6E-17	5.4E-17
NW	2700	PA-234	4.6E-16	8.3E-20	7.8E-20	1.6E-19
NW	2700	PA-234M	5.4E-16	9.7E-20	6.6E-20	1.6E-19
NW	2700	PB-210	8.7E-13	1.6E-16	1.5E-16	3.0E-16
NW	2700	PO-210	8.7E-13	1.6E-16	1.5E-16	3.0E-16
NW	2700	RA-223	2.3E-13	4.1E-17	3.9E-17	8.0E-17
NW	2700	RA-224	9.1E-14	1.6E-17	1.5E-17	3.2E-17
NW	2700	RA-226	9.6E-13	1.7E-16	1.6E-16	3.4E-16
NW	2700	RA-228	1.0E-13	1.8E-17	1.7E-17	3.5E-17
NW	2700	TH-227	2.3E-14	4.1E-18	3.9E-18	8.0E-18
NW	2700	TH-228	1.9E-13	3.3E-17	3.1E-17	6.5E-17
NW	2700	TH-230	1.5E-11	2.7E-15	2.5E-15	5.2E-15
NW	2700	TH-231	2.9E-14	5.1E-18	4.8E-18	9.9E-18
NW	2700	TH-232	2.1E-13	3.8E-17	3.5E-17	7.3E-17
NW	2700	TH-234	4.4E-13	8.0E-17	7.5E-17	1.5E-16
NW	2700	U-234	4.3E-13	7.8E-17	7.3E-17	1.5E-16
NW	2700	U-235	2.9E-14	5.2E-18	4.9E-18	1.0E-17
NW	2700	U-236	2.9E-14	5.2E-18	4.9E-18	1.0E-17
NW	2700	U-238	4.4E-13	8.0E-17	7.5E-17	1.5E-16
NW	3500	RN-222	1.1E-04	0.0E+00	0.0E+00	0.0E+00
NW	3500	AC-227	1.8E-13	3.3E-17	2.9E-17	6.2E-17
NW	3500	AC-228	7.2E-14	1.3E-17	1.2E-17	2.5E-17
NW	3500	BI-210	6.8E-13	1.2E-16	1.1E-16	2.3E-16
NW	3500	FR-223	5.0E-16	9.0E-20	7.6E-20	1.7E-19
NW	3500	PA-231	1.2E-13	2.2E-17	2.0E-17	4.2E-17
NW	3500	PA-234	3.5E-16	6.4E-20	5.8E-20	1.2E-19
NW	3500	PA-234M	1.0E-16	1.9E-20	1.3E-20	3.2E-20
NW	3500	PB-210	6.8E-13	1.2E-16	1.1E-16	2.3E-16
NW	3500	PO-210	6.8E-13	1.2E-16	1.1E-16	2.3E-16
NW	3500	RA-223	1.8E-13	3.3E-17	2.9E-17	6.2E-17
NW	3500	RA-224	7.2E-14	1.3E-17	1.2E-17	2.5E-17
NW	3500	RA-226	7.6E-13	1.4E-16	1.2E-16	2.6E-16
NW	3500	RA-228	7.9E-14	1.4E-17	1.3E-17	2.7E-17
NW	3500	TH-227	1.8E-14	3.2E-18	2.9E-18	6.2E-18
NW	3500	TH-228	1.5E-13	2.6E-17	2.4E-17	5.0E-17
NW	3500	TH-230	1.2E-11	2.1E-15	1.9E-15	4.0E-15
NW	3500	TH-231	2.2E-14	4.0E-18	3.6E-18	7.6E-18
NW	3500	TH-232	1.6E-13	3.0E-17	2.7E-17	5.7E-17
NW	3500	TH-234	3.5E-13	6.3E-17	5.7E-17	1.2E-16
NW	3500	U-234	3.4E-13	6.1E-17	5.5E-17	1.2E-16
NW	3500	U-235	2.3E-14	4.1E-18	3.7E-18	7.8E-18
NW	3500	U-236	2.3E-14	4.1E-18	3.7E-18	7.8E-18
NW	3500	U-238	3.5E-13	6.3E-17	5.7E-17	1.2E-16
WNW	300	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00
WNW	300	AC-227	3.6E-13	6.5E-17	4.6E-16	5.3E-16
WNW	300	AC-228	1.6E-13	2.8E-17	2.0E-16	2.3E-16
WNW	300	BI-210	1.4E-12	2.4E-16	1.7E-15	2.0E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	300	FR-223	4.5E-15	8.0E-19	5.4E-18	6.2E-18
WNW	300	PA-231	2.4E-13	4.4E-17	3.1E-16	3.6E-16
WNW	300	PA-234	7.7E-16	1.4E-19	9.8E-19	1.1E-18
WNW	300	PA-234M	1.1E-13	1.9E-17	6.2E-17	8.1E-17
WNW	300	PB-210	1.4E-12	2.4E-16	1.7E-15	2.0E-15
WNW	300	PO-210	1.4E-12	2.4E-16	1.7E-15	2.0E-15
WNW	300	RA-223	3.6E-13	6.5E-17	4.6E-16	5.3E-16
WNW	300	RA-224	1.4E-13	2.6E-17	1.8E-16	2.1E-16
WNW	300	RA-226	1.5E-12	2.7E-16	1.9E-15	2.2E-15
WNW	300	RA-228	1.6E-13	2.8E-17	2.0E-16	2.3E-16
WNW	300	TH-227	3.6E-14	6.4E-18	4.6E-17	5.2E-17
WNW	300	TH-228	2.9E-13	5.2E-17	3.7E-16	4.2E-16
WNW	300	TH-230	2.3E-11	4.2E-15	3.0E-14	3.4E-14
WNW	300	TH-231	4.5E-14	8.2E-18	5.8E-17	6.6E-17
WNW	300	TH-232	3.3E-13	5.9E-17	4.2E-16	4.8E-16
WNW	300	TH-234	6.9E-13	1.2E-16	8.8E-16	1.0E-15
WNW	300	U-234	6.8E-13	1.2E-16	8.6E-16	9.8E-16
WNW	300	U-235	4.6E-14	8.2E-18	5.8E-17	6.6E-17
WNW	300	U-236	4.6E-14	8.2E-18	5.8E-17	6.6E-17
WNW	300	U-238	6.9E-13	1.2E-16	8.8E-16	1.0E-15
WNW	500	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00
WNW	500	AC-227	3.7E-13	6.7E-17	2.8E-16	3.4E-16
WNW	500	AC-228	1.6E-13	2.9E-17	1.2E-16	1.5E-16
WNW	500	BI-210	1.4E-12	2.5E-16	1.0E-15	1.3E-15
WNW	500	FR-223	4.2E-15	7.5E-19	2.9E-18	3.7E-18
WNW	500	PA-231	2.5E-13	4.5E-17	1.9E-16	2.3E-16
WNW	500	PA-234	7.9E-16	1.4E-19	5.9E-19	7.3E-19
WNW	500	PA-234M	5.0E-14	9.0E-18	1.6E-17	2.5E-17
WNW	500	PB-210	1.4E-12	2.5E-16	1.0E-15	1.3E-15
WNW	500	PO-210	1.4E-12	2.5E-16	1.0E-15	1.3E-15
WNW	500	RA-223	3.7E-13	6.7E-17	2.8E-16	3.4E-16
WNW	500	RA-224	1.5E-13	2.6E-17	1.1E-16	1.4E-16
WNW	500	RA-226	1.5E-12	2.8E-16	1.2E-15	1.4E-15
WNW	500	RA-228	1.6E-13	2.9E-17	1.2E-16	1.5E-16
WNW	500	TH-227	3.7E-14	6.6E-18	2.7E-17	3.4E-17
WNW	500	TH-228	3.0E-13	5.4E-17	2.2E-16	2.8E-16
WNW	500	TH-230	2.4E-11	4.3E-15	1.8E-14	2.2E-14
WNW	500	TH-231	4.7E-14	8.4E-18	3.5E-17	4.3E-17
WNW	500	TH-232	3.4E-13	6.1E-17	2.5E-16	3.1E-16
WNW	500	TH-234	7.1E-13	1.3E-16	5.3E-16	6.6E-16
WNW	500	U-234	6.9E-13	1.2E-16	5.2E-16	6.4E-16
WNW	500	U-235	4.7E-14	8.4E-18	3.5E-17	4.3E-17
WNW	500	U-236	4.7E-14	8.4E-18	3.5E-17	4.3E-17
WNW	500	U-238	7.1E-13	1.3E-16	5.3E-16	6.6E-16
WNW	700	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
WNW	700	AC-227	4.2E-13	7.5E-17	2.0E-16	2.7E-16
WNW	700	AC-228	1.8E-13	3.2E-17	8.4E-17	1.2E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	700	BI-210	1.6E-12	2.8E-16	7.4E-16	1.0E-15
WNW	700	FR-223	4.3E-15	7.7E-19	1.8E-18	2.6E-18
WNW	700	PA-231	2.8E-13	5.1E-17	1.3E-16	1.8E-16
WNW	700	PA-234	8.9E-16	1.6E-19	4.1E-19	5.7E-19
WNW	700	PA-234M	3.3E-14	5.9E-18	7.3E-18	1.3E-17
WNW	700	PB-210	1.6E-12	2.8E-16	7.4E-16	1.0E-15
WNW	700	PO-210	1.6E-12	2.8E-16	7.4E-16	1.0E-15
WNW	700	RA-223	4.2E-13	7.5E-17	2.0E-16	2.7E-16
WNW	700	RA-224	1.7E-13	3.0E-17	7.8E-17	1.1E-16
WNW	700	RA-226	1.7E-12	3.1E-16	8.2E-16	1.1E-15
WNW	700	RA-228	1.8E-13	3.3E-17	8.6E-17	1.2E-16
WNW	700	TH-227	4.2E-14	7.5E-18	2.0E-17	2.7E-17
WNW	700	TH-228	3.4E-13	6.1E-17	1.6E-16	2.2E-16
WNW	700	TH-230	2.7E-11	4.9E-15	1.3E-14	1.8E-14
WNW	700	TH-231	5.3E-14	9.5E-18	2.5E-17	3.4E-17
WNW	700	TH-232	3.8E-13	6.8E-17	1.8E-16	2.5E-16
WNW	700	TH-234	8.0E-13	1.4E-16	3.8E-16	5.2E-16
WNW	700	U-234	7.8E-13	1.4E-16	3.7E-16	5.1E-16
WNW	700	U-235	5.3E-14	9.5E-18	2.5E-17	3.4E-17
WNW	700	U-236	5.3E-14	9.5E-18	2.5E-17	3.4E-17
WNW	700	U-238	8.0E-13	1.4E-16	3.8E-16	5.2E-16
WNW	1000	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
WNW	1000	AC-227	4.5E-13	8.1E-17	1.4E-16	2.2E-16
WNW	1000	AC-228	1.9E-13	3.5E-17	5.8E-17	9.3E-17
WNW	1000	BI-210	1.7E-12	3.1E-16	5.1E-16	8.2E-16
WNW	1000	FR-223	4.0E-15	7.1E-19	1.1E-18	1.8E-18
WNW	1000	PA-231	3.1E-13	5.5E-17	9.3E-17	1.5E-16
WNW	1000	PA-234	9.5E-16	1.7E-19	2.9E-19	4.6E-19
WNW	1000	PA-234M	1.9E-14	3.4E-18	3.0E-18	6.4E-18
WNW	1000	PB-210	1.7E-12	3.1E-16	5.1E-16	8.2E-16
WNW	1000	PO-210	1.7E-12	3.1E-16	5.1E-16	8.2E-16
WNW	1000	RA-223	4.5E-13	8.1E-17	1.4E-16	2.2E-16
WNW	1000	RA-224	1.8E-13	3.2E-17	5.4E-17	8.7E-17
WNW	1000	RA-226	1.9E-12	3.4E-16	5.7E-16	9.1E-16
WNW	1000	RA-228	2.0E-13	3.6E-17	6.0E-17	9.6E-17
WNW	1000	TH-227	4.5E-14	8.1E-18	1.4E-17	2.2E-17
WNW	1000	TH-228	3.6E-13	6.6E-17	1.1E-16	1.8E-16
WNW	1000	TH-230	2.9E-11	5.3E-15	8.9E-15	1.4E-14
WNW	1000	TH-231	5.7E-14	1.0E-17	1.7E-17	2.7E-17
WNW	1000	TH-232	4.1E-13	7.4E-17	1.2E-16	2.0E-16
WNW	1000	TH-234	8.7E-13	1.6E-16	2.6E-16	4.2E-16
WNW	1000	U-234	8.5E-13	1.5E-16	2.6E-16	4.1E-16
WNW	1000	U-235	5.7E-14	1.0E-17	1.7E-17	2.8E-17
WNW	1000	U-236	5.7E-14	1.0E-17	1.7E-17	2.8E-17
WNW	1000	U-238	8.7E-13	1.6E-16	2.6E-16	4.2E-16
WNW	1300	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
WNW	1300	AC-227	4.1E-13	7.3E-17	1.0E-16	1.8E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	1300	AC-228	1.7E-13	3.1E-17	4.4E-17	7.5E-17
WNW	1300	BI-210	1.5E-12	2.8E-16	3.9E-16	6.7E-16
WNW	1300	FR-223	3.1E-15	5.5E-19	7.0E-19	1.3E-18
WNW	1300	PA-231	2.8E-13	5.0E-17	7.1E-17	1.2E-16
WNW	1300	PA-234	8.5E-16	1.5E-19	2.2E-19	3.7E-19
WNW	1300	PA-234M	9.9E-15	1.8E-18	1.4E-18	3.2E-18
WNW	1300	PB-210	1.5E-12	2.8E-16	3.9E-16	6.7E-16
WNW	1300	PO-210	1.5E-12	2.8E-16	3.9E-16	6.7E-16
WNW	1300	RA-223	4.1E-13	7.3E-17	1.0E-16	1.8E-16
WNW	1300	RA-224	1.6E-13	2.9E-17	4.2E-17	7.1E-17
WNW	1300	RA-226	1.7E-12	3.1E-16	4.4E-16	7.4E-16
WNW	1300	RA-228	1.8E-13	3.2E-17	4.6E-17	7.8E-17
WNW	1300	TH-227	4.0E-14	7.3E-18	1.0E-17	1.8E-17
WNW	1300	TH-228	3.3E-13	5.9E-17	8.4E-17	1.4E-16
WNW	1300	TH-230	2.6E-11	4.8E-15	6.8E-15	1.2E-14
WNW	1300	TH-231	5.1E-14	9.2E-18	1.3E-17	2.2E-17
WNW	1300	TH-232	3.7E-13	6.7E-17	9.5E-17	1.6E-16
WNW	1300	TH-234	7.8E-13	1.4E-16	2.0E-16	3.4E-16
WNW	1300	U-234	7.6E-13	1.4E-16	2.0E-16	3.3E-16
WNW	1300	U-235	5.1E-14	9.3E-18	1.3E-17	2.2E-17
WNW	1300	U-236	5.1E-14	9.3E-18	1.3E-17	2.2E-17
WNW	1300	U-238	7.8E-13	1.4E-16	2.0E-16	3.4E-16
WNW	1500	RN-222	2.1E-04	0.0E+00	0.0E+00	0.0E+00
WNW	1500	AC-227	3.7E-13	6.7E-17	9.0E-17	1.6E-16
WNW	1500	AC-228	1.6E-13	2.8E-17	3.8E-17	6.6E-17
WNW	1500	BI-210	1.4E-12	2.5E-16	3.4E-16	5.9E-16
WNW	1500	FR-223	2.6E-15	4.6E-19	5.5E-19	1.0E-18
WNW	1500	PA-231	2.5E-13	4.6E-17	6.1E-17	1.1E-16
WNW	1500	PA-234	7.8E-16	1.4E-19	1.9E-19	3.3E-19
WNW	1500	PA-234M	6.4E-15	1.2E-18	8.7E-19	2.0E-18
WNW	1500	PB-210	1.4E-12	2.5E-16	3.4E-16	5.9E-16
WNW	1500	PO-210	1.4E-12	2.5E-16	3.4E-16	5.9E-16
WNW	1500	RA-223	3.7E-13	6.7E-17	9.0E-17	1.6E-16
WNW	1500	RA-224	1.5E-13	2.7E-17	3.6E-17	6.3E-17
WNW	1500	RA-226	1.6E-12	2.8E-16	3.8E-16	6.6E-16
WNW	1500	RA-228	1.6E-13	3.0E-17	4.0E-17	6.9E-17
WNW	1500	TH-227	3.7E-14	6.7E-18	9.0E-18	1.6E-17
WNW	1500	TH-228	3.0E-13	5.4E-17	7.3E-17	1.3E-16
WNW	1500	TH-230	2.4E-11	4.4E-15	5.9E-15	1.0E-14
WNW	1500	TH-231	4.7E-14	8.4E-18	1.1E-17	2.0E-17
WNW	1500	TH-232	3.4E-13	6.1E-17	8.2E-17	1.4E-16
WNW	1500	TH-234	7.2E-13	1.3E-16	1.7E-16	3.0E-16
WNW	1500	U-234	7.0E-13	1.3E-16	1.7E-16	3.0E-16
WNW	1500	U-235	4.7E-14	8.5E-18	1.1E-17	2.0E-17
WNW	1500	U-236	4.7E-14	8.5E-18	1.1E-17	2.0E-17
WNW	1500	U-238	7.2E-13	1.3E-16	1.7E-16	3.0E-16
WNW	1700	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	1700	AC-227	3.5E-13	6.2E-17	7.9E-17	1.4E-16
WNW	1700	AC-228	1.4E-13	2.6E-17	3.3E-17	5.9E-17
WNW	1700	BI-210	1.3E-12	2.3E-16	3.0E-16	5.3E-16
WNW	1700	FR-223	2.1E-15	3.8E-19	4.3E-19	8.1E-19
WNW	1700	PA-231	2.3E-13	4.2E-17	5.4E-17	9.6E-17
WNW	1700	PA-234	7.1E-16	1.3E-19	1.6E-19	2.9E-19
WNW	1700	PA-234M	4.1E-15	7.5E-19	5.5E-19	1.3E-18
WNW	1700	PB-210	1.3E-12	2.3E-16	3.0E-16	5.3E-16
WNW	1700	PO-210	1.3E-12	2.3E-16	3.0E-16	5.3E-16
WNW	1700	RA-223	3.5E-13	6.2E-17	7.9E-17	1.4E-16
WNW	1700	RA-224	1.4E-13	2.5E-17	3.2E-17	5.6E-17
WNW	1700	RA-226	1.4E-12	2.6E-16	3.3E-16	5.9E-16
WNW	1700	RA-228	1.5E-13	2.7E-17	3.5E-17	6.2E-17
WNW	1700	TH-227	3.4E-14	6.2E-18	7.9E-18	1.4E-17
WNW	1700	TH-228	2.8E-13	5.0E-17	6.4E-17	1.1E-16
WNW	1700	TH-230	2.2E-11	4.0E-15	5.2E-15	9.2E-15
WNW	1700	TH-231	4.3E-14	7.8E-18	9.9E-18	1.8E-17
WNW	1700	TH-232	3.1E-13	5.7E-17	7.2E-17	1.3E-16
WNW	1700	TH-234	6.6E-13	1.2E-16	1.5E-16	2.7E-16
WNW	1700	U-234	6.5E-13	1.2E-16	1.5E-16	2.7E-16
WNW	1700	U-235	4.4E-14	7.9E-18	1.0E-17	1.8E-17
WNW	1700	U-236	4.4E-14	7.9E-18	1.0E-17	1.8E-17
WNW	1700	U-238	6.6E-13	1.2E-16	1.5E-16	2.7E-16
WNW	2000	RN-222	1.8E-04	0.0E+00	0.0E+00	0.0E+00
WNW	2000	AC-227	3.1E-13	5.5E-17	6.7E-17	1.2E-16
WNW	2000	AC-228	1.3E-13	2.3E-17	2.8E-17	5.0E-17
WNW	2000	BI-210	1.2E-12	2.1E-16	2.5E-16	4.6E-16
WNW	2000	FR-223	1.6E-15	2.9E-19	3.1E-19	6.0E-19
WNW	2000	PA-231	2.1E-13	3.8E-17	4.5E-17	8.3E-17
WNW	2000	PA-234	6.3E-16	1.1E-19	1.4E-19	2.5E-19
WNW	2000	PA-234M	2.2E-15	3.9E-19	2.8E-19	6.7E-19
WNW	2000	PB-210	1.2E-12	2.1E-16	2.5E-16	4.6E-16
WNW	2000	PO-210	1.2E-12	2.1E-16	2.5E-16	4.6E-16
WNW	2000	RA-223	3.1E-13	5.5E-17	6.7E-17	1.2E-16
WNW	2000	RA-224	1.2E-13	2.2E-17	2.7E-17	4.9E-17
WNW	2000	RA-226	1.3E-12	2.3E-16	2.8E-16	5.1E-16
WNW	2000	RA-228	1.3E-13	2.4E-17	2.9E-17	5.4E-17
WNW	2000	TH-227	3.1E-14	5.5E-18	6.7E-18	1.2E-17
WNW	2000	TH-228	2.5E-13	4.5E-17	5.4E-17	9.9E-17
WNW	2000	TH-230	2.0E-11	3.6E-15	4.4E-15	8.0E-15
WNW	2000	TH-231	3.8E-14	6.9E-18	8.3E-18	1.5E-17
WNW	2000	TH-232	2.8E-13	5.0E-17	6.1E-17	1.1E-16
WNW	2000	TH-234	5.9E-13	1.1E-16	1.3E-16	2.4E-16
WNW	2000	U-234	5.8E-13	1.0E-16	1.3E-16	2.3E-16
WNW	2000	U-235	3.9E-14	7.0E-18	8.5E-18	1.5E-17
WNW	2000	U-236	3.9E-14	7.0E-18	8.5E-18	1.5E-17
WNW	2000	U-238	5.9E-13	1.1E-16	1.3E-16	2.4E-16

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	2300	RN-222	1.6E-04	0.0E+00	0.0E+00	0.0E+00
WNW	2300	AC-227	2.8E-13	5.0E-17	5.8E-17	1.1E-16
WNW	2300	AC-228	1.1E-13	2.0E-17	2.4E-17	4.4E-17
WNW	2300	BI-210	1.0E-12	1.9E-16	2.2E-16	4.1E-16
WNW	2300	FR-223	1.2E-15	2.2E-19	2.3E-19	4.5E-19
WNW	2300	PA-231	1.9E-13	3.4E-17	3.9E-17	7.3E-17
WNW	2300	PA-234	5.6E-16	1.0E-19	1.2E-19	2.2E-19
WNW	2300	PA-234M	1.1E-15	2.0E-19	1.5E-19	3.5E-19
WNW	2300	PB-210	1.0E-12	1.9E-16	2.2E-16	4.1E-16
WNW	2300	PO-210	1.0E-12	1.9E-16	2.2E-16	4.1E-16
WNW	2300	RA-223	2.8E-13	5.0E-17	5.8E-17	1.1E-16
WNW	2300	RA-224	1.1E-13	2.0E-17	2.3E-17	4.3E-17
WNW	2300	RA-226	1.2E-12	2.1E-16	2.4E-16	4.5E-16
WNW	2300	RA-228	1.2E-13	2.2E-17	2.5E-17	4.7E-17
WNW	2300	TH-227	2.8E-14	5.0E-18	5.8E-18	1.1E-17
WNW	2300	TH-228	2.2E-13	4.0E-17	4.7E-17	8.7E-17
WNW	2300	TH-230	1.8E-11	3.3E-15	3.8E-15	7.0E-15
WNW	2300	TH-231	3.5E-14	6.2E-18	7.2E-18	1.3E-17
WNW	2300	TH-232	2.5E-13	4.6E-17	5.3E-17	9.8E-17
WNW	2300	TH-234	5.3E-13	9.6E-17	1.1E-16	2.1E-16
WNW	2300	U-234	5.2E-13	9.4E-17	1.1E-16	2.0E-16
WNW	2300	U-235	3.5E-14	6.3E-18	7.3E-18	1.4E-17
WNW	2300	U-236	3.5E-14	6.3E-18	7.3E-18	1.4E-17
WNW	2300	U-238	5.3E-13	9.6E-17	1.1E-16	2.1E-16
WNW	2400	RN-222	1.5E-04	0.0E+00	0.0E+00	0.0E+00
WNW	2400	AC-227	2.7E-13	4.9E-17	5.5E-17	1.0E-16
WNW	2400	AC-228	1.1E-13	2.0E-17	2.2E-17	4.2E-17
WNW	2400	BI-210	1.0E-12	1.8E-16	2.1E-16	3.9E-16
WNW	2400	FR-223	1.1E-15	2.1E-19	2.1E-19	4.2E-19
WNW	2400	PA-231	1.8E-13	3.3E-17	3.8E-17	7.0E-17
WNW	2400	PA-234	5.4E-16	9.8E-20	1.1E-19	2.1E-19
WNW	2400	PA-234M	9.2E-16	1.6E-19	1.2E-19	2.9E-19
WNW	2400	PB-210	1.0E-12	1.8E-16	2.1E-16	3.9E-16
WNW	2400	PO-210	1.0E-12	1.8E-16	2.1E-16	3.9E-16
WNW	2400	RA-223	2.7E-13	4.9E-17	5.5E-17	1.0E-16
WNW	2400	RA-224	1.1E-13	1.9E-17	2.2E-17	4.1E-17
WNW	2400	RA-226	1.1E-12	2.0E-16	2.3E-16	4.3E-16
WNW	2400	RA-228	1.2E-13	2.1E-17	2.4E-17	4.6E-17
WNW	2400	TH-227	2.7E-14	4.8E-18	5.5E-18	1.0E-17
WNW	2400	TH-228	2.2E-13	3.9E-17	4.5E-17	8.4E-17
WNW	2400	TH-230	1.8E-11	3.2E-15	3.6E-15	6.8E-15
WNW	2400	TH-231	3.3E-14	6.0E-18	6.9E-18	1.3E-17
WNW	2400	TH-232	2.5E-13	4.4E-17	5.0E-17	9.5E-17
WNW	2400	TH-234	5.2E-13	9.3E-17	1.1E-16	2.0E-16
WNW	2400	U-234	5.1E-13	9.1E-17	1.0E-16	1.9E-16
WNW	2400	U-235	3.4E-14	6.1E-18	7.0E-18	1.3E-17
WNW	2400	U-236	3.4E-14	6.1E-18	7.0E-18	1.3E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	2400	U-238	5.2E-13	9.3E-17	1.1E-16	2.0E-16
WNW	2600	RN-222	1.5E-04	0.0E+00	0.0E+00	0.0E+00
WNW	2600	AC-227	2.5E-13	4.6E-17	5.1E-17	9.7E-17
WNW	2600	AC-228	1.0E-13	1.9E-17	2.1E-17	3.9E-17
WNW	2600	BI-210	9.6E-13	1.7E-16	1.9E-16	3.6E-16
WNW	2600	FR-223	9.7E-16	1.8E-19	1.7E-19	3.5E-19
WNW	2600	PA-231	1.7E-13	3.1E-17	3.5E-17	6.6E-17
WNW	2600	PA-234	5.1E-16	9.2E-20	1.0E-19	1.9E-19
WNW	2600	PA-234M	6.0E-16	1.1E-19	8.0E-20	1.9E-19
WNW	2600	PB-210	9.6E-13	1.7E-16	1.9E-16	3.6E-16
WNW	2600	PO-210	9.6E-13	1.7E-16	1.9E-16	3.6E-16
WNW	2600	RA-223	2.5E-13	4.6E-17	5.1E-17	9.7E-17
WNW	2600	RA-224	1.0E-13	1.8E-17	2.0E-17	3.8E-17
WNW	2600	RA-226	1.1E-12	1.9E-16	2.1E-16	4.0E-16
WNW	2600	RA-228	1.1E-13	2.0E-17	2.2E-17	4.2E-17
WNW	2600	TH-227	2.5E-14	4.6E-18	5.1E-18	9.6E-18
WNW	2600	TH-228	2.1E-13	3.7E-17	4.1E-17	7.8E-17
WNW	2600	TH-230	1.7E-11	3.0E-15	3.3E-15	6.3E-15
WNW	2600	TH-231	3.2E-14	5.7E-18	6.3E-18	1.2E-17
WNW	2600	TH-232	2.3E-13	4.2E-17	4.6E-17	8.8E-17
WNW	2600	TH-234	4.9E-13	8.8E-17	9.8E-17	1.9E-16
WNW	2600	U-234	4.8E-13	8.6E-17	9.5E-17	1.8E-16
WNW	2600	U-235	3.2E-14	5.8E-18	6.4E-18	1.2E-17
WNW	2600	U-236	3.2E-14	5.8E-18	6.4E-18	1.2E-17
WNW	2600	U-238	4.9E-13	8.8E-17	9.8E-17	1.9E-16
WNW	2700	RN-222	1.4E-04	0.0E+00	0.0E+00	0.0E+00
WNW	2700	AC-227	2.5E-13	4.5E-17	4.9E-17	9.4E-17
WNW	2700	AC-228	1.0E-13	1.8E-17	2.0E-17	3.8E-17
WNW	2700	BI-210	9.3E-13	1.7E-16	1.8E-16	3.5E-16
WNW	2700	FR-223	9.0E-16	1.6E-19	1.6E-19	3.2E-19
WNW	2700	PA-231	1.7E-13	3.0E-17	3.3E-17	6.3E-17
WNW	2700	PA-234	4.9E-16	8.9E-20	9.7E-20	1.9E-19
WNW	2700	PA-234M	4.8E-16	8.7E-20	6.5E-20	1.5E-19
WNW	2700	PB-210	9.3E-13	1.7E-16	1.8E-16	3.5E-16
WNW	2700	PO-210	9.3E-13	1.7E-16	1.8E-16	3.5E-16
WNW	2700	RA-223	2.5E-13	4.5E-17	4.9E-17	9.4E-17
WNW	2700	RA-224	9.8E-14	1.8E-17	1.9E-17	3.7E-17
WNW	2700	RA-226	1.0E-12	1.9E-16	2.0E-16	3.9E-16
WNW	2700	RA-228	1.1E-13	2.0E-17	2.1E-17	4.1E-17
WNW	2700	TH-227	2.5E-14	4.4E-18	4.9E-18	9.3E-18
WNW	2700	TH-228	2.0E-13	3.6E-17	4.0E-17	7.5E-17
WNW	2700	TH-230	1.6E-11	2.9E-15	3.2E-15	6.1E-15
WNW	2700	TH-231	3.1E-14	5.5E-18	6.1E-18	1.2E-17
WNW	2700	TH-232	2.3E-13	4.1E-17	4.5E-17	8.5E-17
WNW	2700	TH-234	4.8E-13	8.6E-17	9.4E-17	1.8E-16
WNW	2700	U-234	4.6E-13	8.4E-17	9.2E-17	1.8E-16
WNW	2700	U-235	3.1E-14	5.6E-18	6.2E-18	1.2E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WNW	2700	U-236	3.1E-14	5.6E-18	6.2E-18	1.2E-17
WNW	2700	U-238	4.8E-13	8.6E-17	9.4E-17	1.8E-16
WNW	3500	RN-222	1.2E-04	0.0E+00	0.0E+00	0.0E+00
WNW	3500	AC-227	2.0E-13	3.6E-17	3.7E-17	7.3E-17
WNW	3500	AC-228	7.8E-14	1.4E-17	1.4E-17	2.8E-17
WNW	3500	BI-210	7.5E-13	1.3E-16	1.4E-16	2.7E-16
WNW	3500	FR-223	4.8E-16	8.6E-20	8.2E-20	1.7E-19
WNW	3500	PA-231	1.3E-13	2.4E-17	2.5E-17	4.9E-17
WNW	3500	PA-234	3.9E-16	6.9E-20	7.2E-20	1.4E-19
WNW	3500	PA-234M	9.3E-17	1.7E-20	1.3E-20	3.0E-20
WNW	3500	PB-210	7.5E-13	1.3E-16	1.4E-16	2.7E-16
WNW	3500	PO-210	7.5E-13	1.3E-16	1.4E-16	2.7E-16
WNW	3500	RA-223	2.0E-13	3.6E-17	3.7E-17	7.3E-17
WNW	3500	RA-224	7.9E-14	1.4E-17	1.5E-17	2.9E-17
WNW	3500	RA-226	8.3E-13	1.5E-16	1.6E-16	3.0E-16
WNW	3500	RA-228	8.7E-14	1.6E-17	1.6E-17	3.2E-17
WNW	3500	TH-227	2.0E-14	3.5E-18	3.7E-18	7.2E-18
WNW	3500	TH-228	1.6E-13	2.9E-17	3.0E-17	5.9E-17
WNW	3500	TH-230	1.3E-11	2.3E-15	2.4E-15	4.7E-15
WNW	3500	TH-231	2.4E-14	4.4E-18	4.6E-18	9.0E-18
WNW	3500	TH-232	1.8E-13	3.2E-17	3.4E-17	6.6E-17
WNW	3500	TH-234	3.8E-13	6.9E-17	7.1E-17	1.4E-16
WNW	3500	U-234	3.7E-13	6.7E-17	7.0E-17	1.4E-16
WNW	3500	U-235	2.5E-14	4.5E-18	4.7E-18	9.2E-18
WNW	3500	U-236	2.5E-14	4.5E-18	4.7E-18	9.2E-18
WNW	3500	U-238	3.8E-13	6.9E-17	7.1E-17	1.4E-16
W	300	RN-222	3.8E-04	0.0E+00	0.0E+00	0.0E+00
W	300	AC-227	6.9E-13	1.2E-16	7.4E-16	8.7E-16
W	300	AC-228	3.0E-13	5.4E-17	3.2E-16	3.8E-16
W	300	BI-210	2.6E-12	4.6E-16	2.8E-15	3.3E-15
W	300	FR-223	8.6E-15	1.6E-18	8.9E-18	1.0E-17
W	300	PA-231	4.6E-13	8.4E-17	5.0E-16	5.9E-16
W	300	PA-234	1.5E-15	2.6E-19	1.6E-18	1.9E-18
W	300	PA-234M	2.8E-13	5.1E-17	1.4E-16	1.9E-16
W	300	PB-210	2.6E-12	4.6E-16	2.8E-15	3.3E-15
W	300	PO-210	2.6E-12	4.6E-16	2.8E-15	3.3E-15
W	300	RA-223	6.9E-13	1.2E-16	7.4E-16	8.7E-16
W	300	RA-224	2.7E-13	4.9E-17	2.9E-16	3.4E-16
W	300	RA-226	2.9E-12	5.2E-16	3.1E-15	3.6E-15
W	300	RA-228	3.0E-13	5.4E-17	3.3E-16	3.8E-16
W	300	TH-227	6.8E-14	1.2E-17	7.4E-17	8.6E-17
W	300	TH-228	5.5E-13	1.0E-16	6.0E-16	7.0E-16
W	300	TH-230	4.5E-11	8.0E-15	4.8E-14	5.6E-14
W	300	TH-231	8.7E-14	1.6E-17	9.4E-17	1.1E-16
W	300	TH-232	6.2E-13	1.1E-16	6.8E-16	7.9E-16
W	300	TH-234	1.3E-12	2.4E-16	1.4E-15	1.7E-15
W	300	U-234	1.3E-12	2.3E-16	1.4E-15	1.6E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	300	U-235	8.7E-14	1.6E-17	9.4E-17	1.1E-16
W	300	U-236	8.7E-14	1.6E-17	9.4E-17	1.1E-16
W	300	U-238	1.3E-12	2.4E-16	1.4E-15	1.7E-15
W	500	RN-222	3.8E-04	0.0E+00	0.0E+00	0.0E+00
W	500	AC-227	6.8E-13	1.2E-16	4.4E-16	5.7E-16
W	500	AC-228	3.0E-13	5.3E-17	1.9E-16	2.5E-16
W	500	BI-210	2.6E-12	4.6E-16	1.7E-15	2.1E-15
W	500	FR-223	7.9E-15	1.4E-18	4.8E-18	6.3E-18
W	500	PA-231	4.6E-13	8.3E-17	3.0E-16	3.8E-16
W	500	PA-234	1.5E-15	2.6E-19	9.5E-19	1.2E-18
W	500	PA-234M	1.4E-13	2.5E-17	3.8E-17	6.2E-17
W	500	PB-210	2.6E-12	4.6E-16	1.7E-15	2.1E-15
W	500	PO-210	2.6E-12	4.6E-16	1.7E-15	2.1E-15
W	500	RA-223	6.8E-13	1.2E-16	4.4E-16	5.7E-16
W	500	RA-224	2.7E-13	4.9E-17	1.8E-16	2.3E-16
W	500	RA-226	2.8E-12	5.1E-16	1.9E-15	2.4E-15
W	500	RA-228	3.0E-13	5.4E-17	1.9E-16	2.5E-16
W	500	TH-227	6.8E-14	1.2E-17	4.4E-17	5.6E-17
W	500	TH-228	5.5E-13	9.9E-17	3.6E-16	4.6E-16
W	500	TH-230	4.4E-11	8.0E-15	2.9E-14	3.7E-14
W	500	TH-231	8.6E-14	1.5E-17	5.6E-17	7.1E-17
W	500	TH-232	6.2E-13	1.1E-16	4.0E-16	5.2E-16
W	500	TH-234	1.3E-12	2.4E-16	8.5E-16	1.1E-15
W	500	U-234	1.3E-12	2.3E-16	8.3E-16	1.1E-15
W	500	U-235	8.6E-14	1.6E-17	5.6E-17	7.2E-17
W	500	U-236	8.6E-14	1.6E-17	5.6E-17	7.2E-17
W	500	U-238	1.3E-12	2.4E-16	8.5E-16	1.1E-15
W	700	RN-222	4.1E-04	0.0E+00	0.0E+00	0.0E+00
W	700	AC-227	7.4E-13	1.3E-16	3.2E-16	4.5E-16
W	700	AC-228	3.2E-13	5.8E-17	1.4E-16	1.9E-16
W	700	BI-210	2.8E-12	5.0E-16	1.2E-15	1.7E-15
W	700	FR-223	8.0E-15	1.4E-18	3.1E-18	4.5E-18
W	700	PA-231	5.0E-13	9.1E-17	2.1E-16	3.1E-16
W	700	PA-234	1.6E-15	2.9E-19	6.7E-19	9.6E-19
W	700	PA-234M	8.4E-14	1.5E-17	1.6E-17	3.2E-17
W	700	PB-210	2.8E-12	5.0E-16	1.2E-15	1.7E-15
W	700	PO-210	2.8E-12	5.0E-16	1.2E-15	1.7E-15
W	700	RA-223	7.4E-13	1,3E-16	3.2E-16	4.5E-16
W	700	RA-224	3.0E-13	5.3E-17	1.3E-16	1.8E-16
W	700	RA-226	3.1E-12	5.6E-16	1.3E-15	1.9E-15
W	700	RA-228	3.3E-13	5.9E-17	1.4E-16	2.0E-16
W	700	TH-227	7.4E-14	1.3E-17	3.1E-17	4.5E-17
W	700	TH-228	6.0E-13	1.1E-16	2.6E-16	3.6E-16
W	700	TH-230	4.8E-11	8.7E-15	2.1E-14	2.9E-14
W	700	TH-231	9.4E-14	1.7E-17	4.0E-17	5.7E-17
W	700	TH-232	6.8E-13	1.2E-16	2.9E-16	4.1E-16
W	700	TH-234	1.4E-12	2.6E-16	6.1E-16	8.7E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	700	U-234	1.4E-12	2.5E-16	5.9E-16	8.4E-16
W	700	U-235	9.4E-14	1.7E-17	4.0E-17	5.7E-17
W	700	U-236	9.4E-14	1.7E-17	4.0E-17	5.7E-17
W	700	U-238	1.4E-12	2.6E-16	6.1E-16	8.7E-16
W	1000	RN-222	4.4E-04	0.0E+00	0.0E+00	0.0E+00
W	1000	AC-227	7.8E-13	1.4E-16	2.2E-16	3.6E-16
W	1000	AC-228	3.4E-13	6.1E-17	9.4E-17	1.5E-16
W	1000	BI-210	3.0E-12	5.3E-16	8.3E-16	1.4E-15
W	1000	FR-223	7.3E-15	1.3E-18	1.9E-18	3.2E-18
W	1000	PA-231	5.3E-13	9.6E-17	1.5E-16	2.5E-16
W	1000	PA-234	1.7E-15	3.0E-19	4.6E-19	7.6E-19
W	1000	PA-234M	4.3E-14	7.7E-18	6.4E-18	1.4E-17
W	1000	PB-210	3.0E-12	5.3E-16	8.3E-16	1.4E-15
W	1000	PO-210	3.0E-12	5.3E-16	8.3E-16	1.4E-15
W	1000	RA-223	7.8E-13	1.4E-16	2.2E-16	3.6E-16
W	1000	RA-224	3.1E-13	5.6E-17	8.8E-17	1.4E-16
W	1000	RA-226	3.3E-12	5.9E-16	9.2E-16	1.5E-15
W	1000	RA-228	3.4E-13	6.2E-17	9.7E-17	1.6E-16
W	1000	TH-227	7.8E-14	1.4E-17	2.2E-17	3.6E-17
W	1000	TH-228	6.3E-13	1.1E-16	1.8E-16	2.9E-16
W	1000	TH-230	5.1E-11	9.2E-15	1.4E-14	2.4E-14
W	1000	TH-231	9.9E-14	1.8E-17	2.8E-17	4.5E-17
W	1000	TH-232	7.1E-13	1.3E-16	2.0E-16	3.3E-16
W	1000	TH-234	1.5E-12	2.7E-16	4.2E-16	7.0E-16
W	1000	U-234	1.5E-12	2.6E-16	4.1E-16	6.8E-16
W	1000	U-235	9.9E-14	1.8E-17	2.8E-17	4.6E-17
W	1000	U-236	9.9E-14	1.8E-17	2.8E-17	4.6E-17
W	1000	U-238	1.5E-12	2.7E-16	4.2E-16	7.0E-16
W	1300	RN-222	3.9E-04	0.0E+00	0.0E+00	0.0E+00
W	1300	AC-227	7.0E-13	1.3E-16	1.7E-16	3.0E-16
W	1300	AC-228	3.0E-13	5.4E-17	7.1E-17	1.2E-16
W	1300	BI-210	2.6E-12	4.7E-16	6.4E-16	1.1E-15
W	1300	FR-223	5.6E-15	1.0E-18	1.2E-18	2.2E-18
W	1300	PA-231	4.8E-13	8.6E-17	1.1E-16	2.0E-16
W	1300	PA-234	1.5E-15	2.6E-19	3.5E-19	6.2E-19
W	1300	PA-234M	2.1E-14	3.8E-18	2.9E-18	6.7E-18
W	1300	PB-210	2.6E-12	4.7E-16	6.4E-16	1.1E-15
W	1300	PO-210	2.6E-12	4.7E-16	6.4E-16	1.1E-15
W	1300	RA-223	7.0E-13	1.3E-16	1.7E-16	3.0E-16
W	1300	RA-224	2.8E-13	5.0E-17	6.7E-17	1.2E-16
W	1300	RA-226	2.9E-12	5.3E-16	7.1E-16	1.2E-15
W	1300	RA-228	3.1E-13	5.5E-17	7.4E-17	1.3E-16
W	1300	TH-227	7.0E-14	1.3E-17	1.7E-17	2.9E-17
W	1300	TH-228	5.7E-13	1.0E-16	1.4E-16	2.4E-16
W	1300	TH-230	4.6E-11	8.2E-15	1.1E-14	1.9E-14
W	1300	TH-231	8.8E-14	1.6E-17	2.1E-17	3.7E-17
W	1300	TH-232	6.4E-13	1.1E-16	1.5E-16	2.7E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	1300	TH-234	1.3E-12	2.4E-16	3.2E-16	5.7E-16
W	1300	U-234	1.3E-12	2.4E-16	3.2E-16	5.5E-16
W	1300	U-235	8.9E-14	1.6E-17	2.1E-17	3.7E-17
W	1300	U-236	8.9E-14	1.6E-17	2.1E-17	3.7E-17
W	1300	U-238	1.3E-12	2.4E-16	3.2E-16	5.7E-16
W	1500	RN-222	3.6E-04	0.0E+00	0.0E+00	0.0E+00
W	1500	AC-227	6.5E-13	1.2E-16	1.5E-16	2.6E-16
W	1500	AC-228	2.7E-13	4.9E-17	6.1E-17	1.1E-16
W	1500	BI-210	2.4E-12	4.4E-16	5.5E-16	9.9E-16
W	1500	FR-223	4.7E-15	8.5E-19	9.7E-19	1.8E-18
W	1500	PA-231	4.4E-13	7.9E-17	9.9E-17	1.8E-16
W	1500	PA-234	1.3E-15	2.4E-19	3.0E-19	5.4E-19
W	1500	PA-234M	1.3E-14	2.4E-18	1.8E-18	4.2E-18
W	1500	PB-210	2.4E-12	4.4E-16	5.5E-16	9.9E-16
W	1500	PO-210	2.4E-12	4.4E-16	5.5E-16	9.9E-16
W	1500	RA-223	6.5E-13	1.2E-16	1.5E-16	2.6E-16
W	1500	RA-224	2.6E-13	4.6E-17	5.8E-17	1.0E-16
W	1500	RA-226	2.7E-12	4.9E-16	6.1E-16	1.1E-15
W	1500	RA-228	2.8E-13	5.1E-17	6.4E-17	1.1E-16
W	1500	TH-227	6.4E-14	1.2E-17	1.4E-17	2.6E-17
W	1500	TH-228	5.2E-13	9.4E-17	1.2E-16	2.1E-16
W	1500	TH-230	4.2E-11	7.6E-15	9.5E-15	1.7E-14
W	1500	TH-231	8.1E-14	1.5E-17	1.8E-17	3.3E-17
W	1500	TH-232	5.9E-13	1.1E-16	1.3E-16	2.4E-16
W	1500	TH-234	1.2E-12	2.2E-16	2.8E-16	5.0E-16
W	1500	U-234	1.2E-12	2.2E-16	2.7E-16	4.9E-16
W	1500	U-235	8.2E-14	1.5E-17	1.8E-17	3.3E-17
W	1500	U-236	8.2E-14	1.5E-17	1.8E-17	3.3E-17
W	1500	U-238	1.2E-12	2.2E-16	2.8E-16	5.0E-16
W	1700	RN-222	3.4E-04	0.0E+00	0.0E+00	0.0E+00
W	1700	AC-227	6.0E-13	1.1E-16	1.3E-16	2.4E-16
W	1700	AC-228	2.5E-13	4.5E-17	5.4E-17	9.8E-17
W	1700	BI-210	2.2E-12	4.0E-16	4.8E-16	8.9E-16
W	1700	FR-223	4.0E-15	7.1E-19	7.7E-19	1.5E-18
W	1700	PA-231	4.0E-13	7.3E-17	8.7E-17	1.6E-16
W	1700	PA-234	1.2E-15	2.2E-19	2.6E-19	4.9E-19
W	1700	PA-234M	8.6E-15	1.5E-18	1.1E-18	2.7E-18
W	1700	PB-210	2.2E-12	4.0E-16	4.8E-16	8.9E-16
W	1700	PO-210	2.2E-12	4.0E-16	4.8E-16	8.9E-16
W	1700	RA-223	6.0E-13	1.1E-16	1.3E-16	2.4E-16
W	1700	RA-224	2.4E-13	4.3E-17	5.1E-17	9.3E-17
W	1700	RA-226	2.5E-12	4.5E-16	5.4E-16	9.8E-16
W	1700	RA-228	2.6E-13	4.7E-17	5.6E-17	1.0E-16
W	1700	TH-227	5.9E-14	1.1E-17	1.3E-17	2.3E-17
W	1700	TH-228	4.8E-13	8.6E-17	1.0E-16	1.9E-16
W	1700	TH-230	3.9E-11	7.0E-15	8.3E-15	1.5E-14
W	1700	TH-231	7.4E-14	1.3E-17	1.6E-17	2.9E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	1700	TH-232	5.4E-13	9.7E-17	1.2E-16	2.1E-16
W	1700	TH-234	1.1E-12	2.1E-16	2.5E-16	4.5E-16
W	1700	U-234	1.1E-12	2.0E-16	2.4E-16	4.4E-16
W	1700	U-235	7.5E-14	1.4E-17	1.6E-17	3.0E-17
W	1700	U-236	7.5E-14	1.4E-17	1.6E-17	3.0E-17
W	1700	U-238	1.1E-12	2.1E-16	2.5E-16	4.5E-16
W	2000	RN-222	3.0E-04	0.0E+00	0.0E+00	0.0E+00
W	2000	AC-227	5.3E-13	9.6E-17	1.1E-16	2.0E-16
W	2000	AC-228	2.2E-13	4.0E-17	4.5E-17	8.5E-17
W	2000	BI-210	2.0E-12	3.6E-16	4.1E-16	7.7E-16
W	2000	FR-223	3.1E-15	5.5E-19	5.7E-19	1.1E-18
W	2000	PA-231	3.6E-13	6.5E-17	7.3E-17	1.4E-16
W	2000	PA-234	1.1E-15	2.0E-19	2.2E-19	4.2E-19
W	2000	PA-234M	4.4E-15	7.9E-19	5.8E-19	1.4E-18
W	2000	PB-210	2.0E-12	3.6E-16	4.1E-16	7.7E-16
W	2000	PO-210	2.0E-12	3.6E-16	4.1E-16	7.7E-16
W	2000	RA-223	5.3E-13	9.6E-17	1.1E-16	2.0E-16
W	2000	RA-224	2.1E-13	3.8E-17	4.3E-17	8.1E-17
W	2000	RA-226	2.2E-12	4.0E-16	4.5E-16	8.5E-16
W	2000	RA-228	2.3E-13	4.2E-17	4.8E-17	8.9E-17
W	2000	TH-227	5.3E-14	9.5E-18	1.1E-17	2.0E-17
W	2000	TH-228	4.3E-13	7.7E-17	8.7E-17	1.6E-16
W	2000	TH-230	3.5E-11	6.2E-15	7.1E-15	1.3E-14
W	2000	TH-231	6.6E-14	1.2E-17	1.4E-17	2.5E-17
W	2000	TH-232	4.8E-13	8.7E-17	9.9E-17	1.9E-16
W	2000	TH-234	1.0E-12	1.8E-16	2.1E-16	3.9E-16
W	2000	U-234	1.0E-12	1.8E-16	2.0E-16	3.8E-16
W	2000	U-235	6.7E-14	1.2E-17	1.4E-17	2.6E-17
W	2000	U-236	6.7E-14	1.2E-17	1.4E-17	2.6E-17
W	2000	U-238	1.0E-12	1.8E-16	2.1E-16	3.9E-16
W	2300	RN-222	2.8E-04	0.0E+00	0.0E+00	0.0E+00
W	2300	AC-227	4.8E-13	8.7E-17	9.4E-17	1.8E-16
W	2300	AC-228	2.0E-13	3.6E-17	3.8E-17	7.4E-17
W	2300	BI-210	1.8E-12	3.3E-16	3.5E-16	6.8E-16
W	2300	FR-223	2.4E-15	4.3E-19	4.3E-19	8.6E-19
W	2300	PA-231	3.3E-13	5.9E-17	6.4E-17	1.2E-16
W	2300	PA-234	9.8E-16	1.8E-19	1.9E-19	3.7E-19
W	2300	PA-234M	2.3E-15	4.1E-19	3.0E-19	7.2E-19
W	2300	PB-210	1.8E-12	3.3E-16	3.5E-16	6.8E-16
W	2300	PO-210	1.8E-12	3.3E-16	3.5E-16	6.8E-16
W	2300	RA-223	4.8E-13	8.7E-17	9.4E-17	1.8E-16
W	2300	RA-224	1.9E-13	3.4E-17	3.7E-17	7.2E-17
W	2300	RA-226	2.0E-12	3.6E-16	3.9E-16	7.5E-16
W	2300	RA-228	2.1E-13	3.8E-17	4.1E-17	7.9E-17
W	2300	TH-227	4.8E-14	8.6E-18	9.3E-18	1.8E-17
W	2300	TH-228	3.9E-13	7.0E-17	7.6E-17	1.5E-16
W	2300	TH-230	3.1E-11	5.6E-15	6.1E-15	1.2E-14

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	2300	TH-231	6.0E-14	1.1E-17	1.2E-17	2.2E-17
W	2300	TH-232	4.4E-13	7.9E-17	8.5E-17	1.6E-16
W	2300	TH-234	9.3E-13	1.7E-16	1.8E-16	3.5E-16
W	2300	U-234	9.0E-13	1.6E-16	1.8E-16	3.4E-16
W	2300	U-235	6.1E-14	1.1E-17	1.2E-17	2.3E-17
W	2300	U-236	6.1E-14	1.1E-17	1.2E-17	2.3E-17
W	2300	U-238	9.3E-13	1.7E-16	1.8E-16	3.5E-16
W	2400	RN-222	2.7E-04	0.0E+00	0.0E+00	0.0E+00
W	2400	AC-227	4.7E-13	8.4E-17	9.0E-17	1.7E-16
W	2400	AC-228	1.9E-13	3.5E-17	3.7E-17	7.1E-17
W	2400	BI-210	1.8E-12	3.2E-16	3.4E-16	6.5E-16
W	2400	FR-223	2.2E-15	4.0E-19	3.9E-19	7.9E-19
W	2400	PA-231	3.2E-13	5.7E-17	6.1E-17	1.2E-16
W	2400	PA-234	9.5E-16	1.7E-19	1.8E-19	3.5E-19
W	2400	PA-234M	1.9E-15	3.3E-19	2.5E-19	5.8E-19
W	2400	PB-210	1.8E-12	3.2E-16	3.4E-16	6.5E-16
W	2400	PO-210	1.8E-12	3.2E-16	3.4E-16	6.5E-16
W	2400	RA-223	4.7E-13	8.4E-17	9.0E-17	1.7E-16
W	2400	RA-224	1.9E-13	3.3E-17	3.6E-17	6.9E-17
W	2400	RA-226	2.0E-12	3.5E-16	3.7E-16	7.3E-16
W	2400	RA-228	2.0E-13	3.7E-17	3.9E-17	7.6E-17
W	2400	TH-227	4.6E-14	8.4E-18	8.9E-18	1.7E-17
W	2400	TH-228	3.8E-13	6.8E-17	7.2E-17	1.4E-16
W	2400	TH-230	3.0E-11	5.5E-15	5.8E-15	1.1E-14
W	2400	TH-231	5.8E-14	1.0E-17	1.1E-17	2.2E-17
W	2400	TH-232	4.3E-13	7.7E-17	8.2E-17	1.6E-16
W	2400	TH-234	9.0E-13	1.6E-16	1.7E-16	3.3E-16
W	2400	U-234	8.8E-13	1.6E-16	1.7E-16	3.3E-16
W	2400	U-235	5.9E-14	1.1E-17	1.1E-17	2.2E-17
W	2400	U-236	5.9E-14	1.1E-17	1.1E-17	2.2E-17
W	2400	U-238	9.0E-13	1.6E-16	1.7E-16	3.3E-16
W	2600	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
W	2600	AC-227	4.4E-13	7.9E-17	8.2E-17	1.6E-16
W	2600	AC-228	1.8E-13	3.2E-17	3.3E-17	6.6E-17
W	2600	BI-210	1.7E-12	3.0E-16	3.1E-16	6.1E-16
W	2600	FR-223	1.9E-15	3.4E-19	3.3E-19	6.7E-19
W	2600	PA-231	3.0E-13	5.4E-17	5.6E-17	1.1E-16
W	2600	PA-234	8.9E-16	1.6E-19	1.7E-19	3.3E-19
W	2600	PA-234M	1.2E-15	2.2E-19	1.6E-19	3.8E-19
W	2600	PB-210	1.7E-12	3.0E-16	3.1E-16	6.1E-16
W	2600	PO-210	1.7E-12	3.0E-16	3.1E-16	6.1E-16
W	2600	RA-223	4.4E-13	7.9E-17	8.2E-17	1.6E-16
W	2600	RA-224	1.8E-13	3.2E-17	3.3E-17	6.4E-17
W	2600	RA-226	1.8E-12	3.3E-16	3.4E-16	6.8E-16
W	2600	RA-228	1.9E-13	3.5E-17	3.6E-17	7.1E-17
W	2600	TH-227	4.4E-14	7.9E-18	8.2E-18	1.6E-17
W	2600	TH-228	3.6E-13	6.4E-17	6.6E-17	1.3E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	2600	TH-230	2.9E-11	5.2E-15	5.4E-15	1.1E-14
W	2600	TH-231	5.5E-14	9.9E-18	1.0E-17	2.0E-17
W	2600	TH-232	4.0E-13	7.2E-17	7.5E-17	1.5E-16
W	2600	TH-234	8.5E-13	1.5E-16	1.6E-16	3.1E-16
W	2600	U-234	8.3E-13	1.5E-16	1.5E-16	3.0E-16
W	2600	U-235	5.6E-14	1.0E-17	1.0E-17	2.0E-17
W	2600	U-236	5.6E-14	1.0E-17	1.0E-17	2.0E-17
W	2600	U-238	8.5E-13	1.5E-16	1.6E-16	3.1E-16
W	2700	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
W	2700	AC-227	4.3E-13	7.7E-17	7.9E-17	1.6E-16
W	2700	AC-228	1.7E-13	3.1E-17	3.2E-17	6.3E-17
W	2700	BI-210	1.6E-12	2.9E-16	3.0E-16	5.9E-16
W	2700	FR-223	1.8E-15	3.2E-19	3.0E-19	6.2E-19
W	2700	PA-231	2.9E-13	5.2E-17	5.4E-17	1.1E-16
W	2700	PA-234	8.6E-16	1.6E-19	1.6E-19	3.1E-19
W	2700	PA-234M	9.8E-16	1.8E-19	1.3E-19	3.1E-19
W	2700	PB-210	1.6E-12	2.9E-16	3.0E-16	5.9E-16
W	2700	PO-210	1.6E-12	2.9E-16	3.0E-16	5.9E-16
W	2700	RA-223	4.3E-13	7.7E-17	7.9E-17	1.6E-16
W	2700	RA-224	1.7E-13	3.1E-17	3.1E-17	6.2E-17
W	2700	RA-226	1.8E-12	3.2E-16	3.3E-16	6.5E-16
W	2700	RA-228	1.9E-13	3.4E-17	3.5E-17	6.9E-17
W	2700	TH-227	4.3E-14	7.7E-18	7.9E-18	1.6E-17
W	2700	TH-228	3.5E-13	6.2E-17	6.4E-17	1.3E-16
W	2700	TH-230	2.8E-11	5.0E-15	5.2E-15	1.0E-14
W	2700	TH-231	5.3E-14	9.6E-18	9.8E-18	1.9E-17
W	2700	TH-232	3.9E-13	7.0E-17	7.2E-17	1.4E-16
W	2700	TH-234	8.3E-13	1.5E-16	1.5E-16	3.0E-16
W	2700	U-234	8.0E-13	1.4E-16	1.5E-16	2.9E-16
W	2700	U-235	5.4E-14	9.8E-18	1.0E-17	2.0E-17
W	2700	U-236	5.4E-14	9.8E-18	1.0E-17	2.0E-17
W	2700	U-238	8.3E-13	1.5E-16	1.5E-16	3.0E-16
W	3500	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00
W	3500	AC-227	3.4E-13	6.2E-17	6.0E-17	1.2E-16
W	3500	AC-228	1.4E-13	2.4E-17	2.4E-17	4.8E-17
W	3500	BI-210	1.3E-12	2.3E-16	2.3E-16	4.6E-16
W	3500	FR-223	9.9E-16	1.8E-19	1.7E-19	3.4E-19
W	3500	PA-231	2.3E-13	4.2E-17	4.1E-17	8.3E-17
W	3500	PA-234	6.7E-16	1.2E-19	1.2E-19	2.4E-19
W	3500	PA-234M	1.9E-16	3.4E-20	2.7E-20	6.1E-20
W	3500	PB-210	1.3E-12	2.3E-16	2.3E-16	4.6E-16
W	3500	PO-210	1.3E-12	2.3E-16	2.3E-16	4.6E-16
W	3500	RA-223	3.4E-13	6.2E-17	6.0E-17	1.2E-16
W	3500	RA-224	1.4E-13	2.5E-17	2.4E-17	4.8E-17
W	3500	RA-226	1.4E-12	2.6E-16	2.5E-16	5.1E-16
W	3500	RA-228	1.5E-13	2.7E-17	2.6E-17	5.3E-17
W	3500	TH-227	3.4E-14	6.1E-18	6.0E-18	1.2E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
W	3500	TH-228	2.8E-13	5.0E-17	4.8E-17	9.8E-17
W	3500	TH-230	2.2E-11	4.0E-15	3.9E-15	7.9E-15
W	3500	TH-231	4.2E-14	7.6E-18	7.4E-18	1.5E-17
W	3500	TH-232	3.1E-13	5.6E-17	5.5E-17	1.1E-16
W	3500	TH-234	6.6E-13	1.2E-16	1.2E-16	2.3E-16
W	3500	U-234	6.4E-13	1.2E-16	1.1E-16	2.3E-16
W	3500	U-235	4.3E-14	7.8E-18	7.6E-18	1.5E-17
W	3500	U-236	4.3E-14	7.8E-18	7.6E-18	1.5E-17
W	3500	U-238	6.6E-13	1.2E-16	1.2E-16	2.3E-16
WSW	300	RN-222	6.3E-04	0.0E+00	0.0E+00	0.0E+00
WSW	300	AC-227	1.1E-12	2.1E-16	9.1E-16	1.1E-15
WSW	300	AC-228	5.0E-13	9.0E-17	4.0E-16	4.8E-16
WSW	300	BI-210	4.3E-12	7.7E-16	3.4E-15	4.2E-15
WSW	300	FR-223	1.5E-14	2.7E-18	1.1E-17	1.4E-17
WSW	300	PA-231	7.7E-13	1.4E-16	6.1E-16	7.5E-16
WSW	300	PA-234	2.4E-15	4.4E-19	1.9E-18	2.4E-18
WSW	300	PA-234M	6.8E-13	1.2E-16	3.7E-16	4.9E-16
WSW	300	PB-210	4.3E-12	7.7E-16	3.4E-15	4.2E-15
WSW	300	PO-210	4.3E-12	7.7E-16	3.4E-15	4.2E-15
WSW	300	RA-223	1.1E-12	2.1E-16	9.1E-16	1.1E-15
WSW	300	RA-224	4.5E-13	8.1E-17	3.6E-16	4.4E-16
WSW	300	RA-226	4.8E-12	8.6E-16	3.8E-15	4.6E-15
WSW	300	RA-228	5.0E-13	9.0E-17	4.0E-16	4.9E-16
WSW	300	TH-227	1.1E-13	2.0E-17	9.0E-17	1.1E-16
WSW	300	TH-228	9.2E-13	1.7E-16	7.3E-16	9.0E-16
WSW	300	TH-230	7.4E-11	1.3E-14	5.9E-14	7.2E-14
WSW	300	TH-231	1.4E-13	2.6E-17	1.1E-16	1.4E-16
WSW	300	TH-232	1.0E-12	1.9E-16	8.2E-16	1.0E-15
WSW	300	TH-234	2.2E-12	3.9E-16	1.7E-15	2.1E-15
WSW	300	U-234	2.1E-12	3.8E-16	1.7E-15	2.1E-15
WSW	300	U-235	1.4E-13	2.6E-17	1.1E-16	1.4E-16
WSW	300	U-236	1.4E-13	2.6E-17	1.1E-16	1.4E-16
WSW	300	U-238	2.2E-12	3.9E-16	1.7E-15	2.1E-15
WSW	500	RN-222	7.1E-04	0.0E+00	0.0E+00	0.0E+00
WSW	500	AC-227	1.3E-12	2.3E-16	5.4E-16	7.7E-16
WSW	500	AC-228	5.6E-13	1.0E-16	2.4E-16	3.4E-16
WSW	500	BI-210	4.8E-12	8.7E-16	2.0E-15	2.9E-15
WSW	500	FR-223	1.6E-14	2.9E-18	6.3E-18	9.1E-18
WSW	500	PA-231	8.7E-13	1.6E-16	3.7E-16	5.2E-16
WSW	500	PA-234	2.8E-15	5.0E-19	1.2E-18	1.7E-18
WSW	500	PA-234M	4.3E-13	7.8E-17	1.2E-16	2.0E-16
WSW	500	PB-210	4.8E-12	8.7E-16	2.0E-15	2.9E-15
WSW	500	PO-210	4.8E-12	8.7E-16	2.0E-15	2.9E-15
WSW	500	RA-223	1.3E-12	2.3E-16	5.4E-16	7.7E-16
WSW	500	RA-224	5.1E-13	9.2E-17	2.2E-16	3.1E-16
WSW	500	RA-226	5.4E-12	9.7E-16	2.3E-15	3.2E-15
WSW	500	RA-228	5.6E-13	1.0E-16	2.4E-16	3.4E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WSW	500	TH-227	1.3E-13	2.3E-17	5.4E-17	7.7E-17
WSW	500	TH-228	1.0E-12	1.9E-16	4.4E-16	6.2E-16
WSW	500	TH-230	8.4E-11	1.5E-14	3.5E-14	5.0E-14
WSW	500	TH-231	1.6E-13	2.9E-17	6.8E-17	9.7E-17
WSW	500	TH-232	1.2E-12	2.1E-16	4.9E-16	7.0E-16
WSW	500	TH-234	2.5E-12	4.4E-16	1.0E-15	1.5E-15
WSW	500	U-234	2.4E-12	4.3E-16	1.0E-15	1.4E-15
WSW	500	U-235	1.6E-13	2.9E-17	6.8E-17	9.8E-17
WSW	500	U-236	1.6E-13	2.9E-17	6.8E-17	9.8E-17
WSW	500	U-238	2.5E-12	4.4E-16	1.0E-15	1.5E-15
WSW	700	RN-222	8.3E-04	0.0E+00	0.0E+00	0.0E+00
WSW	700	AC-227	1.5E-12	2.7E-16	3.9E-16	6.6E-16
WSW	700	AC-228	6.5E-13	1.2E-16	1.7E-16	2.8E-16
WSW	700	BI-210	5.7E-12	1.0E-15	1.5E-15	2.5E-15
WSW	700	FR-223	1.7E-14	3.1E-18	4.2E-18	7.3E-18
WSW	700	PA-231	1.0E-12	1.8E-16	2.6E-16	4.5E-16
WSW	700	PA-234	3.2E-15	5.8E-19	8.2E-19	1.4E-18
WSW	700	PA-234M	2.9E-13	5.3E-17	5.2E-17	1.0E-16
WSW	700	PB-210	5.7E-12	1.0E-15	1.5E-15	2.5E-15
WSW	700	PO-210	5.7E-12	1.0E-15	1.5E-15	2.5E-15
WSW	700	RA-223	1.5E-12	2.7E-16	3.9E-16	6.6E-16
WSW	700	RA-224	6.0E-13	1.1E-16	1.5E-16	2.6E-16
WSW	700	RA-226	6.3E-12	1.1E-15	1.6E-15	2.7E-15
WSW	700	RA-228	6.6E-13	1.2E-16	1.7E-16	2.9E-16
WSW	700	TH-227	1.5E-13	2.7E-17	3.8E-17	6.5E-17
WSW	700	TH-228	1.2E-12	2.2E-16	3.1E-16	5.3E-16
WSW	700	TH-230	9.8E-11	1.8E-14	2.5E-14	4.3E-14
WSW	700	TH-231	1.9E-13	3.4E-17	4.9E-17	8.3E-17
WSW	700	TH-232	1.4E-12	2.5E-16	3.5E-16	6.0E-16
WSW	700	TH-234	2.9E-12	5.2E-16	7.4E-16	1.3E-15
WSW	700	U-234	2.8E-12	5.1E-16	7.2E-16	1.2E-15
WSW	700	U-235	1.9E-13	3.4E-17	4.9E-17	8.3E-17
WSW	700	U-236	1.9E-13	3.4E-17	4.9E-17	8.3E-17
WSW	700	U-238	2.9E-12	5.2E-16	7.4E-16	1.3E-15
WSW	1000	RN-222	8.5E-04	0.0E+00	0.0E+00	0.0E+00
WSW	1000	AC-227	1.5E-12	2.8E-16	2.7E-16	5.4E-16
WSW	1000	AC-228	6.6E-13	1.2E-16	1.2E-16	2.3E-16
WSW	1000	BI-210	5.8E-12	1.0E-15	1.0E-15	2.0E-15
WSW	1000	FR-223	1.6E-14	2.9E-18	2.6E-18	5.5E-18
WSW	1000	PA-231	1.0E-12	1.9E-16	1.8E-16	3.7E-16
WSW	1000	PA-234	3.2E-15	5.8E-19	5.7E-19	1.2E-18
WSW	1000	PA-234M	1.4E-13	2.5E-17	1.9E-17	4.4E-17
WSW	1000	PB-210	5.8E-12	1.0E-15	1.0E-15	2.0E-15
WSW	1000	PO-210	5.8E-12	1.0E-15	1.0E-15	2.0E-15
WSW	1000	RA-223	1.5E-12	2.8E-16	2.7E-16	5.4E-16
WSW	1000	RA-224	6.1E-13	1.1E-16	1.1E-16	2.2E-16
WSW	1000	RA-226	6.4E-12	1.1E-15	1.1E-15	2.3E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WSW	1000	RA-228	6.7E-13	1.2E-16	1.2E-16	2.4E-16
WSW	1000	TH-227	1.5E-13	2.7E-17	2.7E-17	5.4E-17
WSW	1000	TH-228	1.2E-12	2.2E-16	2.2E-16	4.4E-16
WSW	1000	TH-230	9.9E-11	1.8E-14	1.8E-14	3.5E-14
WSW	1000	TH-231	1.9E-13	3.5E-17	3.4E-17	6.8E-17
WSW	1000	TH-232	1.4E-12	2.5E-16	2.5E-16	5.0E-16
WSW	1000	TH-234	2.9E-12	5.3E-16	5.2E-16	1.0E-15
WSW	1000	U-234	2.9E-12	5.2E-16	5.0E-16	1.0E-15
WSW	1000	U-235	1.9E-13	3.5E-17	3.4E-17	6.9E-17
WSW	1000	U-236	1.9E-13	3.5E-17	3.4E-17	6.9E-17
WSW	1000	U-238	2.9E-12	5.3E-16	5.2E-16	1.0E-15
WSW	1300	RN-222	7.3E-04	0.0E+00	0.0E+00	0.0E+00
WSW	1300	AC-227	1.3E-12	2.4E-16	2.1E-16	4.4E-16
WSW	1300	AC-228	5.6E-13	1.0E-16	8.8E-17	1.9E-16
WSW	1300	BI-210	4.9E-12	8.9E-16	7.8E-16	1.7E-15
WSW	1300	FR-223	1.3E-14	2.3E-18	1.8E-18	4.1E-18
WSW	1300	PA-231	8.9E-13	1.6E-16	1.4E-16	3.0E-16
WSW	1300	PA-234	2.8E-15	5.0E-19	4.3E-19	9.3E-19
WSW	1300	PA-234M	6.2E-14	1.1E-17	7.9E-18	1.9E-17
WSW	1300	PB-210	4.9E-12	8.9E-16	7.8E-16	1.7E-15
WSW	1300	PO-210	4.9E-12	8.9E-16	7.8E-16	1.7E-15
WSW	1300	RA-223	1.3E-12	2.4E-16	2.1E-16	4.4E-16
WSW	1300	RA-224	5.2E-13	9.4E-17	8.2E-17	1.8E-16
WSW	1300	RA-226	5.5E-12	9.9E-16	8.6E-16	1.8E-15
WSW	1300	RA-228	5.7E-13	1.0E-16	9.0E-17	1.9E-16
WSW	1300	TH-227	1.3E-13	2.3E-17	2.0E-17	4.4E-17
WSW	1300	TH-228	1.1E-12	1.9E-16	1.7E-16	3.6E-16
WSW	1300	TH-230	8.5E-11	1.5E-14	1.3E-14	2.9E-14
WSW	1300	TH-231	1.6E-13	3.0E-17	2.6E-17	5.6E-17
WSW	1300	TH-232	1.2E-12	2.1E-16	1.9E-16	4.0E-16
WSW	1300	TH-234	2.5E-12	4.5E-16	4.0E-16	8.5E-16
WSW	1300	U-234	2.5E-12	4.4E-16	3.9E-16	8.3E-16
WSW	1300	U-235	1.7E-13	3.0E-17	2.6E-17	5.6E-17
WSW	1300	U-236	1.7E-13	3.0E-17	2.6E-17	5.6E-17
WSW	1300	U-238	2.5E-12	4.5E-16	4.0E-16	8.5E-16
WSW	1500	RN-222	6.6E-04	0.0E+00	0.0E+00	0.0E+00
WSW	1500	AC-227	1.2E-12	2.1E-16	1.8E-16	3.9E-16
WSW	1500	AC-228	5.0E-13	9.1E-17	7.6E-17	1.7E-16
WSW	1500	BI-210	4.4E-12	8.0E-16	6.7E-16	1.5E-15
WSW	1500	FR-223	1.1E-14	1.9E-18	1.5E-18	3.4E-18
WSW	1500	PA-231	8.0E-13	1.4E-16	1.2E-16	2.6E-16
WSW	1500	PA-234	2.5E-15	4.5E-19	3.7E-19	8.2E-19
WSW	1500	PA-234M	3.8E-14	6.8E-18	4.7E-18	1.1E-17
WSW	1500	PB-210	4.4E-12	8.0E-16	6.7E-16	1.5E-15
WSW	1500	PO-210	4.4E-12	8.0E-16	6.7E-16	1.5E-15
WSW	1500	RA-223	1.2E-12	2.1E-16	1.8E-16	3.9E-16
WSW	1500	RA-224	4.7E-13	8.4E-17	7.1E-17	1.5E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WSW	1500	RA-226	4.9E-12	8.8E-16	7.4E-16	1.6E-15
WSW	1500	RA-228	5.2E-13	9.3E-17	7.8E-17	1.7E-16
WSW	1500	TH-227	1.2E-13	2.1E-17	1.8E-17	3.9E-17
WSW	1500	TH-228	9.5E-13	1.7E-16	1.4E-16	3.1E-16
WSW	1500	TH-230	7.7E-11	1.4E-14	1.2E-14	2.5E-14
WSW	1500	TH-231	1.5E-13	2.7E-17	2.2E-17	4.9E-17
WSW	1500	TH-232	1.1E-12	1.9E-16	1.6E-16	3.5E-16
WSW	1500	TH-234	2.3E-12	4.1E-16	3.4E-16	7.5E-16
WSW	1500	U-234	2.2E-12	4.0E-16	3.3E-16	7.3E-16
WSW	1500	U-235	1.5E-13	2.7E-17	2.3E-17	4.9E-17
WSW	1500	U-236	1.5E-13	2.7E-17	2.3E-17	4.9E-17
WSW	1500	U-238	2.3E-12	4.1E-16	3.4E-16	7.5E-16
WSW	1700	RN-222	5.9E-04	0.0E+00	0.0E+00	0.0E+00
WSW	1700	AC-227	1.1E-12	1.9E-16	1.6E-16	3.5E-16
WSW	1700	AC-228	4.5E-13	8.1E-17	6.6E-17	1.5E-16
WSW	1700	BI-210	4.0E-12	7.2E-16	5.9E-16	1.3E-15
WSW	1700	FR-223	9.0E-15	1.6E-18	1.2E-18	2.8E-18
WSW	1700	PA-231	7.2E-13	1.3E-16	1.1E-16	2.4E-16
WSW	1700	PA-234	2.2E-15	4.0E-19	3.3E-19	7.3E-19
WSW	1700	PA-234M	2.3E-14	4.2E-18	2.8E-18	7.0E-18
WSW	1700	PB-210	4.0E-12	7.2E-16	5.9E-16	1.3E-15
WSW	1700	PO-210	4.0E-12	7.2E-16	5.9E-16	1.3E-15
WSW	1700	RA-223	1.1E-12	1.9E-16	1.6E-16	3.5E-16
WSW	1700	RA-224	4.2E-13	7.6E-17	6.2E-17	1.4E-16
WSW	1700	RA-226	4.4E-12	8.0E-16	6.5E-16	1.5E-15
WSW	1700	RA-228	4.6E-13	8.4E-17	6.9E-17	1.5E-16
WSW	1700	TH-227	1.1E-13	1.9E-17	1.6E-17	3.5E-17
WSW	1700	TH-228	8.5E-13	1.5E-16	1.3E-16	2.8E-16
WSW	1700	TH-230	6.9E-11	1.2E-14	1.0E-14	2.3E-14
WSW	1700	TH-231	1.3E-13	2.4E-17	2.0E-17	4.4E-17
WSW	1700	TH-232	9.6E-13	1.7E-16	1.4E-16	3.2E-16
WSW	1700	TH-234	2.0E-12	3.7E-16	3.0E-16	6.7E-16
WSW	1700	U-234	2.0E-12	3.6E-16	2.9E-16	6.5E-16
WSW	1700	U-235	1.3E-13	2.4E-17	2.0E-17	4.4E-17
WSW	1700	U-236	1.3E-13	2.4E-17	2.0E-17	4.4E-17
WSW	1700	U-238	2.0E-12	3.7E-16	3.0E-16	6.7E-16
WSW	2000	RN-222	5.2E-04	0.0E+00	0.0E+00	0.0E+00
WSW	2000	AC-227	9.1E-13	1.6E-16	1.3E-16	3.0E-16
WSW	2000	AC-228	3.9E-13	7.0E-17	5.6E-17	1.3E-16
WSW	2000	BI-210	3.4E-12	6.2E-16	5.0E-16	1.1E-15
WSW	2000	FR-223	7.0E-15	1.3E-18	9.3E-19	2.2E-18
WSW	2000	PA-231	6.2E-13	1.1E-16	9.0E-17	2.0E-16
WSW	2000	PA-234	1.9E-15	3.4E-19	2.7E-19	6.2E-19
WSW	2000	PA-234M	1.1E-14	2.1E-18	1.4E-18	3.5E-18
WSW	2000	PB-210	3.4E-12	6.2E-16	5.0E-16	1.1E-15
WSW	2000	PO-210	3.4E-12	6.2E-16	5.0E-16	1.1E-15
WSW	2000	RA-223	9.1E-13	1.6E-16	1.3E-16	3.0E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WSW	2000	RA-224	3.6E-13	6.5E-17	5.3E-17	1.2E-16
WSW	2000	RA-226	3.8E-12	6.9E-16	5.5E-16	1.2E-15
WSW	2000	RA-228	4.0E-13	7.2E-17	5.8E-17	1.3E-16
WSW	2000	TH-227	9.1E-14	1.6E-17	1.3E-17	3.0E-17
WSW	2000	TH-228	7.4E-13	1.3E-16	1.1E-16	2.4E-16
WSW	2000	TH-230	5.9E-11	1.1E-14	8.6E-15	1.9E-14
WSW	2000	TH-231	1.1E-13	2.1E-17	1.7E-17	3.7E-17
WSW	2000	TH-232	8.3E-13	1.5E-16	1.2E-16	2.7E-16
WSW	2000	TH-234	1.8E-12	3.2E-16	2.5E-16	5.7E-16
WSW	2000	U-234	1.7E-12	3.1E-16	2.5E-16	5.6E-16
WSW	2000	U-235	1.2E-13	2.1E-17	1.7E-17	3.8E-17
WSW	2000	U-236	1.2E-13	2.1E-17	1.7E-17	3.8E-17
WSW	2000	U-238	1.8E-12	3.2E-16	2.5E-16	5.7E-16
WSW	2300	RN-222	4.5E-04	0.0E+00	0.0E+00	0.0E+00
WSW	2300	AC-227	8.0E-13	1.4E-16	1.1E-16	2.6E-16
WSW	2300	AC-228	3.4E-13	6.0E-17	4.8E-17	1.1E-16
WSW	2300	BI-210	3.0E-12	5.4E-16	4.3E-16	9.7E-16
WSW	2300	FR-223	5.6E-15	1.0E-18	7.4E-19	1.7E-18
WSW	2300	PA-231	5.4E-13	9.8E-17	7.8E-17	1.8E-16
WSW	2300	PA-234	1.7E-15	3.0E-19	2.4E-19	5.3E-19
WSW	2300	PA-234M	5.8E-15	1.1E-18	7.3E-19	1.8E-18
WSW	2300	PB-210	3.0E-12	5.4E-16	4.3E-16	9.7E-16
WSW	2300	PO-210	3.0E-12	5.4E-16	4.3E-16	9.7E-16
WSW	2300	RA-223	8.0E-13	1.4E-16	1.1E-16	2.6E-16
WSW	2300	RA-224	3.2E-13	5.7E-17	4.6E-17	1.0E-16
WSW	2300	RA-226	3.3E-12	6.0E-16	4.8E-16	1.1E-15
WSW	2300	RA-228	3.5E-13	6.3E-17	5.0E-17	1.1E-16
WSW	2300	TH-227	7.9E-14	1.4E-17	1.1E-17	2.6E-17
WSW	2300	TH-228	6.4E-13	1.2E-16	9.3E-17	2.1E-16
WSW	2300	TH-230	5.2E-11	9.4E-15	7.5E-15	1.7E-14
WSW	2300	TH-231	1.0E-13	1.8E-17	1.4E-17	3.2E-17
WSW	2300	TH-232	7.3E-13	1.3E-16	1.0E-16	2.4E-16
WSW	2300	TH-234	1.5E-12	2.8E-16	2.2E-16	5.0E-16
WSW	2300	U-234	1.5E-12	2.7E-16	2.2E-16	4.8E-16
WSW	2300	U-235	1.0E-13	1.8E-17	1.5E-17	3.3E-17
WSW	2300	U-236	1.0E-13	1.8E-17	1.5E-17	3.3E-17
WSW	2300	U-238	1.5E-12	2.8E-16	2.2E-16	5.0E-16
WSW	2400	RN-222	4.3E-04	0.0E+00	0.0E+00	0.0E+00
WSW	2400	AC-227	7.7E-13	1.4E-16	1.1E-16	2.5E-16
WSW	2400	AC-228	3.2E-13	5.8E-17	4.6E-17	1.0E-16
WSW	2400	BI-210	2.9E-12	5.2E-16	4.1E-16	9.3E-16
WSW	2400	FR-223	5.2E-15	9.3E-19	6.9E-19	1.6E-18
WSW	2400	PA-231	5.2E-13	9.3E-17	7.4E-17	1.7E-16
WSW	2400	PA-234	1.6E-15	2.8E-19	2.3E-19	5.1E-19
WSW	2400	PA-234M	4.7E-15	8.5E-19	5.9E-19	1.4E-18
WSW	2400	PB-210	2.9E-12	5.2E-16	4.1E-16	9.3E-16
WSW	2400	PO-210	2.9E-12	5.2E-16	4.1E-16	9.3E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WSW	2400	RA-223	7.7E-13	1.4E-16	1.1E-16	2.5E-16
WSW	2400	RA-224	3.0E-13	5.5E-17	4.4E-17	9.8E-17
WSW	2400	RA-226	3.2E-12	5.8E-16	4.6E-16	1.0E-15
WSW	2400	RA-228	3.4E-13	6.0E-17	4.8E-17	1.1E-16
WSW	2400	TH-227	7.6E-14	1.4E-17	1.1E-17	2.5E-17
WSW	2400	TH-228	6.2E-13	1.1E-16	8.9E-17	2.0E-16
WSW	2400	TH-230	5.0E-11	9.0E-15	7.1E-15	1.6E-14
WSW	2400	TH-231	9.6E-14	1.7E-17	1.4E-17	3.1E-17
WSW	2400	TH-232	7.0E-13	1.3E-16	1.0E-16	2.3E-16
WSW	2400	TH-234	1.5E-12	2.6E-16	2.1E-16	4.8E-16
WSW	2400	U-234	1.4E-12	2.6E-16	2.1E-16	4.6E-16
WSW	2400	U-235	9.7E-14	1.7E-17	1.4E-17	3.1E-17
WSW	2400	U-236	9.7E-14	1.7E-17	1.4E-17	3.1E-17
WSW	2400	U-238	1.5E-12	2.6E-16	2.1E-16	4.8E-16
WSW	2600	RN-222	4.0E-04	0.0E+00	0.0E+00	0.0E+00
WSW	2600	AC-227	7.1E-13	1.3E-16	1.0E-16	2.3E-16
WSW	2600	AC-228	2.9E-13	5.3E-17	4.2E-17	9.5E-17
WSW	2600	BI-210	2.7E-12	4.8E-16	3.8E-16	8.6E-16
WSW	2600	FR-223	4.5E-15	8.1E-19	6.0E-19	1.4E-18
WSW	2600	PA-231	4.8E-13	8.6E-17	6.9E-17	1.5E-16
WSW	2600	PA-234	1.5E-15	2.6E-19	2.1E-19	4.7E-19
WSW	2600	PA-234M	3.1E-15	5.5E-19	3.9E-19	9.4E-19
WSW	2600	PB-210	2.7E-12	4.8E-16	3.8E-16	8.6E-16
WSW	2600	PO-210	2.7E-12	4.8E-16	3.8E-16	8.6E-16
WSW	2600	RA-223	7.1E-13	1.3E-16	1.0E-16	2.3E-16
WSW	2600	RA-224	2.8E-13	5.1E-17	4.0E-17	9.1E-17
WSW	2600	RA-226	3.0E-12	5.3E-16	4.2E-16	9.5E-16
WSW	2600	RA-228	3.1E-13	5.6E-17	4.4E-17	1.0E-16
WSW	2600	TH-227	7.0E-14	1.3E-17	1.0E-17	2.3E-17
WSW	2600	TH-228	5.7E-13	1.0E-16	8.2E-17	1.8E-16
WSW	2600	TH-230	4.6E-11	8.3E-15	6.6E-15	1.5E-14
WSW	2600	TH-231	8.8E-14	1.6E-17	1.3E-17	2.8E-17
WSW	2600	TH-232	6.4E-13	1.2E-16	9.2E-17	2.1E-16
WSW	2600	TH-234	1.4E-12	2.4E-16	1.9E-16	4.4E-16
WSW	2600	U-234	1.3E-12	2.4E-16	1.9E-16	4.3E-16
WSW	2600	U-235	8.9E-14	1.6E-17	1.3E-17	2.9E-17
WSW	2600	U-236	8.9E-14	1.6E-17	1.3E-17	2.9E-17
WSW	2600	U-238	1.4E-12	2.4E-16	1.9E-16	4.4E-16
WSW	2700	RN-222	3.9E-04	0.0E+00	0.0E+00	0.0E+00
WSW	2700	AC-227	6.8E-13	1.2E-16	9.7E-17	2.2E-16
WSW	2700	AC-228	2.8E-13	5.1E-17	4.0E-17	9.1E-17
WSW	2700	BI-210	2.6E-12	4.6E-16	3.7E-16	8.3E-16
WSW	2700	FR-223	4.2E-15	7.5E-19	5.6E-19	1.3E-18
WSW	2700	PA-231	4.6E-13	8.3E-17	6.6E-17	1.5E-16
WSW	2700	PA-234	1.4E-15	2.5E-19	2.0E-19	4.5E-19
WSW	2700	PA-234M	2.5E-15	4.4E-19	3.2E-19	7.6E-19
WSW	2700	PB-210	2.6E-12	4.6E-16	3.7E-16	8.3E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
WSW	2700	PO-210	2.6E-12	4.6E-16	3.7E-16	8.3E-16
WSW	2700	RA-223	6.8E-13	1.2E-16	9.7E-17	2.2E-16
WSW	2700	RA-224	2.7E-13	4.9E-17	3.9E-17	8.7E-17
WSW	2700	RA-226	2.8E-12	5.1E-16	4.1E-16	9.2E-16
WSW	2700	RA-228	3.0E-13	5.4E-17	4.3E-17	9.6E-17
WSW	2700	TH-227	6.8E-14	1.2E-17	9.7E-18	2.2E-17
WSW	2700	TH-228	5.5E-13	9.9E-17	7.8E-17	1.8E-16
WSW	2700	TH-230	4.4E-11	8.0E-15	6.3E-15	1.4E-14
WSW	2700	TH-231	8.5E-14	1.5E-17	1.2E-17	2.7E-17
WSW	2700	TH-232	6.2E-13	1.1E-16	8.8E-17	2.0E-16
WSW	2700	TH-234	1.3E-12	2.4E-16	1.9E-16	4.2E-16
WSW	2700	U-234	1.3E-12	2.3E-16	1.8E-16	4.1E-16
WSW	2700	U-235	8.6E-14	1.5E-17	1.2E-17	2.8E-17
WSW	2700	U-236	8.6E-14	1.5E-17	1.2E-17	2.8E-17
WSW	2700	U-238	1.3E-12	2.4E-16	1.9E-16	4.2E-16
WSW	3500	RN-222	3.0E-04	0.0E+00	0.0E+00	0.0E+00
WSW	3500	AC-227	5.1E-13	9.2E-17	7.4E-17	1.7E-16
WSW	3500	AC-228	2.1E-13	3.8E-17	3.0E-17	6.8E-17
WSW	3500	BI-210	1.9E-12	3.5E-16	2.8E-16	6.3E-16
WSW	3500	FR-223	2.5E-15	4.4E-19	3.4E-19	7.9E-19
WSW	3500	PA-231	3.5E-13	6.3E-17	5.0E-17	1.1E-16
WSW	3500	PA-234	1.0E-15	1.9E-19	1.5E-19	3.3E-19
WSW	3500	PA-234M	4.7E-16	8.5E-20	6.4E-20	1.5E-19
WSW	3500	PB-210	1.9E-12	3.5E-16	2.8E-16	6.3E-16
WSW	3500	PO-210	1.9E-12	3.5E-16	2.8E-16	6.3E-16
WSW	3500	RA-223	5.1E-13	9.2E-17	7.4E-17	1.7E-16
WSW	3500	RA-224	2.0E-13	3.7E-17	2.9E-17	6.6E-17
WSW	3500	RA-226	2.1E-12	3.9E-16	3.1E-16	6.9E-16
WSW	3500	RA-228	2.2E-13	4.0E-17	3.2E-17	7.3E-17
WSW	3500	TH-227	5.1E-14	9.2E-18	7.4E-18	1.7E-17
WSW	3500	TH-228	4.1E-13	7.4E-17	6.0E-17	1.3E-16
WSW	3500	TH-230	3.3E-11	6.0E-15	4.8E-15	1.1E-14
WSW	3500	TH-231	6.4E-14	1.1E-17	9.2E-18	2.1E-17
WSW	3500	TH-232	4.7E-13	8.4E-17	6.7E-17	1.5E-16
WSW	3500	TH-234	9.8E-13	1.8E-16	1.4E-16	3.2E-16
WSW	3500	U-234	9.6E-13	1.7E-16	1.4E-16	3.1E-16
WSW	3500	U-235	6.5E-14	1.2E-17	9.3E-18	2.1E-17
WSW	3500	U-236	6.5E-14	1.2E-17	9.3E-18	2.1E-17
WSW	3500	U-238	9.8E-13	1.8E-16	1.4E-16	3.2E-16
SW	300	RN-222	4.3E-04	0.0E+00	0.0E+00	0.0E+00
SW	300	AC-227	7.9E-13	1.4E-16	5.1E-16	6.5E-16
SW	300	AC-228	3.4E-13	6.2E-17	2.2E-16	2.9E-16
SW	300	BI-210	3.0E-12	5.3E-16	1.9E-15	2.5E-15
SW	300	FR-223	1.0E-14	1.8E-18	6.4E-18	8.3E-18
SW	300	PA-231	5.3E-13	9.6E-17	3.5E-16	4.4E-16
SW	300	PA-234	1.7E-15	3.0E-19	1.1E-18	1.4E-18
SW	300	PA-234M	4.8E-13	8.6E-17	2.2E-16	3.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	300	PB-210	3.0E-12	5.3E-16	1.9E-15	2.5E-15
SW	300	PO-210	3.0E-12	5.3E-16	1.9E-15	2.5E-15
SW	300	RA-223	7.9E-13	1.4E-16	5.1E-16	6.5E-16
SW	300	RA-224	3.1E-13	5.6E-17	2.0E-16	2.6E-16
SW	300	RA-226	3.3E-12	5.9E-16	2.1E-15	2.7E-15
SW	300	RA-228	3.4E-13	6.2E-17	2.2E-16	2.9E-16
SW	300	TH-227	7.8E-14	1.4E-17	5.1E-17	6.5E-17
SW	300	TH-228	6.3E-13	1.1E-16	4.1E-16	5.3E-16
SW	300	TH-230	5.1E-11	9.2E-15	3.3E-14	4.3E-14
SW	300	TH-231	9.9E-14	1.8E-17	6.5E-17	8.3E-17
SW	300	TH-232	7.1E-13	1.3E-16	4.7E-16	6.0E-16
SW	300	TH-234	1.5E-12	2.7E-16	9.8E-16	1.3E-15
SW	300	U-234	1.5E-12	2.6E-16	9.6E-16	1.2E-15
SW	300	U-235	9.9E-14	1.8E-17	6.5E-17	8.3E-17
SW	300	U-236	9.9E-14	1.8E-17	6.5E-17	8.3E-17
SW	300	U-238	1.5E-12	2.7E-16	9.8E-16	1.3E-15
SW	500	RN-222	5.0E-04	0.0E+00	0.0E+00	0.0E+00
SW	500	AC-227	9.1E-13	1.6E-16	3.1E-16	4.7E-16
SW	500	AC-228	4.0E-13	7.2E-17	1.3E-16	2.1E-16
SW	500	BI-210	3.4E-12	6.2E-16	1.2E-15	1.8E-15
SW	500	FR-223	1.1E-14	2.0E-18	3.6E-18	5.6E-18
SW	500	PA-231	6.2E-13	1.1E-16	2.1E-16	3.2E-16
SW	500	PA-234	2.0E-15	3.5E-19	6.6E-19	1.0E-18
SW	500	PA-234M	3.1E-13	5.5E-17	7.0E-17	1.3E-16
SW	500	PB-210	3.4E-12	6.2E-16	1.2E-15	1.8E-15
SW	500	PO-210	3.4E-12	6.2E-16	1.2E-15	1.8E-15
SW	500	RA-223	9.1E-13	1.6E-16	3.1E-16	4.7E-16
SW	500	RA-224	3.6E-13	6.5E-17	1.2E-16	1.9E-16
SW	500	RA-226	3.8E-12	6.9E-16	1.3E-15	2.0E-15
SW	500	RA-228	4.0E-13	7.2E-17	1.3E-16	2.1E-16
SW	500	TH-227	9.1E-14	1.6E-17	3.1E-17	4.7E-17
SW	500	TH-228	7.4E-13	1.3E-16	2.5E-16	3.8E-16
SW	500	TH-230	5.9E-11	1.1E-14	2.0E-14	3.1E-14
SW	500	TH-231	1.2E-13	2.1E-17	3.9E-17	5.9E-17
SW	500	TH-232	8.3E-13	1.5E-16	2.8E-16	4.3E-16
SW	500	TH-234	1.8E-12	3.2E-16	5.9E-16	9.1E-16
SW	500	U-234	1.7E-12	3.1E-16	5.8E-16	8.8E-16
SW	500	U-235	1.2E-13	2.1E-17	3.9E-17	6.0E-17
SW	500	U-236	1.2E-13	2.1E-17	3.9E-17	6.0E-17
SW	500	U-238	1.8E-12	3.2E-16	5.9E-16	9.1E-16
SW	700	RN-222	5.6E-04	0.0E+00	0.0E+00	0.0E+00
SW	700	AC-227	1.0E-12	1.8E-16	2.2E-16	4.0E-16
SW	700	AC-228	4.4E-13	8.0E-17	9.5E-17	1.7E-16
SW	700	BI-210	3.8E-12	6.9E-16	8.2E-16	1.5E-15
SW	700	FR-223	1.2E-14	2.1E-18	2.4E-18	4.5E-18
SW	700	PA-231	6.9E-13	1.2E-16	1.5E-16	2.7E-16
SW	700	PA-234	2.2E-15	3.9E-19	4.7E-19	8.6E-19

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	700	PA-234M	1.9E-13	3.5E-17	2.9E-17	6.4E-17
SW	700	PB-210	3.8E-12	6.9E-16	8.2E-16	1.5E-15
SW	700	PO-210	3.8E-12	6.9E-16	8.2E-16	1.5E-15
SW	700	RA-223	1.0E-12	1.8E-16	2.2E-16	4.0E-16
SW	700	RA-224	4.0E-13	7.3E-17	8.7E-17	1.6E-16
SW	700	RA-226	4.3E-12	7.7E-16	9.1E-16	1.7E-15
SW	700	RA-228	4.5E-13	8.0E-17	9.6E-17	1.8E-16
SW	700	TH-227	1.0E-13	1.8E-17	2.2E-17	4.0E-17
SW	700	TH-228	8.2E-13	1.5E-16	1.8E-16	3.2E-16
SW	700	TH-230	6.6E-11	1.2E-14	1.4E-14	2.6E-14
SW	700	TH-231	1.3E-13	2.3E-17	2.8E-17	5.1E-17
SW	700	TH-232	9.3E-13	1.7E-16	2.0E-16	3.7E-16
SW	700	TH-234	2.0E-12	3.5E-16	4.2E-16	7.7E-16
SW	700	U-234	1.9E-12	3.4E-16	4.1E-16	7.5E-16
SW	700	U-235	1.3E-13	2.3E-17	2.8E-17	5.1E-17
SW	700	U-236	1.3E-13	2.3E-17	2.8E-17	5.1E-17
SW	700	U-238	2.0E-12	3.5E-16	4.2E-16	7.7E-16
SW	1000	RN-222	5.3E-04	0.0E+00	0.0E+00	0.0E+00
SW	1000	AC-227	9.5E-13	1.7E-16	1.5E-16	3.2E-16
SW	1000	AC-228	4.1E-13	7.4E-17	6.6E-17	1.4E-16
SW	1000	BI-210	3.6E-12	6.4E-16	5.7E-16	1.2E-15
SW	1000	FR-223	1.0E-14	1.8E-18	1.5E-18	3.3E-18
SW	1000	PA-231	6.4E-13	1.2E-16	1.0E-16	2.2E-16
SW	1000	PA-234	2.0E-15	3.6E-19	3.2E-19	6.9E-19
SW	1000	PA-234M	8.4E-14	1.5E-17	1.0E-17	2.5E-17
SW	1000	PB-210	3.6E-12	6.4E-16	5.7E-16	1.2E-15
SW	1000	PO-210	3.6E-12	6.4E-16	5.7E-16	1.2E-15
SW	1000	RA-223	9.5E-13	1.7E-16	1.5E-16	3.2E-16
SW	1000	RA-224	3.8E-13	6.8E-17	6.1E-17	1.3E-16
SW	1000	RA-226	4.0E-12	7.1E-16	6.4E-16	1.4E-15
SW	1000	RA-228	4.2E-13	7.5E-17	6.7E-17	1.4E-16
SW	1000	TH-227	9.4E-14	1.7E-17	1.5E-17	3.2E-17
SW	1000	TH-228	7.7E-13	1.4E-16	1.2E-16	2.6E-16
SW	1000	TH-230	6.2E-11	1.1E-14	9.9E-15	2.1E-14
SW	1000	TH-231	1.2E-13	2.2E-17	1.9E-17	4.1E-17
SW	1000	TH-232	8.6E-13	1.6E-16	1.4E-16	2.9E-16
SW	1000	TH-234	1.8E-12	3.3E-16	2.9E-16	6.2E-16
SW	1000	U-234	1.8E-12	3.2E-16	2.9E-16	6.1E-16
SW	1000	U-235	1.2E-13	2.2E-17	1.9E-17	4.1E-17
SW	1000	U-236	1.2E-13	2.2E-17	1.9E-17	4.1E-17
SW	1000	U-238	1.8E-12	3.3E-16	2.9E-16	6.2E-16
SW	1300	RN-222	4.4E-04	0.0E+00	0.0E+00	0.0E+00
SW	1300	AC-227	7.8E-13	1.4E-16	1.2E-16	2.6E-16
SW	1300	AC-228	3.4E-13	6.0E-17	5.0E-17	1.1E-16
SW	1300	BI-210	2.9E-12	5.3E-16	4.4E-16	9.7E-16
SW	1300	FR-223	7.7E-15	1.4E-18	1.0E-18	2.4E-18
SW	1300	PA-231	5.3E-13	9.5E-17	7.9E-17	1.7E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	1300	PA-234	1.7E-15	3.0E-19	2.5E-19	5.4E-19
SW	1300	PA-234M	3.5E-14	6.4E-18	4.0E-18	1.0E-17
SW	1300	PB-210	2.9E-12	5.3E-16	4.4E-16	9.7E-16
SW	1300	PO-210	2.9E-12	5.3E-16	4.4E-16	9.7E-16
SW	1300	RA-223	7.8E-13	1.4E-16	1.2E-16	2.6E-16
SW	1300	RA-224	3.1E-13	5.6E-17	4.6E-17	1.0E-16
SW	1300	RA-226	3.3E-12	5.9E-16	4.9E-16	1.1E-15
SW	1300	RA-228	3.4E-13	6.2E-17	5.1E-17	1.1E-16
SW	1300	TH-227	7.8E-14	1.4E-17	1.2E-17	2.6E-17
SW	1300	TH-228	6.3E-13	1.1E-16	9.4E-17	2.1E-16
SW	1300	TH-230	5.1E-11	9.2E-15	7.6E-15	1.7E-14
SW	1300	TH-231	9.8E-14	1.8E-17	1.5E-17	3.2E-17
SW	1300	TH-232	7.1E-13	1.3E-16	1.1E-16	2.3E-16
SW	1300	TH-234	1.5E-12	2.7E-16	2.2E-16	4.9E-16
SW	1300	U-234	1.5E-12	2.6E-16	2.2E-16	4.8E-16
SW	1300	U-235	9.9E-14	1.8E-17	1.5E-17	3.3E-17
SW	1300	U-236	9.9E-14	1.8E-17	1.5E-17	3.3E-17
SW	1300	U-238	1.5E-12	2.7E-16	2.2E-16	4.9E-16
SW	1500	RN-222	3.8E-04	0.0E+00	0.0E+00	0.0E+00
SW	1500	AC-227	6.9E-13	1.2E-16	1.0E-16	2.2E-16
SW	1500	AC-228	2.9E-13	5.3E-17	4.3E-17	9.6E-17
SW	1500	BI-210	2.6E-12	4.6E-16	3.8E-16	8.4E-16
SW	1500	FR-223	6.4E-15	1.2E-18	8.5E-19	2.0E-18
SW	1500	PA-231	4.6E-13	8.4E-17	6.8E-17	1.5E-16
SW	1500	PA-234	1.4E-15	2.6E-19	2.1E-19	4.7E-19
SW	1500	PA-234M	2.1E-14	3.7E-18	2.3E-18	6.0E-18
SW	1500	PB-210	2.6E-12	4.6E-16	3.8E-16	8.4E-16
SW	1500	PO-210	2.6E-12	4.6E-16	3.8E-16	8.4E-16
SW	1500	RA-223	6.9E-13	1.2E-16	1.0E-16	2.2E-16
SW	1500	RA-224	2.7E-13	4.9E-17	4.0E-17	8.9E-17
SW	1500	RA-226	2.9E-12	5.2E-16	4.2E-16	9.4E-16
SW	1500	RA-228	3.0E-13	5.4E-17	4.4E-17	9.8E-17
SW	1500	TH-227	6.8E-14	1.2E-17	1.0E-17	2.2E-17
SW	1500	TH-228	5.5E-13	9.9E-17	8.1E-17	1.8E-16
SW	1500	TH-230	4.5E-11	8.0E-15	6.6E-15	1.5E-14
SW	1500	TH-231	8.6E-14	1.5E-17	1.3E-17	2.8E-17
SW	1500	TH-232	6.2E-13	1.1E-16	9.2E-17	2.0E-16
SW	1500	TH-234	1.3E-12	2.4E-16	1.9E-16	4.3E-16
SW	1500	U-234	1.3E-12	2.3E-16	1.9E-16	4.2E-16
SW	1500	U-235	8.7E-14	1.6E-17	1.3E-17	2.8E-17
SW	1500	U-236	8.7E-14	1.6E-17	1.3E-17	2.8E-17
SW	1500	U-238	1.3E-12	2.4E-16	1.9E-16	4.3E-16
SW	1700	RN-222	3.4E-04	0.0E+00	0.0E+00	0.0E+00
SW	1700	AC-227	6.0E-13	1.1E-16	8.9E-17	2.0E-16
SW	1700	AC-228	2.6E-13	4.6E-17	3.8E-17	8.4E-17
SW	1700	BI-210	2.3E-12	4.1E-16	3.3E-16	7.4E-16
SW	1700	FR-223	5.3E-15	9.6E-19	7.0E-19	1.7E-18

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	1700	PA-231	4.1E-13	7.4E-17	6.0E-17	1.3E-16
SW	1700	PA-234	1.3E-15	2.3E-19	1.9E-19	4.1E-19
SW	1700	PA-234M	1.2E-14	2.2E-18	1.4E-18	3.6E-18
SW	1700	PB-210	2.3E-12	4.1E-16	3.3E-16	7.4E-16
SW	1700	PO-210	2.3E-12	4.1E-16	3.3E-16	7.4E-16
SW	1700	RA-223	6.0E-13	1.1E-16	8.9E-17	2.0E-16
SW	1700	RA-224	2.4E-13	4.3E-17	3.5E-17	7.8E-17
SW	1700	RA-226	2.5E-12	4.5E-16	3.7E-16	8.3E-16
SW	1700	RA-228	2.6E-13	4.8E-17	3.9E-17	8.7E-17
SW	1700	TH-227	6.0E-14	1.1E-17	8.8E-18	2.0E-17
SW	1700	TH-228	4.9E-13	8.8E-17	7.2E-17	1.6E-16
SW	1700	TH-230	3.9E-11	7.1E-15	5.8E-15	1.3E-14
SW	1700	TH-231	7.6E-14	1.4E-17	1.1E-17	2.5E-17
SW	1700	TH-232	5.5E-13	9.9E-17	8.1E-17	1.8E-16
SW	1700	TH-234	1.2E-12	2.1E-16	1.7E-16	3.8E-16
SW	1700	U-234	1.1E-12	2.0E-16	1.7E-16	3.7E-16
SW	1700	U-235	7.6E-14	1.4E-17	1.1E-17	2.5E-17
SW	1700	U-236	7.6E-14	1.4E-17	1.1E-17	2.5E-17
SW	1700	U-238	1.2E-12	2.1E-16	1.7E-16	3.8E-16
SW	2000	RN-222	2.9E-04	0.0E+00	0.0E+00	0.0E+00
SW	2000	AC-227	5.1E-13	9.1E-17	7.5E-17	1.7E-16
SW	2000	AC-228	2.2E-13	3.9E-17	3.2E-17	7.0E-17
SW	2000	BI-210	1.9E-12	3.4E-16	2.8E-16	6.3E-16
SW	2000	FR-223	4.1E-15	7.4E-19	5.5E-19	1.3E-18
SW	2000	PA-231	3.4E-13	6.2E-17	5.1E-17	1.1E-16
SW	2000	PA-234	1.1E-15	1.9E-19	1.6E-19	3.5E-19
SW	2000	PA-234M	5.9E-15	1.1E-18	6.9E-19	1.7E-18
SW	2000	PB-210	1.9E-12	3.4E-16	2.8E-16	6.3E-16
SW	2000	PO-210	1.9E-12	3.4E-16	2.8E-16	6.3E-16
SW	2000	RA-223	5.1E-13	9.1E-17	7.5E-17	1.7E-16
SW	2000	RA-224	2.0E-13	3.6E-17	3.0E-17	6.6E-17
SW	2000	RA-226	2.1E-12	3.8E-16	3.1E-16	7.0E-16
SW	2000	RA-228	2.2E-13	4.0E-17	3.3E-17	7.3E-17
SW	2000	TH-227	5.0E-14	9.1E-18	7.5E-18	1.7E-17
SW	2000	TH-228	4.1E-13	7.4E-17	6.1E-17	1.3E-16
SW	2000	TH-230	3.3E-11	6.0E-15	4.9E-15	1.1E-14
SW	2000	TH-231	6.4E-14	1.1E-17	9.4E-18	2.1E-17
SW	2000	TH-232	4.6E-13	8.3E-17	6.8E-17	1.5E-16
SW	2000	TH-234	9.8E-13	1.8E-16	1.4E-16	3.2E-16
SW	2000	U-234	9.5E-13	1.7E-16	1.4E-16	3.1E-16
SW	2000	U-235	6.4E-14	1.2E-17	9.5E-18	2.1E-17
SW	2000	U-236	6.4E-14	1.2E-17	9.5E-18	2.1E-17
SW	2000	U-238	9.8E-13	1.8E-16	1.4E-16	3.2E-16
SW	2300	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
SW	2300	AC-227	4.3E-13	7.8E-17	6.5E-17	1.4E-16
SW	2300	AC-228	1.8E-13	3.3E-17	2.7E-17	6.0E-17
SW	2300	BI-210	1.6E-12	2.9E-16	2.4E-16	5.4E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	2300	FR-223	3.2E-15	5.8E-19	4.3E-19	1.0E-18
SW	2300	PA-231	2.9E-13	5.3E-17	4.4E-17	9.7E-17
SW	2300	PA-234	9.0E-16	1.6E-19	1.3E-19	3.0E-19
SW	2300	PA-234M	2.9E-15	5.3E-19	3.5E-19	8.8E-19
SW	2300	PB-210	1.6E-12	2.9E-16	2.4E-16	5.4E-16
SW	2300	PO-210	1.6E-12	2.9E-16	2.4E-16	5.4E-16
SW	2300	RA-223	4.3E-13	7.8E-17	6.5E-17	1.4E-16
SW	2300	RA-224	1.7E-13	3.1E-17	2.6E-17	5.7E-17
SW	2300	RA-226	1.8E-12	3.3E-16	2.7E-16	6.0E-16
SW	2300	RA-228	1.9E-13	3.4E-17	2.9E-17	6.3E-17
SW	2300	TH-227	4.3E-14	7.8E-18	6.5E-18	1.4E-17
SW	2300	TH-228	3.5E-13	6.3E-17	5.3E-17	1.2E-16
SW	2300	TH-230	2.8E-11	5.1E-15	4.2E-15	9.3E-15
SW	2300	TH-231	5.4E-14	9.8E-18	8.1E-18	1.8E-17
SW	2300	TH-232	4.0E-13	7.1E-17	5.9E-17	1.3E-16
SW	2300	TH-234	8.3E-13	1.5E-16	1.3E-16	2.8E-16
SW	2300	U-234	8.1E-13	1.5E-16	1.2E-16	2.7E-16
SW	2300	U-235	5.5E-14	9.9E-18	8.2E-18	1.8E-17
SW	2300	U-236	5.5E-14	9.9E-18	8.2E-18	1.8E-17
SW	2300	U-238	8.3E-13	1.5E-16	1.3E-16	2.8E-16
SW	2400	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
SW	2400	AC-227	4.1E-13	7.5E-17	6.2E-17	1.4E-16
SW	2400	AC-228	1.7E-13	3.1E-17	2.6E-17	5.7E-17
SW	2400	BI-210	1.6E-12	2.8E-16	2.3E-16	5.1E-16
SW	2400	FR-223	3.0E-15	5.4E-19	4.0E-19	9.4E-19
SW	2400	PA-231	2.8E-13	5.1E-17	4.2E-17	9.3E-17
SW	2400	PA-234	8.6E-16	1.5E-19	1.3E-19	2.8E-19
SW	2400	PA-234M	2.3E-15	4.2E-19	2.8E-19	7.0E-19
SW	2400	PB-210	1.6E-12	2.8E-16	2.3E-16	5.1E-16
SW	2400	PO-210	1.6E-12	2.8E-16	2.3E-16	5.1E-16
SW	2400	RA-223	4.1E-13	7.5E-17	6.2E-17	1.4E-16
SW	2400	RA-224	1.6E-13	3.0E-17	2.5E-17	5.4E-17
SW	2400	RA-226	1.7E-12	3.1E-16	2.6E-16	5.7E-16
SW	2400	RA-228	1.8E-13	3.3E-17	2.7E-17	6.0E-17
SW	2400	TH-227	4.1E-14	7.4E-18	6.2E-18	1.4E-17
SW	2400	TH-228	3.3E-13	6.0E-17	5.0E-17	1.1E-16
SW	2400	TH-230	2.7E-11	4.9E-15	4.1E-15	8.9E-15
SW	2400	TH-231	5.2E-14	9.3E-18	7.8E-18	1.7E-17
SW	2400	TH-232	3.8E-13	6.8E-17	5.7E-17	1.2E-16
SW	2400	TH-234	8.0E-13	1.4E-16	1.2E-16	2.6E-16
SW	2400	U-234	7.8E-13	1.4E-16	1.2E-16	2.6E-16
SW	2400	U-235	5.2E-14	9.4E-18	7.9E-18	1.7E-17
SW	2400	U-236	5.2E-14	9.4E-18	7.9E-18	1.7E-17
SW	2400	U-238	8.0E-13	1.4E-16	1.2E-16	2.6E-16
SW	2600	RN-222	2.1E-04	0.0E+00	0.0E+00	0.0E+00
SW	2600	AC-227	3.8E-13	6.8E-17	5.7E-17	1.3E-16
SW	2600	AC-228	1.6E-13	2.8E-17	2.4E-17	5.2E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	2600	BI-210	1.4E-12	2.6E-16	2.2E-16	4.7E-16
SW	2600	FR-223	2.6E-15	4.6E-19	3.5E-19	8.2E-19
SW	2600	PA-231	2.6E-13	4.6E-17	3.9E-17	8.5E-17
SW	2600	PA-234	7.8E-16	1.4E-19	1.2E-19	2.6E-19
SW	2600	PA-234M	1.5E-15	2.7E-19	1.9E-19	4.5E-19
SW	2600	PB-210	1.4E-12	2.6E-16	2.2E-16	4.7E-16
SW	2600	PO-210	1.4E-12	2.6E-16	2.2E-16	4.7E-16
SW	2600	RA-223	3.8E-13	6.8E-17	5.7E-17	1.3E-16
SW	2600	RA-224	1.5E-13	2.7E-17	2.3E-17	5.0E-17
SW	2600	RA-226	1.6E-12	2.8E-16	2.4E-16	5.2E-16
SW	2600	RA-228	1.7E-13	3.0E-17	2.5E-17	5.5E-17
SW	2600	TH-227	3.8E-14	6.8E-18	5.7E-18	1.2E-17
SW	2600	TH-228	3.0E-13	5.5E-17	4.6E-17	1.0E-16
SW	2600	TH-230	2.5E-11	4.4E-15	3.7E-15	8.2E-15
SW	2600	TH-231	4.7E-14	8.5E-18	7.1E-18	1.6E-17
SW	2600	TH-232	3.4E-13	6.2E-17	5.2E-17	1.1E-16
SW	2600	TH-234	7.3E-13	1.3E-16	1.1E-16	2.4E-16
SW	2600	U-234	7.1E-13	1.3E-16	1.1E-16	2.3E-16
SW	2600	U-235	4.8E-14	8.6E-18	7.2E-18	1.6E-17
SW	2600	U-236	4.8E-14	8.6E-18	7.2E-18	1.6E-17
SW	2600	U-238	7.3E-13	1.3E-16	1.1E-16	2.4E-16
SW	2700	RN-222	2.1E-04	0.0E+00	0.0E+00	0.0E+00
SW	2700	AC-227	3.6E-13	6.5E-17	5.5E-17	1.2E-16
SW	2700	AC-228	1.5E-13	2.7E-17	2.3E-17	5.0E-17
SW	2700	BI-210	1.4E-12	2.5E-16	2.1E-16	4.5E-16
SW	2700	FR-223	2.4E-15	4.3E-19	3.3E-19	7.6E-19
SW	2700	PA-231	2.5E-13	4.4E-17	3.7E-17	8.2E-17
SW	2700	PA-234	7.5E-16	1.3E-19	1.1E-19	2.5E-19
SW	2700	PA-234M	1.2E-15	2.2E-19	1.5E-19	3.7E-19
SW	2700	PB-210	1.4E-12	2.5E-16	2.1E-16	4.5E-16
SW	2700	PO-210	1.4E-12	2.5E-16	2.1E-16	4.5E-16
SW	2700	RA-223	3.6E-13	6.5E-17	5.5E-17	1.2E-16
SW	2700	RA-224	1.4E-13	2.6E-17	2.2E-17	4.8E-17
SW	2700	RA-226	1.5E-12	2.7E-16	2.3E-16	5.0E-16
SW	2700	RA-228	1.6E-13	2.9E-17	2.4E-17	5.3E-17
SW	2700	TH-227	3.6E-14	6.5E-18	5.5E-18	1.2E-17
SW	2700	TH-228	2.9E-13	5.3E-17	4.4E-17	9.7E-17
SW	2700	TH-230	2.4E-11	4.2E-15	3.6E-15	7.8E-15
SW	2700	TH-231	4.5E-14	8.1E-18	6.9E-18	1.5E-17
SW	2700	TH-232	3.3E-13	5.9E-17	5.0E-17	1.1E-16
SW	2700	TH-234	7.0E-13	1.3E-16	1.1E-16	2.3E-16
SW	2700	U-234	6.8E-13	1.2E-16	1.0E-16	2.3E-16
SW	2700	U-235	4.6E-14	8.2E-18	7.0E-18	1.5E-17
SW	2700	U-236	4.6E-14	8.2E-18	7.0E-18	1.5E-17
SW	2700	U-238	7.0E-13	1.3E-16	1.1E-16	2.3E-16
SW	3500	RN-222	1.5E-04	0.0E+00	0.0E+00	0.0E+00
SW	3500	AC-227	2.7E-13	4.8E-17	4.2E-17	9.0E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SW	3500	AC-228	1.1E-13	2.0E-17	1.7E-17	3.7E-17
SW	3500	BI-210	1.0E-12	1.8E-16	1.6E-16	3.4E-16
SW	3500	FR-223	1.4E-15	2.5E-19	2.1E-19	4.6E-19
SW	3500	PA-231	1.8E-13	3.3E-17	2.8E-17	6.1E-17
SW	3500	PA-234	5.4E-16	9.7E-20	8.5E-20	1.8E-19
SW	3500	PA-234M	2.2E-16	4.0E-20	3.0E-20	7.0E-20
SW	3500	PB-210	1.0E-12	1.8E-16	1.6E-16	3.4E-16
SW	3500	PO-210	1.0E-12	1.8E-16	1.6E-16	3.4E-16
SW	3500	RA-223	2.7E-13	4.8E-17	4.2E-17	9.0E-17
SW	3500	RA-224	1.1E-13	1.9E-17	1.7E-17	3.6E-17
SW	3500	RA-226	1.1E-12	2.0E-16	1.8E-16	3.8E-16
SW	3500	RA-228	1.2E-13	2.1E-17	1.8E-17	3.9E-17
SW	3500	TH-227	2.6E-14	4.8E-18	4.2E-18	8.9E-18
SW	3500	TH-228	2.1E-13	3.9E-17	3.4E-17	7.3E-17
SW	3500	TH-230	1.7E-11	3.1E-15	2.7E-15	5.9E-15
SW	3500	TH-231	3.3E-14	6.0E-18	5.2E-18	1.1E-17
SW	3500	TH-232	2.4E-13	4.4E-17	3.8E-17	8.2E-17
SW	3500	TH-234	5.1E-13	9.2E-17	8.1E-17	1.7E-16
SW	3500	U-234	5.0E-13	9.0E-17	7.9E-17	1.7E-16
SW	3500	U-235	3.4E-14	6.1E-18	5.3E-18	1.1E-17
SW	3500	U-236	3.4E-14	6.1E-18	5.3E-18	1.1E-17
SW	3500	U-238	5.1E-13	9.2E-17	8.1E-17	1.7E-16
SSW	300	RN-222	2.4E-04	0.0E+00	0.0E+00	0.0E+00
SSW	300	AC-227	4.3E-13	7.7E-17	4.2E-16	4.9E-16
SSW	300	AC-228	1.9E-13	3.4E-17	1.8E-16	2.2E-16
SSW	300	BI-210	1.6E-12	2.9E-16	1.6E-15	1.9E-15
SSW	300	FR-223	5.6E-15	1.0E-18	5.2E-18	6.2E-18
SSW	300	PA-231	2.9E-13	5.2E-17	2.8E-16	3.3E-16
SSW	300	PA-234	9.2E-16	1.7E-19	8.9E-19	1.1E-18
SSW	300	PA-234M	2.9E-13	5.2E-17	1.9E-16	2.4E-16
SSW	300	PB-210	1.6E-12	2.9E-16	1.6E-15	1.9E-15
SSW	300	PO-210	1.6E-12	2.9E-16	1.6E-15	1.9E-15
SSW	300	RA-223	4.3E-13	7.7E-17	4.2E-16	4.9E-16
SSW	300	RA-224	1.7E-13	3.0E-17	1.7E-16	2.0E-16
SSW	300	RA-226	1.8E-12	3.2E-16	1.7E-15	2.1E-15
SSW	300	RA-228	1.9E-13	3.4E-17	1.8E-16	2.2E-16
SSW	300	TH-227	4.2E-14	7.6E-18	4.1E-17	4.9E-17
SSW	300	TH-228	3.4E-13	6.2E-17	3.4E-16	4.0E-16
SSW	300	TH-230	2.8E-11	5.0E-15	2.7E-14	3.2E-14
SSW	300	TH-231	5.4E-14	9.7E-18	5.3E-17	6.2E-17
SSW	300	TH-232	3.9E-13	7.0E-17	3.8E-16	4.5E-16
SSW	300	TH-234	8.2E-13	1.5E-16	8.0E-16	9.5E-16
SSW	300	U-234	8.0E-13	1.4E-16	7.8E-16	9.2E-16
SSW	300	U-235	5.4E-14	9.7E-18	5.3E-17	6.2E-17
SSW	300	U-236	5.4E-14	9.7E-18	5.3E-17	6.2E-17
SSW	300	U-238	8.2E-13	1.5E-16	8.0E-16	9.5E-16
SSW	500	RN-222	3.5E-04	0.0E+00	0.0E+00	0.0E+00

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	500	AC-227	6.4E-13	1.1E-16	2.5E-16	3.6E-16
SSW	500	AC-228	2.8E-13	5.0E-17	1.1E-16	1.6E-16
SSW	500	BI-210	2.4E-12	4.3E-16	9.4E-16	1.4E-15
SSW	500	FR-223	8.0E-15	1.4E-18	2.9E-18	4.4E-18
SSW	500	PA-231	4.3E-13	7.8E-17	1.7E-16	2.5E-16
SSW	500	PA-234	1.4E-15	2.5E-19	5.3E-19	7.8E-19
SSW	500	PA-234M	2.5E-13	4.5E-17	6.2E-17	1.1E-16
SSW	500	PB-210	2.4E-12	4.3E-16	9.4E-16	1.4E-15
SSW	500	PO-210	2.4E-12	4.3E-16	9.4E-16	1.4E-15
SSW	500	RA-223	6.4E-13	1.1E-16	2.5E-16	3.6E-16
SSW	500	RA-224	2.5E-13	4.5E-17	9.9E-17	1.4E-16
SSW	500	RA-226	2.7E-12	4.8E-16	1.0E-15	1.5E-15
SSW	500	RA-228	2.8E-13	5.0E-17	1.1E-16	1.6E-16
SSW	500	TH-227	6.3E-14	1.1E-17	2.5E-17	3.6E-17
SSW	500	TH-228	5.1E-13	9.2E-17	2.0E-16	2.9E-16
SSW	500	TH-230	4.1E-11	7.4E-15	1.6E-14	2.4E-14
SSW	500	TH-231	8.0E-14	1.4E-17	3.1E-17	4.6E-17
SSW	500	TH-232	5.8E-13	1.0E-16	2.3E-16	3.3E-16
SSW	500	TH-234	1.2E-12	2.2E-16	4.8E-16	7.0E-16
SSW	500	U-234	1.2E-12	2.1E-16	4.7E-16	6.8E-16
SSW	500	U-235	8.0E-14	1.4E-17	3.1E-17	4.6E-17
SSW	500	U-236	8.0E-14	1.4E-17	3.1E-17	4.6E-17
SSW	500	U-238	1.2E-12	2.2E-16	4.8E-16	7.0E-16
SSW	700	RN-222	4.2E-04	0.0E+00	0.0E+00	0.0E+00
SSW	700	AC-227	7.7E-13	1.4E-16	1.8E-16	3.2E-16
SSW	700	AC-228	3.3E-13	6.0E-17	7.7E-17	1.4E-16
SSW	700	BI-210	2.9E-12	5.2E-16	6.7E-16	1.2E-15
SSW	700	FR-223	9.2E-15	1.6E-18	1.9E-18	3.6E-18
SSW	700	PA-231	5.2E-13	9.4E-17	1.2E-16	2.1E-16
SSW	700	PA-234	1.6E-15	3.0E-19	3.8E-19	6.7E-19
SSW	700	PA-234M	1.8E-13	3.2E-17	2.6E-17	5.8E-17
SSW	700	PB-210	2.9E-12	5.2E-16	6.7E-16	1.2E-15
SSW	700	PO-210	2.9E-12	5.2E-16	6.7E-16	1.2E-15
SSW	700	RA-223	7.7E-13	1.4E-16	1.8E-16	3.2E-16
SSW	700	RA-224	3.0E-13	5.5E-17	7.1E-17	1.3E-16
SSW	700	RA-226	3.2E-12	5.8E-16	7.4E-16	1.3E-15
SSW	700	RA-228	3.4E-13	6.0E-17	7.8E-17	1.4E-16
SSW	700	TH-227	7.6E-14	1.4E-17	1.8E-17	3.1E-17
SSW	700	TH-228	6.2E-13	1.1E-16	1.4E-16	2.5E-16
SSW	700	TH-230	5.0E-11	9.0E-15	1.2E-14	2.1E-14
SSW	700	TH-231	9.7E-14	1.7E-17	2.2E-17	4.0E-17
SSW	700	TH-232	7.0E-13	1.3E-16	1.6E-16	2.9E-16
SSW	700	TH-234	1.5E-12	2.6E-16	3.4E-16	6.1E-16
SSW	700	U-234	1.4E-12	2.6E-16	3.3E-16	5.9E-16
SSW	700	U-235	9.7E-14	1.7E-17	2.2E-17	4.0E-17
SSW	700	U-236	9.7E-14	1.7E-17	2.2E-17	4.0E-17
SSW	700	U-238	1.5E-12	2.6E-16	3.4E-16	6.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	1000	RN-222	4.1E-04	0.0E+00	0.0E+00	0.0E+00
SSW	1000	AC-227	7.4E-13	1.3E-16	1.2E-16	2.6E-16
SSW	1000	AC-228	3.2E-13	5.8E-17	5.3E-17	1.1E-16
SSW	1000	BI-210	2.8E-12	5.0E-16	4.7E-16	9.7E-16
SSW	1000	FR-223	8.2E-15	1.5E-18	1.2E-18	2.7E-18
SSW	1000	PA-231	5.0E-13	9.1E-17	8.4E-17	1.7E-16
SSW	1000	PA-234	1.6E-15	2.8E-19	2.6E-19	5.5E-19
SSW	1000	PA-234M	8.0E-14	1.4E-17	9.1E-18	2.3E-17
SSW	1000	PB-210	2.8E-12	5.0E-16	4.7E-16	9.7E-16
SSW	1000	PO-210	2.8E-12	5.0E-16	4.7E-16	9.7E-16
SSW	1000	RA-223	7.4E-13	1.3E-16	1.2E-16	2.6E-16
SSW	1000	RA-224	3.0E-13	5.3E-17	4.9E-17	1.0E-16
SSW	1000	RA-226	3.1E-12	5.6E-16	5.2E-16	1.1E-15
SSW	1000	RA-228	3.3E-13	5.9E-17	5.4E-17	1.1E-16
SSW	1000	TH-227	7.4E-14	1.3E-17	1.2E-17	2.6E-17
SSW	1000	TH-228	6.0E-13	1.1E-16	1.0E-16	2.1E-16
SSW	1000	TH-230	4.8E-11	8.7E-15	8.1E-15	1.7E-14
SSW	1000	TH-231	9.4E-14	1.7E-17	1.6E-17	3.2E-17
SSW	1000	TH-232	6.8E-13	1.2E-16	1.1E-16	2.3E-16
SSW	1000	TH-234	1.4E-12	2.6E-16	2.4E-16	5.0E-16
SSW	1000	U-234	1.4E-12	2.5E-16	2.3E-16	4.8E-16
SSW	1000	U-235	9.4E-14	1.7E-17	1.6E-17	3.3E-17
SSW	1000	U-236	9.4E-14	1.7E-17	1.6E-17	3.3E-17
SSW	1000	U-238	1.4E-12	2.6E-16	2.4E-16	5.0E-16
SSW	1300	RN-222	3.4E-04	0.0E+00	0.0E+00	0.0E+00
SSW	1300	AC-227	6.2E-13	1.1E-16	9.5E-17	2.1E-16
SSW	1300	AC-228	2.7E-13	4.8E-17	4.1E-17	8.9E-17
SSW	1300	BI-210	2.3E-12	4.2E-16	3.6E-16	7.8E-16
SSW	1300	FR-223	6.3E-15	1.1E-18	8.5E-19	2.0E-18
SSW	1300	PA-231	4.2E-13	7.5E-17	6.4E-17	1.4E-16
SSW	1300	PA-234	1.3E-15	2.4E-19	2.0E-19	4.4E-19
SSW	1300	PA-234M	3.4E-14	6.1E-18	3.6E-18	9.7E-18
SSW	1300	PB-210	2.3E-12	4.2E-16	3.6E-16	7.8E-16
SSW	1300	PO-210	2.3E-12	4.2E-16	3.6E-16	7.8E-16
SSW	1300	RA-223	6.2E-13	1.1E-16	9.5E-17	2.1E-16
SSW	1300	RA-224	2.5E-13	4.4E-17	3.8E-17	8.2E-17
SSW	1300	RA-226	2.6E-12	4.6E-16	4.0E-16	8.6E-16
SSW	1300	RA-228	2.7E-13	4.9E-17	4.2E-17	9.0E-17
SSW	1300	TH-227	6.1E-14	1.1E-17	9.4E-18	2.1E-17
SSW	1300	TH-228	5.0E-13	9.0E-17	7.7E-17	1.7E-16
SSW	1300	TH-230	4.0E-11	7.2E-15	6.2E-15	1.3E-14
SSW	1300	TH-231	7.8E-14	1.4E-17	1.2E-17	2.6E-17
SSW	1300	TH-232	5.6E-13	1.0E-16	8.6E-17	1.9E-16
SSW	1300	TH-234	1.2E-12	2.1E-16	1.8E-16	4.0E-16
SSW	1300	U-234	1.2E-12	2.1E-16	1.8E-16	3.9E-16
SSW	1300	U-235	7.8E-14	1.4E-17	1.2E-17	2.6E-17
SSW	1300	U-236	7.8E-14	1.4E-17	1.2E-17	2.6E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	1300	U-238	1.2E-12	2.1E-16	1.8E-16	4.0E-16
SSW	1500	RN-222	3.0E-04	0.0E+00	0.0E+00	0.0E+00
SSW	1500	AC-227	5.5E-13	9.8E-17	8.2E-17	1.8E-16
SSW	1500	AC-228	2.3E-13	4.2E-17	3.5E-17	7.7E-17
SSW	1500	BI-210	2.1E-12	3.7E-16	3.1E-16	6.8E-16
SSW	1500	FR-223	5.3E-15	9.5E-19	6.9E-19	1.6E-18
SSW	1500	PA-231	3.7E-13	6.7E-17	5.6E-17	1.2E-16
SSW	1500	PA-234	1.2E-15	2.1E-19	1.7E-19	3.8E-19
SSW	1500	PA-234M	2.0E-14	3.6E-18	2.1E-18	5.6E-18
SSW	1500	PB-210	2.1E-12	3.7E-16	3.1E-16	6.8E-16
SSW	1500	PO-210	2.1E-12	3.7E-16	3.1E-16	6.8E-16
SSW	1500	RA-223	5.5E-13	9.8E-17	8.2E-17	1.8E-16
SSW	1500	RA-224	2.2E-13	3.9E-17	3.3E-17	7.2E-17
SSW	1500	RA-226	2.3E-12	4.1E-16	3.4E-16	7.5E-16
SSW	1500	RA-228	2.4E-13	4.3E-17	3.6E-17	7.9E-17
SSW	1500	TH-227	5.4E-14	9.8E-18	8.2E-18	1.8E-17
SSW	1500	TH-228	4.4E-13	7.9E-17	6.6E-17	1.5E-16
SSW	1500	TH-230	3.6E-11	6.4E-15	5.3E-15	1.2E-14
SSW	1500	TH-231	6.9E-14	1.2E-17	1.0E-17	2.3E-17
SSW	1500	TH-232	5.0E-13	8.9E-17	7.5E-17	1.6E-16
SSW	1500	TH-234	1.0E-12	1.9E-16	1.6E-16	3.5E-16
SSW	1500	U-234	1.0E-12	1.8E-16	1.5E-16	3.4E-16
SSW	1500	U-235	6.9E-14	1.2E-17	1.0E-17	2.3E-17
SSW	1500	U-236	6.9E-14	1.2E-17	1.0E-17	2.3E-17
SSW	1500	U-238	1.0E-12	1.9E-16	1.6E-16	3.5E-16
SSW	1700	RN-222	2.7E-04	0.0E+00	0.0E+00	0.0E+00
SSW	1700	AC-227	4.8E-13	8.7E-17	7.2E-17	1.6E-16
SSW	1700	AC-228	2.1E-13	3.7E-17	3.1E-17	6.8E-17
SSW	1700	BI-210	1.8E-12	3.3E-16	2.7E-16	6.0E-16
SSW	1700	FR-223	4.4E-15	8.0E-19	5.7E-19	1.4E-18
SSW	1700	PA-231	3.3E-13	5.9E-17	4.9E-17	1.1E-16
SSW	1700	PA-234	1.0E-15	1.8E-19	1.5E-19	3.3E-19
SSW	1700	PA-234M	1.2E-14	2.1E-18	1.2E-18	3.3E-18
SSW	1700	PB-210	1.8E-12	3.3E-16	2.7E-16	6.0E-16
SSW	1700	PO-210	1.8E-12	3.3E-16	2.7E-16	6.0E-16
SSW	1700	RA-223	4.8E-13	8.7E-17	7.2E-17	1.6E-16
SSW	1700	RA-224	1.9E-13	3.5E-17	2.9E-17	6.3E-17
SSW	1700	RA-226	2.0E-12	3.6E-16	3.0E-16	6.6E-16
SSW	1700	RA-228	2.1E-13	3.8E-17	3.2E-17	7.0E-17
SSW	1700	TH-227	4.8E-14	8.6E-18	7.2E-18	1.6E-17
SSW	1700	TH-228	3.9E-13	7.0E-17	5.8E-17	1.3E-16
SSW	1700	TH-230	3.1E-11	5.7E-15	4.7E-15	1.0E-14
SSW	1700	TH-231	6.1E-14	1.1E-17	9.0E-18	2.0E-17
SSW	1700	TH-232	4.4E-13	7.9E-17	6.6E-17	1.4E-16
SSW	1700	TH-234	9.3E-13	1.7E-16	1.4E-16	3.1E-16
SSW	1700	U-234	9.1E-13	1.6E-16	1.4E-16	3.0E-16
SSW	1700	U-235	6.1E-14	1.1E-17	9.1E-18	2.0E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	1700	U-236	6.1E-14	1.1E-17	9.1E-18	2.0E-17
SSW	1700	U-238	9.3E-13	1.7E-16	1.4E-16	3.1E-16
SSW	2000	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
SSW	2000	AC-227	4.1E-13	7.4E-17	6.1E-17	1.3E-16
SSW	2000	AC-228	1.7E-13	3.1E-17	2.6E-17	5.7E-17
SSW	2000	BI-210	1.5E-12	2.8E-16	2.3E-16	5.1E-16
SSW	2000	FR-223	3.5E-15	6.3E-19	4.5E-19	1.1E-18
SSW	2000	PA-231	2.8E-13	5.0E-17	4.1E-17	9.1E-17
SSW	2000	PA-234	8.6E-16	1.5E-19	1.3E-19	2.8E-19
SSW	2000	PA-234M	5.6E-15	1.0E-18	5.9E-19	1.6E-18
SSW	2000	PB-210	1.5E-12	2.8E-16	2.3E-16	5.1E-16
SSW	2000	PO-210	1.5E-12	2.8E-16	2.3E-16	5.1E-16
SSW	2000	RA-223	4.1E-13	7.4E-17	6.1E-17	1.3E-16
SSW	2000	RA-224	1.6E-13	2.9E-17	2.4E-17	5.3E-17
SSW	2000	RA-226	1.7E-12	3.1E-16	2.6E-16	5.6E-16
SSW	2000	RA-228	1.8E-13	3.2E-17	2.7E-17	5.9E-17
SSW	2000	TH-227	4.1E-14	7.3E-18	6.1E-18	1.3E-17
SSW	2000	TH-228	3.3E-13	5.9E-17	4.9E-17	1.1E-16
SSW	2000	TH-230	2.7E-11	4.8E-15	4.0E-15	8.8E-15
SSW	2000	TH-231	5.1E-14	9.2E-18	7.6E-18	1.7E-17
SSW	2000	TH-232	3.7E-13	6.7E-17	5.6E-17	1.2E-16
SSW	2000	TH-234	7.9E-13	1.4E-16	1.2E-16	2.6E-16
SSW	2000	U-234	7.7E-13	1.4E-16	1.1E-16	2.5E-16
SSW	2000	U-235	5.2E-14	9.3E-18	7.7E-18	1.7E-17
SSW	2000	U-236	5.2E-14	9.3E-18	7.7E-18	1.7E-17
SSW	2000	U-238	7.9E-13	1.4E-16	1.2E-16	2.6E-16
SSW	2300	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00
SSW	2300	AC-227	3.5E-13	6.4E-17	5.3E-17	1.2E-16
SSW	2300	AC-228	1.5E-13	2.7E-17	2.2E-17	4.9E-17
SSW	2300	BI-210	1.3E-12	2.4E-16	2.0E-16	4.4E-16
SSW	2300	FR-223	2.8E-15	5.0E-19	3.6E-19	8.5E-19
SSW	2300	PA-231	2.4E-13	4.3E-17	3.6E-17	7.9E-17
SSW	2300	PA-234	7.3E-16	1.3E-19	1.1E-19	2.4E-19
SSW	2300	PA-234M	2.7E-15	4.9E-19	3.0E-19	7.9E-19
SSW	2300	PB-210	1.3E-12	2.4E-16	2.0E-16	4.4E-16
SSW	2300	PO-210	1.3E-12	2.4E-16	2.0E-16	4.4E-16
SSW	2300	RA-223	3.5E-13	6.4E-17	5.3E-17	1.2E-16
SSW	2300	RA-224	1.4E-13	2.5E-17	2.1E-17	4.6E-17
SSW	2300	RA-226	1.5E-12	2.7E-16	2.2E-16	4.9E-16
SSW	2300	RA-228	1.5E-13	2.8E-17	2.3E-17	5.1E-17
SSW	2300	TH-227	3.5E-14	6.3E-18	5.3E-18	1.2E-17
SSW	2300	TH-228	2.8E-13	5.1E-17	4.3E-17	9.4E-17
SSW	2300	TH-230	2.3E-11	4.1E-15	3.4E-15	7.6E-15
SSW	2300	TH-231	4.4E-14	7.9E-18	6.6E-18	1.5E-17
SSW	2300	TH-232	3.2E-13	5.8E-17	4.8E-17	1.1E-16
SSW	2300	TH-234	6.8E-13	1.2E-16	1.0E-16	2.2E-16
SSW	2300	U-234	6.6E-13	1.2E-16	9.9E-17	2.2E-16

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	2300	U-235	4.5E-14	8.0E-18	6.7E-18	1.5E-17
SSW	2300	U-236	4.5E-14	8.0E-18	6.7E-18	1.5E-17
SSW	2300	U-238	6.8E-13	1.2E-16	1.0E-16	2.2E-16
SSW	2400	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
SSW	2400	AC-227	3.4E-13	6.1E-17	5.1E-17	1.1E-16
SSW	2400	AC-228	1.4E-13	2.6E-17	2.1E-17	4.7E-17
SSW	2400	BI-210	1.3E-12	2.3E-16	1.9E-16	4.2E-16
SSW	2400	FR-223	2.6E-15	4.6E-19	3.3E-19	7.9E-19
SSW	2400	PA-231	2.3E-13	4.1E-17	3.4E-17	7.5E-17
SSW	2400	PA-234	7.0E-16	1.3E-19	1.0E-19	2.3E-19
SSW	2400	PA-234M	2.2E-15	3.9E-19	2.4E-19	6.3E-19
SSW	2400	PB-210	1.3E-12	2.3E-16	1.9E-16	4.2E-16
SSW	2400	PO-210	1.3E-12	2.3E-16	1.9E-16	4.2E-16
SSW	2400	RA-223	3.4E-13	6.1E-17	5.1E-17	1.1E-16
SSW	2400	RA-224	1.3E-13	2.4E-17	2.0E-17	4.4E-17
SSW	2400	RA-226	1.4E-12	2.5E-16	2.1E-16	4.6E-16
SSW	2400	RA-228	1.5E-13	2.7E-17	2.2E-17	4.9E-17
SSW	2400	TH-227	3.3E-14	6.0E-18	5.0E-18	1.1E-17
SSW	2400	TH-228	2.7E-13	4.9E-17	4.1E-17	9.0E-17
SSW	2400	TH-230	2.2E-11	3.9E-15	3.3E-15	7.2E-15
SSW	2400	TH-231	4.2E-14	7.6E-18	6.3E-18	1.4E-17
SSW	2400	TH-232	3.1E-13	5.5E-17	4.6E-17	1.0E-16
SSW	2400	TH-234	6.5E-13	1.2E-16	9.7E-17	2.1E-16
SSW	2400	U-234	6.3E-13	1.1E-16	9.5E-17	2.1E-16
SSW	2400	U-235	4.3E-14	7.7E-18	6.4E-18	1.4E-17
SSW	2400	U-236	4.3E-14	7.7E-18	6.4E-18	1.4E-17
SSW	2400	U-238	6.5E-13	1.2E-16	9.7E-17	2.1E-16
SSW	2600	RN-222	1.8E-04	0.0E+00	0.0E+00	0.0E+00
SSW	2600	AC-227	3.1E-13	5.6E-17	4.7E-17	1.0E-16
SSW	2600	AC-228	1.3E-13	2.3E-17	1.9E-17	4.3E-17
SSW	2600	BI-210	1.2E-12	2.1E-16	1.8E-16	3.8E-16
SSW	2600	FR-223	2.2E-15	4.0E-19	2.9E-19	6.9E-19
SSW	2600	PA-231	2.1E-13	3.8E-17	3.2E-17	6.9E-17
SSW	2600	PA-234	6.4E-16	1.2E-19	9.5E-20	2.1E-19
SSW	2600	PA-234M	1.4E-15	2.5E-19	1.6E-19	4.0E-19
SSW	2600	PB-210	1.2E-12	2.1E-16	1.8E-16	3.8E-16
SSW	2600	PO-210	1.2E-12	2.1E-16	1.8E-16	3.8E-16
SSW	2600	RA-223	3.1E-13	5.6E-17	4.7E-17	1.0E-16
SSW	2600	RA-224	1.2E-13	2.2E-17	1.8E-17	4.1E-17
SSW	2600	RA-226	1.3E-12	2.3E-16	1.9E-16	4.3E-16
SSW	2600	RA-228	1.4E-13	2.4E-17	2.0E-17	4.5E-17
SSW	2600	TH-227	3.1E-14	5.5E-18	4.6E-18	1.0E-17
SSW	2600	TH-228	2.5E-13	4.5E-17	3.8E-17	8.2E-17
SSW	2600	TH-230	2.0E-11	3.6E-15	3.0E-15	6.7E-15
SSW	2600	TH-231	3.9E-14	7.0E-18	5.8E-18	1.3E-17
SSW	2600	TH-232	2.8E-13	5.1E-17	4.2E-17	9.3E-17
SSW	2600	TH-234	5.9E-13	1.1E-16	9.0E-17	2.0E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	2600	U-234	5.8E-13	1.0E-16	8.7E-17	1.9E-16
SSW	2600	U-235	3.9E-14	7.0E-18	5.9E-18	1.3E-17
SSW	2600	U-236	3.9E-14	7.0E-18	5.9E-18	1.3E-17
SSW	2600	U-238	5.9E-13	1.1E-16	9.0E-17	2.0E-16
SSW	2700	RN-222	1.7E-04	0.0E+00	0.0E+00	0.0E+00
SSW	2700	AC-227	3.0E-13	5.3E-17	4.5E-17	9.8E-17
SSW	2700	AC-228	1.2E-13	2.2E-17	1.9E-17	4.1E-17
SSW	2700	BI-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
SSW	2700	FR-223	2.1E-15	3.7E-19	2.7E-19	6.4E-19
SSW	2700	PA-231	2.0E-13	3.6E-17	3.0E-17	6.7E-17
SSW	2700	PA-234	6.1E-16	1.1E-19	9.2E-20	2.0E-19
SSW	2700	PA-234M	1.1E-15	2.0E-19	1.3E-19	3.2E-19
SSW	2700	PB-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
SSW	2700	PO-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
SSW	2700	RA-223	3.0E-13	5.3E-17	4.5E-17	9.8E-17
SSW	2700	RA-224	1.2E-13	2.1E-17	1.8E-17	3.9E-17
SSW	2700	RA-226	1.2E-12	2.2E-16	1.9E-16	4.1E-16
SSW	2700	RA-228	1.3E-13	2.3E-17	2.0E-17	4.3E-17
SSW	2700	TH-227	3.0E-14	5.3E-18	4.5E-18	9.8E-18
SSW	2700	TH-228	2.4E-13	4.3E-17	3.6E-17	7.9E-17
SSW	2700	TH-230	1.9E-11	3.5E-15	2.9E-15	6.4E-15
SSW	2700	TH-231	3.7E-14	6.7E-18	5.6E-18	1.2E-17
SSW	2700	TH-232	2.7E-13	4.9E-17	4.1E-17	8.9E-17
SSW	2700	TH-234	5.7E-13	1.0E-16	8.6E-17	1.9E-16
SSW	2700	U-234	5.6E-13	1.0E-16	8.4E-17	1.8E-16
SSW	2700	U-235	3.8E-14	6.8E-18	5.7E-18	1.2E-17
SSW	2700	U-236	3.8E-14	6.8E-18	5.7E-18	1.2E-17
SSW	2700	U-238	5.7E-13	1.0E-16	8.6E-17	1.9E-16
SSW	3500	RN-222	1.3E-04	0.0E+00	0.0E+00	0.0E+00
SSW	3500	AC-227	2.2E-13	4.0E-17	3.4E-17	7.4E-17
SSW	3500	AC-228	9.1E-14	1.6E-17	1.4E-17	3.0E-17
SSW	3500	BI-210	8.3E-13	1.5E-16	1.3E-16	2.8E-16
SSW	3500	FR-223	1.2E-15	2.2E-19	1.7E-19	4.0E-19
SSW	3500	PA-231	1.5E-13	2.7E-17	2.3E-17	5.0E-17
SSW	3500	PA-234	4.5E-16	8.1E-20	6.9E-20	1.5E-19
SSW	3500	PA-234M	2.0E-16	3.7E-20	2.5E-20	6.1E-20
SSW	3500	PB-210	8.3E-13	1.5E-16	1.3E-16	2.8E-16
SSW	3500	PO-210	8.3E-13	1.5E-16	1.3E-16	2.8E-16
SSW	3500	RA-223	2.2E-13	4.0E-17	3.4E-17	7.4E-17
SSW	3500	RA-224	8.8E-14	1.6E-17	1.4E-17	2.9E-17
SSW	3500	RA-226	9.3E-13	1.7E-16	1.4E-16	3.1E-16
SSW	3500	RA-228	9.7E-14	1.7E-17	1.5E-17	3.2E-17
SSW	3500	TH-227	2.2E-14	4.0E-18	3.4E-18	7.4E-18
SSW	3500	TH-228	1.8E-13	3.2E-17	2.8E-17	6.0E-17
SSW	3500	TH-230	1.4E-11	2.6E-15	2.2E-15	4.8E-15
SSW	3500	TH-231	2.8E-14	5.0E-18	4.2E-18	9.2E-18
SSW	3500	TH-232	2.0E-13	3.6E-17	3.1E-17	6.7E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSW	3500	TH-234	4.3E-13	7.7E-17	6.6E-17	1.4E-16
SSW	3500	U-234	4.2E-13	7.5E-17	6.4E-17	1.4E-16
SSW	3500	U-235	2.8E-14	5.0E-18	4.3E-18	9.4E-18
SSW	3500	U-236	2.8E-14	5.0E-18	4.3E-18	9.4E-18
SSW	3500	U-238	4.3E-13	7.7E-17	6.6E-17	1.4E-16
S	300	RN-222	2.2E-04	0.0E+00	0.0E+00	0.0E+00
S	300	AC-227	3.9E-13	7.1E-17	4.1E-16	4.8E-16
S	300	AC-228	1.7E-13	3.1E-17	1.8E-16	2.1E-16
S	300	BI-210	1.5E-12	2.7E-16	1.5E-15	1.8E-15
S	300	FR-223	5.2E-15	9.4E-19	5.1E-18	6.1E-18
S	300	PA-231	2.7E-13	4.8E-17	2.8E-16	3.3E-16
S	300	PA-234	8.5E-16	1.5E-19	8.8E-19	1.0E-18
S	300	PA-234M	3.0E-13	5.4E-17	1.8E-16	2.3E-16
S	300	PB-210	1.5E-12	2.7E-16	1.5E-15	1.8E-15
S	300	PO-210	1.5E-12	2.7E-16	1.5E-15	1.8E-15
S	300	RA-223	3.9E-13	7.1E-17	4.1E-16	4.8E-16
S	300	RA-224	1.6E-13	2.8E-17	1.6E-16	1.9E-16
S	300	RA-226	1.6E-12	3.0E-16	1.7E-15	2.0E-15
S	300	RA-228	1.7E-13	3.1E-17	1.8E-16	2.1E-16
S	300	TH-227	3.9E-14	7.0E-18	4.1E-17	4.8E-17
S	300	TH-228	3.2E-13	5.7E-17	3.3E-16	3.9E-16
S	300	TH-230	2.6E-11	4.6E-15	2.7E-14	3.1E-14
S	300	TH-231	5.0E-14	9.0E-18	5.2E-17	6.1E-17
S	300	TH-232	3.6E-13	6.5E-17	3.7E-16	4.4E-16
S	300	TH-234	7.6E-13	1.4E-16	7.9E-16	9.2E-16
S	300	U-234	7.4E-13	1.3E-16	7.7E-16	9.0E-16
S	300	U-235	5.0E-14	9.0E-18	5.2E-17	6.1E-17
S	300	U-236	5.0E-14	9.0E-18	5.2E-17	6.1E-17
S	300	U-238	7.6E-13	1.4E-16	7.9E-16	9.2E-16
S	500	RN-222	3.2E-04	0.0E+00	0.0E+00	0.0E+00
S	500	AC-227	5.7E-13	1.0E-16	2.5E-16	3.5E-16
S	500	AC-228	2.5E-13	4.5E-17	1.1E-16	1.5E-16
S	500	BI-210	2.2E-12	3.9E-16	9.2E-16	1.3E-15
S	500	FR-223	7.3E-15	1.3E-18	2.9E-18	4.2E-18
S	500	PA-231	3.9E-13	7.0E-17	1.7E-16	2.4E-16
S	500	PA-234	1.2E-15	2.2E-19	5.2E-19	7.5E-19
S	500	PA-234M	2.5E-13	4.6E-17	6.1E-17	1.1E-16
S	500	PB-210	2.2E-12	3.9E-16	9.2E-16	1.3E-15
S	500	PO-210	2.2E-12	3.9E-16	9.2E-16	1.3E-15
S	500	RA-223	5.7E-13	1.0E-16	2.5E-16	3.5E-16
S	500	RA-224	2.3E-13	4.1E-17	9.7E-17	1.4E-16
S	500	RA-226	2.4E-12	4.3E-16	1.0E-15	1.5E-15
S	500	RA-228	2.5E-13	4.5E-17	1.1E-16	1.5E-16
S	500	TH-227	5.7E-14	1.0E-17	2.4E-17	3.5E-17
S	500	TH-228	4.6E-13	8.3E-17	2.0E-16	2.8E-16
S	500	TH-230	3.7E-11	6.7E-15	1.6E-14	2.3E-14
S	500	TH-231	7.2E-14	1.3E-17	3.1E-17	4.4E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
S	500	TH-232	5.2E-13	9.4E-17	2.2E-16	3.2E-16
S	500	TH-234	1.1E-12	2.0E-16	4.7E-16	6.7E-16
S	500	U-234	1.1E-12	1.9E-16	4.6E-16	6.5E-16
S	500	U-235	7.3E-14	1.3E-17	3.1E-17	4.4E-17
S	500	U-236	7.3E-14	1.3E-17	3.1E-17	4.4E-17
S	500	U-238	1.1E-12	2.0E-16	4.7E-16	6.7E-16
S	700	RN-222	3.8E-04	0.0E+00	0.0E+00	0.0E+00
S	700	AC-227	7.0E-13	1.3E-16	1.7E-16	3.0E-16
S	700	AC-228	3.0E-13	5.5E-17	7.6E-17	1.3E-16
S	700	BI-210	2.6E-12	4.7E-16	6.6E-16	1.1E-15
S	700	FR-223	8.4E-15	1.5E-18	1.9E-18	3.4E-18
S	700	PA-231	4.7E-13	8.5E-17	1.2E-16	2.0E-16
S	700	PA-234	1.5E-15	2.7E-19	3.7E-19	6.4E-19
S	700	PA-234M	1.8E-13	3.2E-17	2.6E-17	5.8E-17
S	700	PB-210	2.6E-12	4.7E-16	6.6E-16	1.1E-15
S	700	PO-210	2.6E-12	4.7E-16	6.6E-16	1.1E-15
S	700	RA-223	7.0E-13	1.3E-16	1.7E-16	3.0E-16
S	700	RA-224	2.8E-13	5.0E-17	6.9E-17	1.2E-16
S	700	RA-226	2.9E-12	5.2E-16	7.3E-16	1.3E-15
S	700	RA-228	3.0E-13	5.5E-17	7.7E-17	1.3E-16
S	700	TH-227	6.9E-14	1.2E-17	1.7E-17	3.0E-17
S	700	TH-228	5.6E-13	1.0E-16	1.4E-16	2.4E-16
S	700	TH-230	4.5E-11	8.2E-15	1.1E-14	2.0E-14
S	700	TH-231	8.8E-14	1.6E-17	2.2E-17	3.8E-17
S	700	TH-232	6.3E-13	1.1E-16	1.6E-16	2.7E-16
S	700	TH-234	1.3E-12	2.4E-16	3.4E-16	5.8E-16
S	700	U-234	1.3E-12	2.3E-16	3.3E-16	5.6E-16
S	700	U-235	8.8E-14	1.6E-17	2.2E-17	3.8E-17
S	700	U-236	8.8E-14	1.6E-17	2.2E-17	3.8E-17
S	700	U-238	1.3E-12	2.4E-16	3.4E-16	5.8E-16
S	1000	RN-222	3.9E-04	0.0E+00	0.0E+00	0.0E+00
S	1000	AC-227	7.0E-13	1.3E-16	1.2E-16	2.5E-16
S	1000	AC-228	3.0E-13	5.5E-17	5.2E-17	1.1E-16
S	1000	BI-210	2.6E-12	4.8E-16	4.6E-16	9.3E-16
S	1000	FR-223	7.7E-15	1.4E-18	1.2E-18	2.6E-18
S	1000	PA-231	4.8E-13	8.6E-17	8.3E-17	1.7E-16
S	1000	PA-234	1.5E-15	2.7E-19	2.6E-19	5.3E-19
S	1000	PA-234M	8.0E-14	1.4E-17	9.2E-18	2.4E-17
S	1000	PB-210	2.6E-12	4.8E-16	4.6E-16	9.3E-16
S	1000	PO-210	2.6E-12	4.8E-16	4.6E-16	9.3E-16
S	1000	RA-223	7.0E-13	1.3E-16	1.2E-16	2.5E-16
S	1000	RA-224	2.8E-13	5.0E-17	4.8E-17	9.9E-17
S	1000	RA-226	2.9E-12	5.3E-16	5.1E-16	1.0E-15
S	1000	RA-228	3.1E-13	5.5E-17	5.3E-17	1.1E-16
S	1000	TH-227	7.0E-14	1.3E-17	1.2E-17	2.5E-17
S	1000	TH-228	5.7E-13	1.0E-16	9.8E-17	2.0E-16
S	1000	TH-230	4.6E-11	8.2E-15	7.9E-15	1.6E-14

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
S	1000	TH-231	8.8E-14	1.6E-17	1.5E-17	3.1E-17
S	1000	TH-232	6.4E-13	1.1E-16	1.1E-16	2.3E-16
S	1000	TH-234	1.3E-12	2.4E-16	2.3E-16	4.8E-16
S	1000	U-234	1.3E-12	2.4E-16	2.3E-16	4.7E-16
S	1000	U-235	8.9E-14	1.6E-17	1.5E-17	3.1E-17
S	1000	U-236	8.9E-14	1.6E-17	1.5E-17	3.1E-17
S	1000	U-238	1.3E-12	2.4E-16	2.3E-16	4.8E-16
S	1300	RN-222	3.3E-04	0.0E+00	0.0E+00	0.0E+00
S	1300	AC-227	6.0E-13	1.1E-16	9.3E-17	2.0E-16
S	1300	AC-228	2.6E-13	4.6E-17	4.0E-17	8.6E-17
S	1300	BI-210	2.2E-12	4.0E-16	3.5E-16	7.6E-16
S	1300	FR-223	6.0E-15	1.1E-18	8.3E-19	1.9E-18
S	1300	PA-231	4.0E-13	7.3E-17	6.3E-17	1.4E-16
S	1300	PA-234	1.3E-15	2.3E-19	2.0E-19	4.2E-19
S	1300	PA-234M	3.4E-14	6.1E-18	3.7E-18	9.8E-18
S	1300	PB-210	2.2E-12	4.0E-16	3.5E-16	7.6E-16
S	1300	PO-210	2.2E-12	4.0E-16	3.5E-16	7.6E-16
S	1300	RA-223	6.0E-13	1.1E-16	9.3E-17	2.0E-16
S	1300	RA-224	2.4E-13	4.3E-17	3.7E-17	8.0E-17
S	1300	RA-226	2.5E-12	4.5E-16	3.9E-16	8.4E-16
S	1300	RA-228	2.6E-13	4.7E-17	4.1E-17	8.8E-17
S	1300	TH-227	5.9E-14	1.1E-17	9.3E-18	2.0E-17
S	1300	TH-228	4.8E-13	8.7E-17	7.5E-17	1.6E-16
S	1300	TH-230	3.9E-11	7.0E-15	6.1E-15	1.3E-14
S	1300	TH-231	7.5E-14	1.4E-17	1.2E-17	2.5E-17
S	1300	TH-232	5.4E-13	9.8E-17	8.5E-17	1.8E-16
S	1300	TH-234	1.1E-12	2.1E-16	1.8E-16	3.9E-16
S	1300	U-234	1.1E-12	2.0E-16	1.7E-16	3.8E-16
S	1300	U-235	7.5E-14	1.4E-17	1.2E-17	2.5E-17
S	1300	U-236	7.5E-14	1.4E-17	1.2E-17	2.5E-17
S	1300	U-238	1.1E-12	2.1E-16	1.8E-16	3.9E-16
S	1500	RN-222	3.0E-04	0.0E+00	0.0E+00	0.0E+00
S	1500	AC-227	5.3E-13	9.6E-17	8.1E-17	1.8E-16
S	1500	AC-228	2.3E-13	4.1E-17	3.4E-17	7.5E-17
S	1500	BI-210	2.0E-12	3.6E-16	3.0E-16	6.6E-16
S	1500	FR-223	5.1E-15	9.2E-19	6.7E-19	1.6E-18
S	1500	PA-231	3.6E-13	6.5E-17	5.5E-17	1.2E-16
S	1500	PA-234	1.1E-15	2.0E-19	1.7E-19	3.7E-19
S	1500	PA-234M	2.0E-14	3.5E-18	2.1E-18	5.6E-18
S	1500	PB-210	2.0E-12	3.6E-16	3.0E-16	6.6E-16
S	1500	PO-210	2.0E-12	3.6E-16	3.0E-16	6.6E-16
S	1500	RA-223	5.3E-13	9.6E-17	8.1E-17	1.8E-16
S	1500	RA-224	2.1E-13	3.8E-17	3.2E-17	7.0E-17
S	1500	RA-226	2.2E-12	4.0E-16	3.4E-16	7.4E-16
S	1500	RA-228	2.3E-13	4.2E-17	3.5E-17	7.7E-17
S	1500	TH-227	5.3E-14	9.5E-18	8.0E-18	1.8E-17
S	1500	TH-228	4.3E-13	7.7E-17	6.5E-17	1.4E-16

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
S	1500	TH-230	3.5E-11	6.2E-15	5.3E-15	1.1E-14
S	1500	TH-231	6.7E-14	1.2E-17	1.0E-17	2.2E-17
S	1500	TH-232	4.8E-13	8.7E-17	7.3E-17	1.6E-16
S	1500	TH-234	1.0E-12	1.8E-16	1.6E-16	3.4E-16
S	1500	U-234	1.0E-12	1.8E-16	1.5E-16	3.3E-16
S	1500	U-235	6.7E-14	1.2E-17	1.0E-17	2.2E-17
S	1500	U-236	6.7E-14	1.2E-17	1.0E-17	2.2E-17
S	1500	U-238	1.0E-12	1.8E-16	1.6E-16	3.4E-16
S	1700	RN-222	2.7E-04	0.0E+00	0.0E+00	0.0E+00
S	1700	AC-227	4.8E-13	8.6E-17	7.1E-17	1.6E-16
S	1700	AC-228	2.0E-13	3.7E-17	3.0E-17	6.7E-17
S	1700	BI-210	1.8E-12	3.2E-16	2.7E-16	5.9E-16
S	1700	FR-223	4.3E-15	7.8E-19	5.6E-19	1.3E-18
S	1700	PA-231	3.2E-13	5.8E-17	4.8E-17	1.1E-16
S	1700	PA-234	1.0E-15	1.8E-19	1.5E-19	3.3E-19
S	1700	PA-234M	1.2E-14	2.1E-18	1.3E-18	3.3E-18
S	1700	PB-210	1.8E-12	3.2E-16	2.7E-16	5.9E-16
S	1700	PO-210	1.8E-12	3.2E-16	2.7E-16	5.9E-16
S	1700	RA-223	4.8E-13	8.6E-17	7.1E-17	1.6E-16
S	1700	RA-224	1.9E-13	3.4E-17	2.8E-17	6.2E-17
S	1700	RA-226	2.0E-12	3.6E-16	3.0E-16	6.5E-16
S	1700	RA-228	2.1E-13	3.8E-17	3.1E-17	6.9E-17
S	1700	TH-227	4.7E-14	8.5E-18	7.1E-18	1.6E-17
S	1700	TH-228	3.8E-13	6.9E-17	5.7E-17	1.3E-16
S	1700	TH-230	3.1E-11	5.6E-15	4.6E-15	1.0E-14
S	1700	TH-231	6.0E-14	1.1E-17	8.9E-18	2.0E-17
S	1700	TH-232	4.3E-13	7.8E-17	6.5E-17	1.4E-16
S	1700	TH-234	9.1E-13	1.6E-16	1.4E-16	3.0E-16
S	1700	U-234	8.9E-13	1.6E-16	1.3E-16	2.9E-16
S	1700	U-235	6.0E-14	1.1E-17	9.0E-18	2.0E-17
S	1700	U-236	6.0E-14	1.1E-17	9.0E-18	2.0E-17
S	1700	U-238	9.1E-13	1.6E-16	1.4E-16	3.0E-16
S	2000	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
S	2000	AC-227	4.1E-13	7.3E-17	6.0E-17	1.3E-16
S	2000	AC-228	1.7E-13	3.1E-17	2.5E-17	5.6E-17
S	2000	BI-210	1.5E-12	2.8E-16	2.3E-16	5.0E-16
S	2000	FR-223	3.4E-15	6.1E-19	4.3E-19	1.0E-18
S	2000	PA-231	2.8E-13	5.0E-17	4.1E-17	9.0E-17
S	2000	PA-234	8.5E-16	1.5E-19	1.2E-19	2.8E-19
S	2000	PA-234M	5.4E-15	9.8E-19	6.0E-19	1.6E-18
S	2000	PB-210	1.5E-12	2.8E-16	2.3E-16	5.0E-16
S	2000	PO-210	1.5E-12	2.8E-16	2.3E-16	5.0E-16
S	2000	RA-223	4.1E-13	7.3E-17	6.0E-17	1.3E-16
S	2000	RA-224	1.6E-13	2.9E-17	2.4E-17	5.3E-17
S	2000	RA-226	1.7E-12	3.1E-16	2.5E-16	5.6E-16
S	2000	RA-228	1.8E-13	3.2E-17	2.6E-17	5.8E-17
S	2000	TH-227	4.0E-14	7.3E-18	6.0E-18	1.3E-17

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
S	2000	TH-228	3.3E-13	5.9E-17	4.8E-17	1.1E-16
S	2000	TH-230	2.6E-11	4.8E-15	3.9E-15	8.7E-15
S	2000	TH-231	5.1E-14	9.2E-18	7.5E-18	1.7E-17
S	2000	TH-232	3.7E-13	6.7E-17	5.5E-17	1.2E-16
S	2000	TH-234	7.8E-13	1.4E-16	1.2E-16	2.6E-16
S	2000	U-234	7.6E-13	1.4E-16	1.1E-16	2.5E-16
S	2000	U-235	5.1E-14	9.2E-18	7.6E-18	1.7E-17
S	2000	U-236	5.1E-14	9.2E-18	7.6E-18	1.7E-17
S	2000	U-238	7.8E-13	1.4E-16	1.2E-16	2.6E-16
S	2300	RN-222	2.0E-04	0.0E+00	0.0E+00	0.0E+00
S	2300	AC-227	3.5E-13	6.4E-17	5.2E-17	1.2E-16
S	2300	AC-228	1.5E-13	2.7E-17	2.2E-17	4.9E-17
S	2300	BI-210	1.3E-12	2.4E-16	2.0E-16	4.3E-16
S	2300	FR-223	2.7E-15	4.8E-19	3.5E-19	8.3E-19
S	2300	PA-231	2.4E-13	4.3E-17	3.5E-17	7.8E-17
S	2300	PA-234	7.3E-16	1.3E-19	1.1E-19	2.4E-19
S	2300	PA-234M	2.7E-15	4.8E-19	3.0E-19	7.8E-19
S	2300	PB-210	1.3E-12	2.4E-16	2.0E-16	4.3E-16
S	2300	PO-210	1.3E-12	2.4E-16	2.0E-16	4.3E-16
S	2300	RA-223	3.5E-13	6.4E-17	5.2E-17	1.2E-16
S	2300	RA-224	1.4E-13	2.5E-17	2.1E-17	4.6E-17
S	2300	RA-226	1.5E-12	2.7E-16	2.2E-16	4.8E-16
S	2300	RA-228	1.5E-13	2.8E-17	2.3E-17	5.1E-17
S	2300	TH-227	3.5E-14	6.3E-18	5.2E-18	1.1E-17
S	2300	TH-228	2.8E-13	5.1E-17	4.2E-17	9.3E-17
S	2300	TH-230	2.3E-11	4.1E-15	3.4E-15	7.5E-15
S	2300	TH-231	4.4E-14	7.9E-18	6.5E-18	1.4E-17
S	2300	TH-232	3.2E-13	5.8E-17	4.7E-17	1.1E-16
S	2300	TH-234	6.8E-13	1.2E-16	1.0E-16	2.2E-16
S	2300	U-234	6.6E-13	1.2E-16	9.7E-17	2.2E-16
S	2300	U-235	4.5E-14	8.0E-18	6.6E-18	1.5E-17
S	2300	U-236	4.5E-14	8.0E-18	6.6E-18	1.5E-17
S	2300	U-238	6.8E-13	1.2E-16	1.0E-16	2.2E-16
S	2400	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
S	2400	AC-227	3.4E-13	6.1E-17	5.0E-17	1.1E-16
S	2400	AC-228	1.4E-13	2.6E-17	2.1E-17	4.6E-17
S	2400	BI-210	1.3E-12	2.3E-16	1.9E-16	4.2E-16
S	2400	FR-223	2.5E-15	4.5E-19	3.2E-19	7.7E-19
S	2400	PA-231	2.3E-13	4.1E-17	3.4E-17	7.5E-17
S	2400	PA-234	7.0E-16	1.3E-19	1.0E-19	2.3E-19
S	2400	PA-234M	2.1E-15	3.8E-19	2.4E-19	6.2E-19
S	2400	PB-210	1.3E-12	2.3E-16	1.9E-16	4.2E-16
S	2400	PO-210	1.3E-12	2.3E-16	1.9E-16	4.2E-16
S	2400	RA-223	3.4E-13	6.1E-17	5.0E-17	1.1E-16
S	2400	RA-224	1.3E-13	2.4E-17	2.0E-17	4.4E-17
S	2400	RA-226	1.4E-12	2.5E-16	2.1E-16	4.6E-16
S	2400	RA-228	1.5E-13	2.7E-17	2.2E-17	4.8E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
S	2400	TH-227	3.4E-14	6.0E-18	4.9E-18	1.1E-17
S	2400	TH-228	2.7E-13	4.9E-17	4.0E-17	8.9E-17
S	2400	TH-230	2.2E-11	4.0E-15	3.2E-15	7.2E-15
S	2400	TH-231	4.2E-14	7.6E-18	6.2E-18	1.4E-17
S	2400	TH-232	3.1E-13	5.5E-17	4.5E-17	1.0E-16
S	2400	TH-234	6.5E-13	1.2E-16	9.6E-17	2.1E-16
S	2400	U-234	6.3E-13	1.1E-16	9.3E-17	2.1E-16
S	2400	U-235	4.3E-14	7.7E-18	6.3E-18	1.4E-17
S	2400	U-236	4.3E-14	7.7E-18	6.3E-18	1.4E-17
S	2400	U-238	6.5E-13	1.2E-16	9.6E-17	2.1E-16
S	2600	RN-222	1.8E-04	0.0E+00	0.0E+00	0.0E+00
S	2600	AC-227	3.1E-13	5.6E-17	4.6E-17	1.0E-16
S	2600	AC-228	1.3E-13	2.3E-17	1.9E-17	4.2E-17
S	2600	BI-210	1.2E-12	2.1E-16	1.7E-16	3.8E-16
S	2600	FR-223	2.2E-15	3.9E-19	2.8E-19	6.7E-19
S	2600	PA-231	2.1E-13	3.8E-17	3.1E-17	6.9E-17
S	2600	PA-234	6.4E-16	1.2E-19	9.4E-20	2.1E-19
S	2600	PA-234M	1.3E-15	2.4E-19	1.5E-19	3.9E-19
S	2600	PB-210	1.2E-12	2.1E-16	1.7E-16	3.8E-16
S	2600	PO-210	1.2E-12	2.1E-16	1.7E-16	3.8E-16
S	2600	RA-223	3.1E-13	5.6E-17	4.6E-17	1.0E-16
S	2600	RA-224	1.2E-13	2.2E-17	1.8E-17	4.0E-17
S	2600	RA-226	1.3E-12	2.3E-16	1.9E-16	4.2E-16
S	2600	RA-228	1.4E-13	2.4E-17	2.0E-17	4.5E-17
S	2600	TH-227	3.1E-14	5.6E-18	4.6E-18	1.0E-17
S	2600	TH-228	2.5E-13	4.5E-17	3.7E-17	8.2E-17
S	2600	TH-230	2.0E-11	3.6E-15	3.0E-15	6.6E-15
S	2600	TH-231	3.9E-14	7.0E-18	5.7E-18	1.3E-17
S	2600	TH-232	2.8E-13	5.1E-17	4.2E-17	9.3E-17
S	2600	TH-234	6.0E-13	1.1E-16	8.8E-17	2.0E-16
S	2600	U-234	5.8E-13	1.0E-16	8.6E-17	1.9E-16
S	2600	U-235	3.9E-14	7.1E-18	5.8E-18	1.3E-17
S	2600	U-236	3.9E-14	7.1E-18	5.8E-18	1.3E-17
S	2600	U-238	6.0E-13	1.1E-16	8.8E-17	2.0E-16
S	2700	RN-222	1.7E-04	0.0E+00	0.0E+00	0.0E+00
S	2700	AC-227	3.0E-13	5.4E-17	4.4E-17	9.8E-17
S	2700	AC-228	1.2E-13	2.2E-17	1.8E-17	4.1E-17
S	2700	BI-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
S	2700	FR-223	2.0E-15	3.6E-19	2.6E-19	6.3E-19
S	2700	PA-231	2.0E-13	3.6E-17	3.0E-17	6.6E-17
S	2700	PA-234	6.2E-16	1.1E-19	9.0E-20	2.0E-19
S	2700	PA-234M	1.1E-15	1.9E-19	1.2E-19	3.2E-19
S	2700	PB-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
S	2700	PO-210	1.1E-12	2.0E-16	1.7E-16	3.7E-16
S	2700	RA-223	3.0E-13	5.4E-17	4.4E-17	9.8E-17
S	2700	RA-224	1.2E-13	2.1E-17	1.7E-17	3.9E-17
S	2700	RA-226	1.2E-12	2.2E-16	1.8E-16	4.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
S	2700	RA-228	1.3E-13	2.4E-17	1.9E-17	4.3E-17
S	2700	TH-227	3.0E-14	5.3E-18	4.4E-18	9.7E-18
S	2700	TH-228	2.4E-13	4.3E-17	3.6E-17	7.9E-17
S	2700	TH-230	1.9E-11	3.5E-15	2.9E-15	6.4E-15
S	2700	TH-231	3.7E-14	6.7E-18	5.5E-18	1.2E-17
S	2700	TH-232	2.7E-13	4.9E-17	4.0E-17	8.9E-17
S	2700	TH-234	5.7E-13	1.0E-16	8.5E-17	1.9E-16
S	2700	U-234	5.6E-13	1.0E-16	8.3E-17	1.8E-16
S	2700	U-235	3.8E-14	6.8E-18	5.6E-18	1.2E-17
S	2700	U-236	3.8E-14	6.8E-18	5.6E-18	1.2E-17
S	2700	U-238	5.7E-13	1.0E-16	8.5E-17	1.9E-16
S	3500	RN-222	1.3E-04	0.0E+00	0.0E+00	0.0E+00
S	3500	AC-227	2.2E-13	4.0E-17	3.4E-17	7.4E-17
S	3500	AC-228	9.2E-14	1.7E-17	1.4E-17	3.0E-17
S	3500	BI-210	8.4E-13	1.5E-16	1.3E-16	2.8E-16
S	3500	FR-223	1.2E-15	2.2E-19	1.7E-19	3.8E-19
S	3500	PA-231	1.5E-13	2.7E-17	2.3E-17	5.0E-17
S	3500	PA-234	4.5E-16	8.2E-20	6.7E-20	1.5E-19
S	3500	PA-234M	1.9E-16	3.5E-20	2.4E-20	5.9E-20
S	3500	PB-210	8.4E-13	1.5E-16	1.3E-16	2.8E-16
S	3500	PO-210	8.4E-13	1.5E-16	1.3E-16	2.8E-16
S	3500	RA-223	2.2E-13	4.0E-17	3.4E-17	7.4E-17
S	3500	RA-224	8.9E-14	1.6E-17	1.3E-17	2.9E-17
S	3500	RA-226	9.4E-13	1.7E-16	1.4E-16	3.1E-16
S	3500	RA-228	9.8E-14	1.8E-17	1.5E-17	3.2E-17
S	3500	TH-227	2.2E-14	4.0E-18	3.3E-18	7.3E-18
S	3500	TH-228	1.8E-13	3.3E-17	2.7E-17	6.0E-17
S	3500	TH-230	1.5E-11	2.6E-15	2.2E-15	4.8E-15
S	3500	TH-231	2.8E-14	5.0E-18	4.2E-18	9.2E-18
S	3500	TH-232	2.0E-13	3.7E-17	3.1E-17	6.7E-17
S	3500	TH-234	4.3E-13	7.7E-17	6.5E-17	1.4E-16
S	3500	U-234	4.2E-13	7.6E-17	6.3E-17	1.4E-16
S	3500	U-235	2.8E-14	5.1E-18	4.2E-18	9.3E-18
S	3500	U-236	2.8E-14	5.1E-18	4.2E-18	9.3E-18
S	3500	U-238	4.3E-13	7.7E-17	6.5E-17	1.4E-16
SSE	300	RN-222	2.6E-04	0.0E+00	0.0E+00	0.0E+00
SSE	300	AC-227	4.8E-13	8.6E-17	6.4E-16	7.2E-16
SSE	300	AC-228	2.1E-13	3.8E-17	2.8E-16	3.2E-16
SSE	300	BI-210	1.8E-12	3.2E-16	2.4E-15	2.7E-15
SSE	300	FR-223	6.3E-15	1.1E-18	7.9E-18	9.0E-18
SSE	300	PA-231	3.2E-13	5.8E-17	4.3E-16	4.9E-16
SSE	300	PA-234	1.0E-15	1.9E-19	1.4E-18	1.6E-18
SSE	300	PA-234M	3.4E-13	6.2E-17	2.0E-16	2.6E-16
SSE	300	PB-210	1.8E-12	3.2E-16	2.4E-15	2.7E-15
SSE	300	PO-210	1.8E-12	3.2E-16	2.4E-15	2.7E-15
SSE	300	RA-223	4.8E-13	8.6E-17	6.4E-16	7.2E-16
SSE	300	RA-224	1.9E-13	3.4E-17	2.5E-16	2.9E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	300	RA-226	2.0E-12	3.6E-16	2.7E-15	3.0E-15
SSE	300	RA-228	2.1E-13	3.8E-17	2.8E-16	3.2E-16
SSE	300	TH-227	4.8E-14	8.6E-18	6.3E-17	7.2E-17
SSE	300	TH-228	3.9E-13	6.9E-17	5.1E-16	5.8E-16
SSE	300	TH-230	3.1E-11	5.6E-15	4.2E-14	4.7E-14
SSE	300	TH-231	6.0E-14	1.1E-17	8.0E-17	9.1E-17
SSE	300	TH-232	4.4E-13	7.8E-17	5.8E-16	6.6E-16
SSE	300	TH-234	9.2E-13	1.7E-16	1.2E-15	1.4E-15
SSE	300	U-234	9.0E-13	1.6E-16	1.2E-15	1.4E-15
SSE	300	U-235	6.0E-14	1.1E-17	8.1E-17	9.1E-17
SSE	300	U-236	6.0E-14	1.1E-17	8.1E-17	9.1E-17
SSE	300	U-238	9.2E-13	1.7E-16	1.2E-15	1.4E-15
SSE	500	RN-222	3.4E-04	0.0E+00	0.0E+00	0.0E+00
SSE	500	AC-227	6.2E-13	1.1E-16	3.8E-16	4.9E-16
SSE	500	AC-228	2.7E-13	4.9E-17	1.7E-16	2.1E-16
SSE	500	BI-210	2.3E-12	4.2E-16	1.4E-15	1.9E-15
SSE	500	FR-223	7.8E-15	1.4E-18	4.3E-18	5.7E-18
SSE	500	PA-231	4.2E-13	7.6E-17	2.6E-16	3.3E-16
SSE	500	PA-234	1.3E-15	2.4E-19	8.1E-19	1.1E-18
SSE	500	PA-234M	2.4E-13	4.4E-17	6.4E-17	1.1E-16
SSE	500	PB-210	2.3E-12	4.2E-16	1.4E-15	1.9E-15
SSE	500	PO-210	2.3E-12	4.2E-16	1.4E-15	1.9E-15
SSE	500	RA-223	6.2E-13	1.1E-16	3.8E-16	4.9E-16
SSE	500	RA-224	2.5E-13	4.4E-17	1.5E-16	2.0E-16
SSE	500	RA-226	2.6E-12	4.7E-16	1.6E-15	2.1E-15
SSE	500	RA-228	2.7E-13	4.9E-17	1.7E-16	2.2E-16
SSE	500	TH-227	6.2E-14	1.1E-17	3.8E-17	4.9E-17
SSE	500	TH-228	5.0E-13	9.0E-17	3.1E-16	4.0E-16
SSE	500	TH-230	4.0E-11	7.3E-15	2.5E-14	3.2E-14
SSE	500	TH-231	7.8E-14	1.4E-17	4.8E-17	6.2E-17
SSE	500	TH-232	5.6E-13	1.0E-16	3.5E-16	4.5E-16
SSE	500	TH-234	1.2E-12	2.1E-16	7.3E-16	9.5E-16
SSE	500	U-234	1.2E-12	2.1E-16	7.2E-16	9.2E-16
SSE	500	U-235	7.8E-14	1.4E-17	4.8E-17	6.2E-17
SSE	500	U-236	7.8E-14	1.4E-17	4.8E-17	6.2E-17
SSE	500	U-238	1.2E-12	2.1E-16	7.3E-16	9.5E-16
SSE	700	RN-222	4.2E-04	0.0E+00	0.0E+00	0.0E+00
SSE	700	AC-227	7.6E-13	1.4E-16	2.7E-16	4.1E-16
SSE	700	AC-228	3.3E-13	6.0E-17	1.2E-16	1.8E-16
SSE	700	BI-210	2.9E-12	5.2E-16	1.0E-15	1.5E-15
SSE	700	FR-223	8.9E-15	1.6E-18	2.8E-18	4.4E-18
SSE	700	PA-231	5.2E-13	9.3E-17	1.8E-16	2.8E-16
SSE	700	PA-234	1.6E-15	2.9E-19	5.8E-19	8.7E-19
SSE	700	PA-234M	1.6E-13	3.0E-17	2.8E-17	5.8E-17
SSE	700	PB-210	2.9E-12	5.2E-16	1.0E-15	1.5E-15
SSE	700	PO-210	2.9E-12	5.2E-16	1.0E-15	1.5E-15
SSE	700	RA-223	7.6E-13	1.4E-16	2.7E-16	4.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	700	RA-224	3.0E-13	5.4E-17	1.1E-16	1.6E-16
SSE	700	RA-226	3.2E-12	5.7E-16	1.1E-15	1.7E-15
SSE	700	RA-228	3.3E-13	6.0E-17	1.2E-16	1.8E-16
SSE	700	TH-227	7.6E-14	1.4E-17	2.7E-17	4.1E-17
SSE	700	TH-228	6.1E-13	1.1E-16	2.2E-16	3.3E-16
SSE	700	TH-230	5.0E-11	8.9E-15	1.8E-14	2.7E-14
SSE	700	TH-231	9.6E-14	1.7E-17	3.4E-17	5.2E-17
SSE	700	TH-232	6.9E-13	1.2E-16	2.5E-16	3.7E-16
SSE	700	TH-234	1.5E-12	2.6E-16	5.2E-16	7.9E-16
SSE	700	U-234	1.4E-12	2.6E-16	5.1E-16	7.7E-16
SSE	700	U-235	9.6E-14	1.7E-17	3.4E-17	5.2E-17
SSE	700	U-236	9.6E-14	1.7E-17	3.4E-17	5.2E-17
SSE	700	U-238	1.5E-12	2.6E-16	5.2E-16	7.9E-16
SSE	1000	RN-222	4.5E-04	0.0E+00	0.0E+00	0.0E+00
SSE	1000	AC-227	8.1E-13	1.5E-16	1.9E-16	3.4E-16
SSE	1000	AC-228	3.5E-13	6.3E-17	8.1E-17	1.4E-16
SSE	1000	BI-210	3.1E-12	5.5E-16	7.1E-16	1.3E-15
SSE	1000	FR-223	8.5E-15	1.5E-18	1.8E-18	3.3E-18
SSE	1000	PA-231	5.5E-13	9.9E-17	1.3E-16	2.3E-16
SSE	1000	PA-234	1.7E-15	3.1E-19	4.0E-19	7.1E-19
SSE	1000	PA-234M	8.0E-14	1.4E-17	1.0E-17	2.5E-17
SSE	1000	PB-210	3.1E-12	5.5E-16	7.1E-16	1.3E-15
SSE	1000	PO-210	3.1E-12	5.5E-16	7.1E-16	1.3E-15
SSE	1000	RA-223	8.1E-13	1.5E-16	1.9E-16	3.4E-16
SSE	1000	RA-224	3.2E-13	5.8E-17	7.5E-17	1.3E-16
SSE	1000	RA-226	3.4E-12	6.1E-16	7.9E-16	1.4E-15
SSE	1000	RA-228	3.6E-13	6.4E-17	8.3E-17	1.5E-16
SSE	1000	TH-227	8.1E-14	1.5E-17	1.9E-17	3.3E-17
SSE	1000	TH-228	6.6E-13	1.2E-16	1.5E-16	2.7E-16
SSE	1000	TH-230	5.3E-11	9.5E-15	1.2E-14	2.2E-14
SSE	1000	TH-231	1.0E-13	1.8E-17	2.4E-17	4.2E-17
SSE	1000	TH-232	7.4E-13	1.3E-16	1.7E-16	3.1E-16
SSE	1000	TH-234	1.6E-12	2.8E-16	3.6E-16	6.5E-16
SSE	1000	U-234	1.5E-12	2.7E-16	3.6E-16	6.3E-16
SSE	1000	U-235	1.0E-13	1.8E-17	2.4E-17	4.2E-17
SSE	1000	U-236	1.0E-13	1.8E-17	2.4E-17	4.2E-17
SSE	1000	U-238	1.6E-12	2.8E-16	3.6E-16	6.5E-16
SSE	1300	RN-222	4.0E-04	0.0E+00	0.0E+00	0.0E+00
SSE	1300	AC-227	7.1E-13	1.3E-16	1.5E-16	2.7E-16
SSE	1300	AC-228	3.1E-13	5.5E-17	6.2E-17	1.2E-16
SSE	1300	BI-210	2.7E-12	4.8E-16	5.5E-16	1.0E-15
SSE	1300	FR-223	6.7E-15	1.2E-18	1.2E-18	2.4E-18
SSE	1300	PA-231	4.8E-13	8.7E-17	9.9E-17	1.9E-16
SSE	1300	PA-234	1.5E-15	2.7E-19	3.0E-19	5.7E-19
SSE	1300	PA-234M	3.7E-14	6.6E-18	4.3E-18	1.1E-17
SSE	1300	PB-210	2.7E-12	4.8E-16	5.5E-16	1.0E-15
SSE	1300	PO-210	2.7E-12	4.8E-16	5.5E-16	1.0E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	1300	RA-223	7.1E-13	1.3E-16	1.5E-16	2.7E-16
SSE	1300	RA-224	2.8E-13	5.1E-17	5.8E-17	1.1E-16
SSE	1300	RA-226	3.0E-12	5.3E-16	6.1E-16	1.1E-15
SSE	1300	RA-228	3.1E-13	5.6E-17	6.4E-17	1.2E-16
SSE	1300	TH-227	7.1E-14	1.3E-17	1.4E-17	2.7E-17
SSE	1300	TH-228	5.7E-13	1.0E-16	1.2E-16	2.2E-16
SSE	1300	TH-230	4.6E-11	8.3E-15	9.5E-15	1.8E-14
SSE	1300	TH-231	8.9E-14	1.6E-17	1.8E-17	3.4E-17
SSE	1300	TH-232	6.5E-13	1.2E-16	1.3E-16	2.5E-16
SSE	1300	TH-234	1.4E-12	2.5E-16	2.8E-16	5.3E-16
SSE	1300	U-234	1.3E-12	2.4E-16	2.7E-16	5.1E-16
SSE	1300	U-235	9.0E-14	1.6E-17	1.8E-17	3.5E-17
SSE	1300	U-236	9.0E-14	1.6E-17	1.8E-17	3.5E-17
SSE	1300	U-238	1.4E-12	2.5E-16	2.8E-16	5.3E-16
SSE	1500	RN-222	3.6E-04	0.0E+00	0.0E+00	0.0E+00
SSE	1500	AC-227	6.5E-13	1.2E-16	1.3E-16	2.4E-16
SSE	1500	AC-228	2.8E-13	5.0E-17	5.3E-17	1.0E-16
SSE	1500	BI-210	2.4E-12	4.4E-16	4.7E-16	9.1E-16
SSE	1500	FR-223	5.7E-15	1.0E-18	9.5E-19	2.0E-18
SSE	1500	PA-231	4.4E-13	7.9E-17	8.5E-17	1.6E-16
SSE	1500	PA-234	1.4E-15	2.4E-19	2.6E-19	5.1E-19
SSE	1500	PA-234M	2.2E-14	4.0E-18	2.5E-18	6.5E-18
SSE	1500	PB-210	2.4E-12	4.4E-16	4.7E-16	9.1E-16
SSE	1500	PO-210	2.4E-12	4.4E-16	4.7E-16	9.1E-16
SSE	1500	RA-223	6.5E-13	1.2E-16	1.3E-16	2.4E-16
SSE	1500	RA-224	2.6E-13	4.6E-17	5.0E-17	9.6E-17
SSE	1500	RA-226	2.7E-12	4.9E-16	5.2E-16	1.0E-15
SSE	1500	RA-228	2.8E-13	5.1E-17	5.5E-17	1.1E-16
SSE	1500	TH-227	6.4E-14	1.2E-17	1.2E-17	2.4E-17
SSE	1500	TH-228	5.2E-13	9.4E-17	1.0E-16	2.0E-16
SSE	1500	TH-230	4.2E-11	7.6E-15	8.2E-15	1.6E-14
SSE	1500	TH-231	8.1E-14	1.5E-17	1.6E-17	3.0E-17
SSE	1500	TH-232	5.9E-13	1.1E-16	1.1E-16	2.2E-16
SSE	1500	TH-234	1.2E-12	2.2E-16	2.4E-16	4.6E-16
SSE	1500	U-234	1.2E-12	2.2E-16	2.4E-16	4.5E-16
SSE	1500	U-235	8.2E-14	1.5E-17	1.6E-17	3.1E-17
SSE	1500	U-236	8.2E-14	1.5E-17	1.6E-17	3.1E-17
SSE	1500	U-238	1.2E-12	2.2E-16	2.4E-16	4.6E-16
SSE	1700	RN-222	3.3E-04	0.0E+00	0.0E+00	0.0E+00
SSE	1700	AC-227	5.9E-13	1.1E-16	1.1E-16	2.2E-16
SSE	1700	AC-228	2.5E-13	4.5E-17	4.7E-17	9.2E-17
SSE	1700	BI-210	2.2E-12	4.0E-16	4.2E-16	8.1E-16
SSE	1700	FR-223	4.8E-15	8.7E-19	7.8E-19	1.7E-18
SSE	1700	PA-231	4.0E-13	7.2E-17	7.5E-17	1.5E-16
SSE	1700	PA-234	1.2E-15	2.2E-19	2.3E-19	4.5E-19
SSE	1700	PA-234M	1.4E-14	2.5E-18	1.5E-18	4.0E-18
SSE	1700	PB-210	2.2E-12	4.0E-16	4.2E-16	8.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	1700	PO-210	2.2E-12	4.0E-16	4.2E-16	8.1E-16
SSE	1700	RA-223	5.9E-13	1.1E-16	1.1E-16	2.2E-16
SSE	1700	RA-224	2.3E-13	4.2E-17	4.4E-17	8.6E-17
SSE	1700	RA-226	2.5E-12	4.4E-16	4.6E-16	9.0E-16
SSE	1700	RA-228	2.6E-13	4.6E-17	4.8E-17	9.5E-17
SSE	1700	TH-227	5.9E-14	1.1E-17	1.1E-17	2.2E-17
SSE	1700	TH-228	4.8E-13	8.6E-17	8.9E-17	1.7E-16
SSE	1700	TH-230	3.8E-11	6.9E-15	7.2E-15	1.4E-14
SSE	1700	TH-231	7.4E-14	1.3E-17	1.4E-17	2.7E-17
SSE	1700	TH-232	5.4E-13	9.6E-17	1.0E-16	2.0E-16
SSE	1700	TH-234	1.1E-12	2.0E-16	2.1E-16	4.2E-16
SSE	1700	U-234	1.1E-12	2.0E-16	2.1E-16	4.1E-16
SSE	1700	U-235	7.4E-14	1.3E-17	1.4E-17	2.7E-17
SSE	1700	U-236	7.4E-14	1.3E-17	1.4E-17	2.7E-17
SSE	1700	U-238	1.1E-12	2.0E-16	2.1E-16	4.2E-16
SSE	2000	RN-222	2.9E-04	0.0E+00	0.0E+00	0.0E+00
SSE	2000	AC-227	5.2E-13	9.3E-17	9.4E-17	1.9E-16
SSE	2000	AC-228	2.2E-13	3.9E-17	3.9E-17	7.8E-17
SSE	2000	BI-210	2.0E-12	3.5E-16	3.5E-16	7.0E-16
SSE	2000	FR-223	3.8E-15	6.9E-19	5.9E-19	1.3E-18
SSE	2000	PA-231	3.5E-13	6.3E-17	6.3E-17	1.3E-16
SSE	2000	PA-234	1.1E-15	1.9E-19	1.9E-19	3.9E-19
SSE	2000	PA-234M	6.8E-15	1.2E-18	7.6E-19	2.0E-18
SSE	2000	PB-210	2.0E-12	3.5E-16	3.5E-16	7.0E-16
SSE	2000	PO-210	2.0E-12	3.5E-16	3.5E-16	7.0E-16
SSE	2000	RA-223	5.2E-13	9.3E-17	9.4E-17	1.9E-16
SSE	2000	RA-224	2.1E-13	3.7E-17	3.7E-17	7.4E-17
SSE	2000	RA-226	2.2E-12	3.9E-16	3.9E-16	7.8E-16
SSE	2000	RA-228	2.3E-13	4.1E-17	4.1E-17	8.2E-17
SSE	2000	TH-227	5.2E-14	9.3E-18	9.3E-18	1.9E-17
SSE	2000	TH-228	4.2E-13	7.5E-17	7.5E-17	1.5E-16
SSE	2000	TH-230	3.4E-11	6.1E-15	6.1E-15	1.2E-14
SSE	2000	TH-231	6.5E-14	1.2E-17	1.2E-17	2.3E-17
SSE	2000	TH-232	4.7E-13	8.5E-17	8.5E-17	1.7E-16
SSE	2000	TH-234	1.0E-12	1.8E-16	1.8E-16	3.6E-16
SSE	2000	U-234	9.7E-13	1.7E-16	1.8E-16	3.5E-16
SSE	2000	U-235	6.6E-14	1.2E-17	1.2E-17	2.4E-17
SSE	2000	U-236	6.6E-14	1.2E-17	1.2E-17	2.4E-17
SSE	2000	U-238	1.0E-12	1.8E-16	1.8E-16	3.6E-16
SSE	2300	RN-222	2.6E-04	0.0E+00	0.0E+00	0.0E+00
SSE	2300	AC-227	4.6E-13	8.4E-17	8.1E-17	1.6E-16
SSE	2300	AC-228	1.9E-13	3.5E-17	3.4E-17	6.8E-17
SSE	2300	BI-210	1.7E-12	3.1E-16	3.0E-16	6.2E-16
SSE	2300	FR-223	3.1E-15	5.5E-19	4.6E-19	1.0E-18
SSE	2300	PA-231	3.1E-13	5.7E-17	5.5E-17	1.1E-16
SSE	2300	PA-234	9.6E-16	1.7E-19	1.7E-19	3.4E-19
SSE	2300	PA-234M	3.5E-15	6.2E-19	3.9E-19	1.0E-18

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	2300	PB-210	1.7E-12	3.1E-16	3.0E-16	6.2E-16
SSE	2300	PO-210	1.7E-12	3.1E-16	3.0E-16	6.2E-16
SSE	2300	RA-223	4.6E-13	8.4E-17	8.1E-17	1.6E-16
SSE	2300	RA-224	1.8E-13	3.3E-17	3.2E-17	6.5E-17
SSE	2300	RA-226	1.9E-12	3.5E-16	3.4E-16	6.9E-16
SSE	2300	RA-228	2.0E-13	3.7E-17	3.5E-17	7.2E-17
SSE	2300	TH-227	4.6E-14	8.3E-18	8.0E-18	1.6E-17
SSE	2300	TH-228	3.7E-13	6.7E-17	6.5E-17	1.3E-16
SSE	2300	TH-230	3.0E-11	5.4E-15	5.3E-15	1.1E-14
SSE	2300	TH-231	5.8E-14	1.0E-17	1.0E-17	2.1E-17
SSE	2300	TH-232	4.2E-13	7.6E-17	7.4E-17	1.5E-16
SSE	2300	TH-234	8.9E-13	1.6E-16	1.6E-16	3.2E-16
SSE	2300	U-234	8.7E-13	1.6E-16	1.5E-16	3.1E-16
SSE	2300	U-235	5.9E-14	1.1E-17	1.0E-17	2.1E-17
SSE	2300	U-236	5.9E-14	1.1E-17	1.0E-17	2.1E-17
SSE	2300	U-238	8.9E-13	1.6E-16	1.6E-16	3.2E-16
SSE	2400	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
SSE	2400	AC-227	4.5E-13	8.1E-17	7.7E-17	1.6E-16
SSE	2400	AC-228	1.9E-13	3.4E-17	3.2E-17	6.6E-17
SSE	2400	BI-210	1.7E-12	3.0E-16	2.9E-16	6.0E-16
SSE	2400	FR-223	2.9E-15	5.1E-19	4.3E-19	9.4E-19
SSE	2400	PA-231	3.0E-13	5.5E-17	5.2E-17	1.1E-16
SSE	2400	PA-234	9.2E-16	1.7E-19	1.6E-19	3.2E-19
SSE	2400	PA-234M	2.8E-15	5.0E-19	3.1E-19	8.1E-19
SSE	2400	PB-210	1.7E-12	3.0E-16	2.9E-16	6.0E-16
SSE	2400	PO-210	1.7E-12	3.0E-16	2.9E-16	6.0E-16
SSE	2400	RA-223	4.5E-13	8.1E-17	7.7E-17	1.6E-16
SSE	2400	RA-224	1.8E-13	3.2E-17	3.1E-17	6.3E-17
SSE	2400	RA-226	1.9E-12	3.4E-16	3.2E-16	6.6E-16
SSE	2400	RA-228	2.0E-13	3.5E-17	3.4E-17	6.9E-17
SSE	2400	TH-227	4.5E-14	8.0E-18	7.7E-18	1.6E-17
SSE	2400	TH-228	3.6E-13	6.5E-17	6.2E-17	1.3E-16
SSE	2400	TH-230	2.9E-11	5.3E-15	5.0E-15	1.0E-14
SSE	2400	TH-231	5.6E-14	1.0E-17	9.6E-18	2.0E-17
SSE	2400	TH-232	4.1E-13	7.3E-17	7.0E-17	1.4E-16
SSE	2400	TH-234	8.6E-13	1.6E-16	1.5E-16	3.0E-16
SSE	2400	U-234	8.4E-13	1.5E-16	1.5E-16	3.0E-16
SSE	2400	U-235	5.7E-14	1.0E-17	9.8E-18	2.0E-17
SSE	2400	U-236	5.7E-14	1.0E-17	9.8E-18	2.0E-17
SSE	2400	U-238	8.6E-13	1.6E-16	1.5E-16	3.0E-16
SSE	2600	RN-222	2.4E-04	0.0E+00	0.0E+00	0.0E+00
SSE	2600	AC-227	4.2E-13	7.6E-17	7.1E-17	1.5E-16
SSE	2600	AC-228	1.7E-13	3.1E-17	2.9E-17	6.1E-17
SSE	2600	BI-210	1.6E-12	2.9E-16	2.7E-16	5.5E-16
SSE	2600	FR-223	2.5E-15	4.5E-19	3.7E-19	8.1E-19
SSE	2600	PA-231	2.9E-13	5.1E-17	4.8E-17	1.0E-16
SSE	2600	PA-234	8.6E-16	1.5E-19	1.4E-19	3.0E-19

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	2600	PA-234M	1.8E-15	3.2E-19	2.0E-19	5.3E-19
SSE	2600	PB-210	1.6E-12	2.9E-16	2.7E-16	5.5E-16
SSE	2600	PO-210	1.6E-12	2.9E-16	2.7E-16	5.5E-16
SSE	2600	RA-223	4.2E-13	7.6E-17	7.1E-17	1.5E-16
SSE	2600	RA-224	1.7E-13	3.0E-17	2.8E-17	5.8E-17
SSE	2600	RA-226	1.8E-12	3.2E-16	3.0E-16	6.1E-16
SSE	2600	RA-228	1.8E-13	3.3E-17	3.1E-17	6.4E-17
SSE	2600	TH-227	4.2E-14	7.5E-18	7.1E-18	1.5E-17
SSE	2600	TH-228	3.4E-13	6.1E-17	5.7E-17	1.2E-16
SSE	2600	TH-230	2.7E-11	4.9E-15	4.6E-15	9.6E-15
SSE	2600	TH-231	5.2E-14	9.4E-18	8.9E-18	1.8E-17
SSE	2600	TH-232	3.8E-13	6.9E-17	6.5E-17	1.3E-16
SSE	2600	TH-234	8.1E-13	1.5E-16	1.4E-16	2.8E-16
SSE	2600	U-234	7.9E-13	1.4E-16	1.3E-16	2.8E-16
SSE	2600	U-235	5.3E-14	9.6E-18	9.0E-18	1.9E-17
SSE	2600	U-236	5.3E-14	9.6E-18	9.0E-18	1.9E-17
SSE	2600	U-238	8.1E-13	1.5E-16	1.4E-16	2.8E-16
SSE	2700	RN-222	2.3E-04	0.0E+00	0.0E+00	0.0E+00
SSE	2700	AC-227	4.1E-13	7.4E-17	6.8E-17	1.4E-16
SSE	2700	AC-228	1.7E-13	3.0E-17	2.8E-17	5.8E-17
SSE	2700	BI-210	1.5E-12	2.8E-16	2.6E-16	5.3E-16
SSE	2700	FR-223	2.3E-15	4.2E-19	3.4E-19	7.6E-19
SSE	2700	PA-231	2.8E-13	5.0E-17	4.6E-17	9.6E-17
SSE	2700	PA-234	8.3E-16	1.5E-19	1.4E-19	2.9E-19
SSE	2700	PA-234M	1.4E-15	2.6E-19	1.7E-19	4.3E-19
SSE	2700	PB-210	1.5E-12	2.8E-16	2.6E-16	5.3E-16
SSE	2700	PO-210	1.5E-12	2.8E-16	2.6E-16	5.3E-16
SSE	2700	RA-223	4.1E-13	7.4E-17	6.8E-17	1.4E-16
SSE	2700	RA-224	1.6E-13	2.9E-17	2.7E-17	5.6E-17
SSE	2700	RA-226	1.7E-12	3.1E-16	2.9E-16	5.9E-16
SSE	2700	RA-228	1.8E-13	3.2E-17	3.0E-17	6.2E-17
SSE	2700	TH-227	4.1E-14	7.3E-18	6.8E-18	1.4E-17
SSE	2700	TH-228	3.3E-13	5.9E-17	5.5E-17	1.1E-16
SSE	2700	TH-230	2.7E-11	4.8E-15	4.5E-15	9.2E-15
SSE	2700	TH-231	5.1E-14	9.2E-18	8.5E-18	1.8E-17
SSE	2700	TH-232	3.7E-13	6.7E-17	6.2E-17	1.3E-16
SSE	2700	TH-234	7.8E-13	1.4E-16	1.3E-16	2.7E-16
SSE	2700	U-234	7.7E-13	1.4E-16	1.3E-16	2.7E-16
SSE	2700	U-235	5.2E-14	9.3E-18	8.7E-18	1.8E-17
SSE	2700	U-236	5.2E-14	9.3E-18	8.7E-18	1.8E-17
SSE	2700	U-238	7.8E-13	1.4E-16	1.3E-16	2.7E-16
SSE	3500	RN-222	1.9E-04	0.0E+00	0.0E+00	0.0E+00
SSE	3500	AC-227	3.2E-13	5.8E-17	5.2E-17	1.1E-16
SSE	3500	AC-228	1.3E-13	2.3E-17	2.1E-17	4.4E-17
SSE	3500	BI-210	1.2E-12	2.2E-16	2.0E-16	4.1E-16
SSE	3500	FR-223	1.4E-15	2.5E-19	2.0E-19	4.5E-19
SSE	3500	PA-231	2.2E-13	3.9E-17	3.5E-17	7.5E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SSE	3500	PA-234	6.4E-16	1.2E-19	1.0E-19	2.2E-19
SSE	3500	PA-234M	2.7E-16	4.9E-20	3.3E-20	8.2E-20
SSE	3500	PB-210	1.2E-12	2.2E-16	2.0E-16	4.1E-16
SSE	3500	PO-210	1.2E-12	2.2E-16	2.0E-16	4.1E-16
SSE	3500	RA-223	3.2E-13	5.8E-17	5.2E-17	1.1E-16
SSE	3500	RA-224	1.3E-13	2.3E-17	2.1E-17	4.4E-17
SSE	3500	RA-226	1.3E-12	2.4E-16	2.2E-16	4.6E-16
SSE	3500	RA-228	1.4E-13	2.5E-17	2.3E-17	4.8E-17
SSE	3500	TH-227	3.2E-14	5.8E-18	5.2E-18	1.1E-17
SSE	3500	TH-228	2.6E-13	4.7E-17	4.2E-17	8.9E-17
SSE	3500	TH-230	2.1E-11	3.8E-15	3.4E-15	7.2E-15
SSE	3500	TH-231	4.0E-14	7.2E-18	6.4E-18	1.4E-17
SSE	3500	TH-232	2.9E-13	5.3E-17	4.7E-17	1.0E-16
SSE	3500	TH-234	6.2E-13	1.1E-16	1.0E-16	2.1E-16
SSE	3500	U-234	6.0E-13	1.1E-16	9.8E-17	2.1E-16
SSE	3500	U-235	4.1E-14	7.3E-18	6.6E-18	1.4E-17
SSE	3500	U-236	4.1E-14	7.3E-18	6.6E-18	1.4E-17
SSE	3500	U-238	6.2E-13	1.1E-16	1.0E-16	2.1E-16
SE	300	RN-222	3.4E-04	0.0E+00	0.0E+00	0.0E+00
SE	300	AC-227	6.2E-13	1.1E-16	9.8E-16	1.1E-15
SE	300	AC-228	2.7E-13	4.9E-17	4.3E-16	4.8E-16
SE	300	BI-210	2.3E-12	4.2E-16	3.7E-15	4.1E-15
SE	300	FR-223	8.1E-15	1.5E-18	1.2E-17	1.3E-17
SE	300	PA-231	4.2E-13	7.5E-17	6.7E-16	7.4E-16
SE	300	PA-234	1.3E-15	2.4E-19	2.1E-18	2.3E-18
SE	300	PA-234M	4.3E-13	7.8E-17	2.4E-16	3.2E-16
SE	300	PB-210	2.3E-12	4.2E-16	3.7E-15	4.1E-15
SE	300	PO-210	2.3E-12	4.2E-16	3.7E-15	4.1E-15
SE	300	RA-223	6.2E-13	1.1E-16	9.8E-16	1.1E-15
SE	300	RA-224	2.4E-13	4.4E-17	3.9E-16	4.3E-16
SE	300	RA-226	2.6E-12	4.6E-16	4.1E-15	4.6E-15
SE	300	RA-228	2.7E-13	4.9E-17	4.3E-16	4.8E-16
SE	300	TH-227	6.1E-14	1.1E-17	9.8E-17	1.1E-16
SE	300	TH-228	5.0E-13	9.0E-17	7.9E-16	8.8E-16
SE	300	TH-230	4.0E-11	7.2E-15	6.4E-14	7.1E-14
SE	300	TH-231	7.8E-14	1.4E-17	1.2E-16	1.4E-16
SE	300	TH-232	5.6E-13	1.0E-16	8.9E-16	9.9E-16
SE	300	TH-234	1.2E-12	2.1E-16	1.9E-15	2.1E-15
SE	300	U-234	1.2E-12	2.1E-16	1.8E-15	2.0E-15
SE	300	U-235	7.8E-14	1.4E-17	1.2E-16	1.4E-16
SE	300	U-236	7.8E-14	1.4E-17	1.2E-16	1.4E-16
SE	300	U-238	1.2E-12	2.1E-16	1.9E-15	2.1E-15
SE	500	RN-222	4.1E-04	0.0E+00	0.0E+00	0.0E+00
SE	500	AC-227	7.5E-13	1.3E-16	5.9E-16	7.2E-16
SE	500	AC-228	3.3E-13	5.9E-17	2.5E-16	3.1E-16
SE	500	BI-210	2.8E-12	5.1E-16	2.2E-15	2.7E-15
SE	500	FR-223	9.3E-15	1.7E-18	6.4E-18	8.1E-18

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	500	PA-231	5.1E-13	9.1E-17	4.0E-16	4.9E-16
SE	500	PA-234	1.6E-15	2.9E-19	1.3E-18	1.5E-18
SE	500	PA-234M	3.0E-13	5.3E-17	7.6E-17	1.3E-16
SE	500	PB-210	2.8E-12	5.1E-16	2.2E-15	2.7E-15
SE	500	PO-210	2.8E-12	5.1E-16	2.2E-15	2.7E-15
SE	500	RA-223	7.5E-13	1.3E-16	5.9E-16	7.2E-16
SE	500	RA-224	3.0E-13	5.3E-17	2.3E-16	2.9E-16
SE	500	RA-226	3.1E-12	5.6E-16	2.5E-15	3.0E-15
SE	500	RA-228	3.3E-13	5.9E-17	2.6E-16	3.2E-16
SE	500	TH-227	7.4E-14	1.3E-17	5.8E-17	7.2E-17
SE	500	TH-228	6.0E-13	1.1E-16	4.7E-16	5.8E-16
SE	500	TH-230	4.9E-11	8.8E-15	3.8E-14	4.7E-14
SE	500	TH-231	9.4E-14	1.7E-17	7.4E-17	9.1E-17
SE	500	TH-232	6.8E-13	1.2E-16	5.3E-16	6.6E-16
SE	500	TH-234	1.4E-12	2.6E-16	1.1E-15	1.4E-15
SE	500	U-234	1.4E-12	2.5E-16	1.1E-15	1.4E-15
SE	500	U-235	9.5E-14	1.7E-17	7.4E-17	9.1E-17
SE	500	U-236	9.5E-14	1.7E-17	7.4E-17	9.1E-17
SE	500	U-238	1.4E-12	2.6E-16	1.1E-15	1.4E-15
SE	700	RN-222	5.0E-04	0.0E+00	0.0E+00	0.0E+00
SE	700	AC-227	9.0E-13	1.6E-16	4.2E-16	5.8E-16
SE	700	AC-228	3.9E-13	7.1E-17	1.8E-16	2.5E-16
SE	700	BI-210	3.4E-12	6.1E-16	1.6E-15	2.2E-15
SE	700	FR-223	1.1E-14	1.9E-18	4.2E-18	6.1E-18
SE	700	PA-231	6.1E-13	1.1E-16	2.8E-16	3.9E-16
SE	700	PA-234	1.9E-15	3.5E-19	8.9E-19	1.2E-18
SE	700	PA-234M	2.0E-13	3.5E-17	3.3E-17	6.9E-17
SE	700	PB-210	3.4E-12	6.1E-16	1.6E-15	2.2E-15
SE	700	PO-210	3.4E-12	6.1E-16	1.6E-15	2.2E-15
SE	700	RA-223	9.0E-13	1.6E-16	4.2E-16	5.8E-16
SE	700	RA-224	3.6E-13	6.5E-17	1.7E-16	2.3E-16
SE	700	RA-226	3.8E-12	6.8E-16	1.7E-15	2.4E-15
SE	700	RA-228	4.0E-13	7.1E-17	1.8E-16	2.5E-16
SE	700	TH-227	9.0E-14	1.6E-17	4.2E-17	5.8E-17
SE	700	TH-228	7.3E-13	1.3E-16	3.4E-16	4.7E-16
SE	700	TH-230	5.9E-11	1.1E-14	2.7E-14	3.8E-14
SE	700	TH-231	1.1E-13	2.0E-17	5.3E-17	7.3E-17
SE	700	TH-232	8.2E-13	1.5E-16	3.8E-16	5.3E-16
SE	700	TH-234	1.7E-12	3.1E-16	8.0E-16	1.1E-15
SE	700	U-234	1.7E-12	3.0E-16	7.8E-16	1.1E-15
SE	700	U-235	1.1E-13	2.1E-17	5.3E-17	7.3E-17
SE	700	U-236	1.1E-13	2.1E-17	5.3E-17	7.3E-17
SE	700	U-238	1.7E-12	3.1E-16	8.0E-16	1.1E-15
SE	1000	RN-222	5.4E-04	0.0E+00	0.0E+00	0.0E+00
SE	1000	AC-227	9.7E-13	1.8E-16	2.9E-16	4.7E-16
SE	1000	AC-228	4.2E-13	7.5E-17	1.2E-16	2.0E-16
SE	1000	BI-210	3.7E-12	6.6E-16	1.1E-15	1.8E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	1000	FR-223	1.0E-14	1.8E-18	2.5E-18	4.3E-18
SE	1000	PA-231	6.6E-13	1.2E-16	2.0E-16	3.2E-16
SE	1000	PA-234	2.1E-15	3.7E-19	6.1E-19	9.9E-19
SE	1000	PA-234M	9.6E-14	1.7E-17	1.2E-17	3.0E-17
SE	1000	PB-210	3.7E-12	6.6E-16	1.1E-15	1.8E-15
SE	1000	PO-210	3.7E-12	6.6E-16	1.1E-15	1.8E-15
SE	1000	RA-223	9.7E-13	1.8E-16	2.9E-16	4.7E-16
SE	1000	RA-224	3.9E-13	6.9E-17	1.2E-16	1.9E-16
SE	1000	RA-226	4.1E-12	7.3E-16	1.2E-15	2.0E-15
SE	1000	RA-228	4.3E-13	7.7E-17	1.3E-16	2.0E-16
SE	1000	TH-227	9.7E-14	1.7E-17	2.9E-17	4.6E-17
SE	1000	TH-228	7.8E-13	1.4E-16	2.4E-16	3.8E-16
SE	1000	TH-230	6.3E-11	1.1E-14	1.9E-14	3.0E-14
SE	1000	TH-231	1.2E-13	2.2E-17	3.7E-17	5.9E-17
SE	1000	TH-232	8.8E-13	1.6E-16	2.7E-16	4.2E-16
SE	1000	TH-234	1.9E-12	3.4E-16	5.6E-16	9.0E-16
SE	1000	U-234	1.8E-12	3.3E-16	5.5E-16	8.8E-16
SE	1000	U-235	1.2E-13	2.2E-17	3.7E-17	5.9E-17
SE	1000	U-236	1.2E-13	2.2E-17	3.7E-17	5.9E-17
SE	1000	U-238	1.9E-12	3.4E-16	5.6E-16	9.0E-16
SE	1300	RN-222	4.8E-04	0.0E+00	0.0E+00	0.0E+00
SE	1300	AC-227	8.6E-13	1.5E-16	2.2E-16	3.8E-16
SE	1300	AC-228	3.7E-13	6.6E-17	9.5E-17	1.6E-16
SE	1300	BI-210	3.2E-12	5.8E-16	8.4E-16	1.4E-15
SE	1300	FR-223	8.0E-15	1.4E-18	1.7E-18	3.1E-18
SE	1300	PA-231	5.8E-13	1.0E-16	1.5E-16	2.6E-16
SE	1300	PA-234	1.8E-15	3.3E-19	4.7E-19	7.9E-19
SE	1300	PA-234M	4.4E-14	7.9E-18	5.2E-18	1.3E-17
SE	1300	PB-210	3.2E-12	5.8E-16	8.4E-16	1.4E-15
SE	1300	PO-210	3.2E-12	5.8E-16	8.4E-16	1.4E-15
SE	1300	RA-223	8.6E-13	1.5E-16	2.2E-16	3.8E-16
SE	1300	RA-224	3.4E-13	6.1E-17	8.9E-17	1.5E-16
SE	1300	RA-226	3.6E-12	6.5E-16	9.3E-16	1.6E-15
SE	1300	RA-228	3.8E-13	6.8E-17	9.8E-17	1.7E-16
SE	1300	TH-227	8.5E-14	1.5E-17	2.2E-17	3.8E-17
SE	1300	TH-228	6.9E-13	1.2E-16	1.8E-16	3.1E-16
SE	1300	TH-230	5.6E-11	1.0E-14	1.5E-14	2.5E-14
SE	1300	TH-231	1.1E-13	1.9E-17	2.8E-17	4.7E-17
SE	1300	TH-232	7.8E-13	1.4E-16	2.0E-16	3.4E-16
SE	1300	TH-234	1.7E-12	3.0E-16	4.3E-16	7.3E-16
SE	1300	U-234	1.6E-12	2.9E-16	4.2E-16	7.1E-16
SE	1300	U-235	1.1E-13	2.0E-17	2.8E-17	4.8E-17
SE	1300	U-236	1.1E-13	2.0E-17	2.8E-17	4.8E-17
SE	1300	U-238	1.7E-12	3.0E-16	4.3E-16	7.3E-16
SE	1500	RN-222	4.4E-04	0.0E+00	0.0E+00	0.0E+00
SE	1500	AC-227	7.9E-13	1.4E-16	1.9E-16	3.3E-16
SE	1500	AC-228	3.3E-13	6.0E-17	8.1E-17	1.4E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	1500	BI-210	3.0E-12	5.3E-16	7.3E-16	1.3E-15
SE	1500	FR-223	6.8E-15	1.2E-18	1.3E-18	2.6E-18
SE	1500	PA-231	5.3E-13	9.6E-17	1.3E-16	2.3E-16
SE	1500	PA-234	1.6E-15	3.0E-19	4.0E-19	7.0E-19
SE	1500	PA-234M	2.7E-14	4.8E-18	3.1E-18	7.9E-18
SE	1500	PB-210	3.0E-12	5.3E-16	7.3E-16	1.3E-15
SE	1500	PO-210	3.0E-12	5.3E-16	7.3E-16	1.3E-15
SE	1500	RA-223	7.9E-13	1.4E-16	1.9E-16	3.3E-16
SE	1500	RA-224	3.1E-13	5.6E-17	7.7E-17	1.3E-16
SE	1500	RA-226	3.3E-12	5.9E-16	8.1E-16	1.4E-15
SE	1500	RA-228	3.4E-13	6.2E-17	8.5E-17	1.5E-16
SE	1500	TH-227	7.8E-14	1.4E-17	1.9E-17	3.3E-17
SE	1500	TH-228	6.3E-13	1.1E-16	1.6E-16	2.7E-16
SE	1500	TH-230	5.1E-11	9.2E-15	1.3E-14	2.2E-14
SE	1500	TH-231	9.9E-14	1.8E-17	2.4E-17	4.2E-17
SE	1500	TH-232	7.2E-13	1.3E-16	1.8E-16	3.0E-16
SE	1500	TH-234	1.5E-12	2.7E-16	3.7E-16	6.4E-16
SE	1500	U-234	1.5E-12	2.7E-16	3.6E-16	6.3E-16
SE	1500	U-235	9.9E-14	1.8E-17	2.4E-17	4.2E-17
SE	1500	U-236	9.9E-14	1.8E-17	2.4E-17	4.2E-17
SE	1500	U-238	1.5E-12	2.7E-16	3.7E-16	6.4E-16
SE	1700	RN-222	4.1E-04	0.0E+00	0.0E+00	0.0E+00
SE	1700	AC-227	7.2E-13	1.3E-16	1.7E-16	3.0E-16
SE	1700	AC-228	3.1E-13	5.5E-17	7.1E-17	1.3E-16
SE	1700	BI-210	2.7E-12	4.9E-16	6.4E-16	1.1E-15
SE	1700	FR-223	5.8E-15	1.0E-18	1.1E-18	2.1E-18
SE	1700	PA-231	4.9E-13	8.8E-17	1.2E-16	2.0E-16
SE	1700	PA-234	1.5E-15	2.7E-19	3.5E-19	6.2E-19
SE	1700	PA-234M	1.6E-14	2.9E-18	1.9E-18	4.8E-18
SE	1700	PB-210	2.7E-12	4.9E-16	6.4E-16	1.1E-15
SE	1700	PO-210	2.7E-12	4.9E-16	6.4E-16	1.1E-15
SE	1700	RA-223	7.2E-13	1.3E-16	1.7E-16	3.0E-16
SE	1700	RA-224	2.9E-13	5.2E-17	6.7E-17	1.2E-16
SE	1700	RA-226	3.0E-12	5.4E-16	7.1E-16	1.3E-15
SE	1700	RA-228	3.2E-13	5.7E-17	7.5E-17	1.3E-16
SE	1700	TH-227	7.2E-14	1.3E-17	1.7E-17	3.0E-17
SE	1700	TH-228	5.8E-13	1.0E-16	1.4E-16	2.4E-16
SE	1700	TH-230	4.7E-11	8.5E-15	1.1E-14	2.0E-14
SE	1700	TH-231	9.0E-14	1.6E-17	2.1E-17	3.7E-17
SE	1700	TH-232	6.6E-13	1.2E-16	1.5E-16	2.7E-16
SE	1700	TH-234	1.4E-12	2.5E-16	3.3E-16	5.8E-16
SE	1700	U-234	1.4E-12	2.4E-16	3.2E-16	5.6E-16
SE	1700	U-235	9.1E-14	1.6E-17	2.1E-17	3.8E-17
SE	1700	U-236	9.1E-14	1.6E-17	2.1E-17	3.8E-17
SE	1700	U-238	1.4E-12	2.5E-16	3.3E-16	5.8E-16
SE	2000	RN-222	3.6E-04	0.0E+00	0.0E+00	0.0E+00
SE	2000	AC-227	6.4E-13	1.2E-16	1.4E-16	2.6E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	2000	AC-228	2.7E-13	4.9E-17	6.0E-17	1.1E-16
SE	2000	BI-210	2.4E-12	4.4E-16	5.4E-16	9.8E-16
SE	2000	FR-223	4.6E-15	8.2E-19	8.1E-19	1.6E-18
SE	2000	PA-231	4.4E-13	7.9E-17	9.8E-17	1.8E-16
SE	2000	PA-234	1.3E-15	2.4E-19	2.9E-19	5.3E-19
SE	2000	PA-234M	8.1E-15	1.5E-18	9.3E-19	2.4E-18
SE	2000	PB-210	2.4E-12	4.4E-16	5.4E-16	9.8E-16
SE	2000	PO-210	2.4E-12	4.4E-16	5.4E-16	9.8E-16
SE	2000	RA-223	6.4E-13	1.2E-16	1.4E-16	2.6E-16
SE	2000	RA-224	2.6E-13	4.6E-17	5.7E-17	1.0E-16
SE	2000	RA-226	2.7E-12	4.8E-16	6.0E-16	1.1E-15
SE	2000	RA-228	2.8E-13	5.1E-17	6.3E-17	1.1E-16
SE	2000	TH-227	6.4E-14	1.2E-17	1.4E-17	2.6E-17
SE	2000	TH-228	5.2E-13	9.4E-17	1.2E-16	2.1E-16
SE	2000	TH-230	4.2E-11	7.5E-15	9.4E-15	1.7E-14
SE	2000	TH-231	8.1E-14	1.4E-17	1.8E-17	3.2E-17
SE	2000	TH-232	5.9E-13	1.1E-16	1.3E-16	2.4E-16
SE	2000	TH-234	1.2E-12	2.2E-16	2.8E-16	5.0E-16
SE	2000	U-234	1.2E-12	2.2E-16	2.7E-16	4.9E-16
SE	2000	U-235	8.1E-14	1.5E-17	1.8E-17	3.3E-17
SE	2000	U-236	8.1E-14	1.5E-17	1.8E-17	3.3E-17
SE	2000	U-238	1.2E-12	2.2E-16	2.8E-16	5.0E-16
SE	2300	RN-222	3.3E-04	0.0E+00	0.0E+00	0.0E+00
SE	2300	AC-227	5.9E-13	1.1E-16	1.2E-16	2.3E-16
SE	2300	AC-228	2.4E-13	4.4E-17	5.1E-17	9.5E-17
SE	2300	BI-210	2.2E-12	4.0E-16	4.7E-16	8.7E-16
SE	2300	FR-223	3.7E-15	6.6E-19	6.2E-19	1.3E-18
SE	2300	PA-231	4.0E-13	7.2E-17	8.4E-17	1.6E-16
SE	2300	PA-234	1.2E-15	2.2E-19	2.5E-19	4.7E-19
SE	2300	PA-234M	4.1E-15	7.4E-19	4.8E-19	1.2E-18
SE	2300	PB-210	2.2E-12	4.0E-16	4.7E-16	8.7E-16
SE	2300	PO-210	2.2E-12	4.0E-16	4.7E-16	8.7E-16
SE	2300	RA-223	5.9E-13	1.1E-16	1.2E-16	2.3E-16
SE	2300	RA-224	2.3E-13	4.2E-17	4.9E-17	9.1E-17
SE	2300	RA-226	2.5E-12	4.4E-16	5.2E-16	9.6E-16
SE	2300	RA-228	2.6E-13	4.6E-17	5.5E-17	1.0E-16
SE	2300	TH-227	5.8E-14	1.0E-17	1.2E-17	2.3E-17
SE	2300	TH-228	4.7E-13	8.5E-17	1.0E-16	1.9E-16
SE	2300	TH-230	3.8E-11	6.9E-15	8.1E-15	1.5E-14
SE	2300	TH-231	7.3E-14	1.3E-17	1.5E-17	2.9E-17
SE	2300	TH-232	5.3E-13	9.6E-17	1.1E-16	2.1E-16
SE	2300	TH-234	1.1E-12	2.0E-16	2.4E-16	4.4E-16
SE	2300	U-234	1.1E-12	2.0E-16	2.3E-16	4.3E-16
SE	2300	U-235	7.4E-14	1.3E-17	1.6E-17	2.9E-17
SE	2300	U-236	7.4E-14	1.3E-17	1.6E-17	2.9E-17
SE	2300	U-238	1.1E-12	2.0E-16	2.4E-16	4.4E-16
SE	2400	RN-222	3.2E-04	0.0E+00	0.0E+00	0.0E+00

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	2400	AC-227	5.7E-13	1.0E-16	1.2E-16	2.2E-16
SE	2400	AC-228	2.4E-13	4.3E-17	4.9E-17	9.1E-17
SE	2400	BI-210	2.1E-12	3.9E-16	4.5E-16	8.3E-16
SE	2400	FR-223	3.4E-15	6.2E-19	5.7E-19	1.2E-18
SE	2400	PA-231	3.9E-13	7.0E-17	8.1E-17	1.5E-16
SE	2400	PA-234	1.2E-15	2.1E-19	2.4E-19	4.5E-19
SE	2400	PA-234M	3.3E-15	6.0E-19	3.9E-19	9.8E-19
SE	2400	PB-210	2.1E-12	3.9E-16	4.5E-16	8.3E-16
SE	2400	PO-210	2.1E-12	3.9E-16	4.5E-16	8.3E-16
SE	2400	RA-223	5.7E-13	1.0E-16	1.2E-16	2.2E-16
SE	2400	RA-224	2.3E-13	4.1E-17	4.7E-17	8.8E-17
SE	2400	RA-226	2.4E-12	4.3E-16	5.0E-16	9.3E-16
SE	2400	RA-228	2.5E-13	4.5E-17	5.2E-17	9.7E-17
SE	2400	TH-227	5.7E-14	1.0E-17	1.2E-17	2.2E-17
SE	2400	TH-228	4.6E-13	8.3E-17	9.6E-17	1.8E-16
SE	2400	TH-230	3.7E-11	6.7E-15	7.7E-15	1.4E-14
SE	2400	TH-231	7.1E-14	1.3E-17	1.5E-17	2.8E-17
SE	2400	TH-232	5.2E-13	9.4E-17	1.1E-16	2.0E-16
SE	2400	TH-234	1.1E-12	2.0E-16	2.3E-16	4.3E-16
SE	2400	U-234	1.1E-12	1.9E-16	2.2E-16	4.2E-16
SE	2400	U-235	7.2E-14	1.3E-17	1.5E-17	2.8E-17
SE	2400	U-236	7.2E-14	1.3E-17	1.5E-17	2.8E-17
SE	2400	U-238	1.1E-12	2.0E-16	2.3E-16	4.3E-16
SE	2600	RN-222	3.1E-04	0.0E+00	0.0E+00	0.0E+00
SE	2600	AC-227	5.4E-13	9.8E-17	1.1E-16	2.1E-16
SE	2600	AC-228	2.2E-13	4.0E-17	4.5E-17	8.5E-17
SE	2600	BI-210	2.0E-12	3.7E-16	4.1E-16	7.8E-16
SE	2600	FR-223	3.0E-15	5.4E-19	4.9E-19	1.0E-18
SE	2600	PA-231	3.7E-13	6.6E-17	7.4E-17	1.4E-16
SE	2600	PA-234	1.1E-15	2.0E-19	2.2E-19	4.2E-19
SE	2600	PA-234M	2.1E-15	3.9E-19	2.5E-19	6.4E-19
SE	2600	PB-210	2.0E-12	3.7E-16	4.1E-16	7.8E-16
SE	2600	PO-210	2.0E-12	3.7E-16	4.1E-16	7.8E-16
SE	2600	RA-223	5.4E-13	9.8E-17	1.1E-16	2.1E-16
SE	2600	RA-224	2.2E-13	3.9E-17	4.3E-17	8.2E-17
SE	2600	RA-226	2.3E-12	4.1E-16	4.6E-16	8.7E-16
SE	2600	RA-228	2.4E-13	4.3E-17	4.8E-17	9.1E-17
SE	2600	TH-227	5.4E-14	9.7E-18	1.1E-17	2.1E-17
SE	2600	TH-228	4.4E-13	7.9E-17	8.8E-17	1.7E-16
SE	2600	TH-230	3.5E-11	6.4E-15	7.1E-15	1.3E-14
SE	2600	TH-231	6.8E-14	1.2E-17	1.4E-17	2.6E-17
SE	2600	TH-232	4.9E-13	8.9E-17	1.0E-16	1.9E-16
SE	2600	TH-234	1.0E-12	1.9E-16	2.1E-16	4.0E-16
SE	2600	U-234	1.0E-12	1.8E-16	2.1E-16	3.9E-16
SE	2600	U-235	6.9E-14	1.2E-17	1.4E-17	2.6E-17
SE	2600	U-236	6.9E-14	1.2E-17	1.4E-17	2.6E-17
SE	2600	U-238	1.0E-12	1.9E-16	2.1E-16	4.0E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	2700	RN-222	3.0E-04	0.0E+00	0.0E+00	0.0E+00
SE	2700	AC-227	5.3E-13	9.6E-17	1.1E-16	2.0E-16
SE	2700	AC-228	2.2E-13	3.9E-17	4.3E-17	8.2E-17
SE	2700	BI-210	2.0E-12	3.6E-16	4.0E-16	7.6E-16
SE	2700	FR-223	2.8E-15	5.0E-19	4.5E-19	9.5E-19
SE	2700	PA-231	3.6E-13	6.5E-17	7.1E-17	1.4E-16
SE	2700	PA-234	1.1E-15	1.9E-19	2.1E-19	4.1E-19
SE	2700	PA-234M	1.7E-15	3.1E-19	2.1E-19	5.2E-19
SE	2700	PB-210	2.0E-12	3.6E-16	4.0E-16	7.6E-16
SE	2700	PO-210	2.0E-12	3.6E-16	4.0E-16	7.6E-16
SE	2700	RA-223	5.3E-13	9.6E-17	1.1E-16	2.0E-16
SE	2700	RA-224	2.1E-13	3.8E-17	4.2E-17	8.0E-17
SE	2700	RA-226	2.2E-12	4.0E-16	4.4E-16	8.4E-16
SE	2700	RA-228	2.3E-13	4.2E-17	4.6E-17	8.8E-17
SE	2700	TH-227	5.3E-14	9.5E-18	1.0E-17	2.0E-17
SE	2700	TH-228	4.3E-13	7.7E-17	8.5E-17	1.6E-16
SE	2700	TH-230	3.5E-11	6.2E-15	6.9E-15	1.3E-14
SE	2700	TH-231	6.6E-14	1.2E-17	1.3E-17	2.5E-17
SE	2700	TH-232	4.8E-13	8.7E-17	9.6E-17	1.8E-16
SE	2700	TH-234	1.0E-12	1.8E-16	2.0E-16	3.9E-16
SE	2700	U-234	9.9E-13	1.8E-16	2.0E-16	3.8E-16
SE	2700	U-235	6.7E-14	1.2E-17	1.3E-17	2.5E-17
SE	2700	U-236	6.7E-14	1.2E-17	1.3E-17	2.5E-17
SE	2700	U-238	1.0E-12	1.8E-16	2.0E-16	3.9E-16
SE	3500	RN-222	2.5E-04	0.0E+00	0.0E+00	0.0E+00
SE	3500	AC-227	4.3E-13	7.8E-17	8.0E-17	1.6E-16
SE	3500	AC-228	1.7E-13	3.1E-17	3.2E-17	6.3E-17
SE	3500	BI-210	1.6E-12	2.9E-16	3.0E-16	6.0E-16
SE	3500	FR-223	1.7E-15	3.0E-19	2.6E-19	5.6E-19
SE	3500	PA-231	2.9E-13	5.3E-17	5.4E-17	1.1E-16
SE	3500	PA-234	8.6E-16	1.6E-19	1.6E-19	3.1E-19
SE	3500	PA-234M	3.3E-16	5.9E-20	4.1E-20	1.0E-19
SE	3500	PB-210	1.6E-12	2.9E-16	3.0E-16	6.0E-16
SE	3500	PO-210	1.6E-12	2.9E-16	3.0E-16	6.0E-16
SE	3500	RA-223	4.3E-13	7.8E-17	8.0E-17	1.6E-16
SE	3500	RA-224	1.7E-13	3.1E-17	3.2E-17	6.3E-17
SE	3500	RA-226	1.8E-12	3.3E-16	3.3E-16	6.6E-16
SE	3500	RA-228	1.9E-13	3.4E-17	3.5E-17	6.9E-17
SE	3500	TH-227	4.3E-14	7.8E-18	8.0E-18	1.6E-17
SE	3500	TH-228	3.5E-13	6.3E-17	6.5E-17	1.3E-16
SE	3500	TH-230	2.8E-11	5.1E-15	5.2E-15	1.0E-14
SE	3500	TH-231	5.4E-14	9.7E-18	9.9E-18	2.0E-17
SE	3500	TH-232	4.0E-13	7.1E-17	7.3E-17	1.4E-16
SE	3500	TH-234	8.3E-13	1.5E-16	1.5E-16	3.0E-16
SE	3500	U-234	8.1E-13	1.5E-16	1.5E-16	3.0E-16
SE	3500	U-235	5.5E-14	9.9E-18	1.0E-17	2.0E-17
SE	3500	U-236	5.5E-14	9.9E-18	1.0E-17	2.0E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
SE	3500	U-238	8.3E-13	1.5E-16	1.5E-16	3.0E-16
ESE	300	RN-222	4.0E-04	0.0E+00	0.0E+00	0.0E+00
ESE	300	AC-227	7.3E-13	1.3E-16	1.2E-15	1.4E-15
ESE	300	AC-228	3.2E-13	5.7E-17	5.4E-16	6.0E-16
ESE	300	BI-210	2.7E-12	4.9E-16	4.7E-15	5.1E-15
ESE	300	FR-223	9.6E-15	1.7E-18	1.5E-17	1.7E-17
ESE	300	PA-231	4.9E-13	8.9E-17	8.4E-16	9.3E-16
ESE	300	PA-234	1.6E-15	2.8E-19	2.6E-18	2.9E-18
ESE	300	PA-234M	5.5E-13	9.9E-17	3.4E-16	4.4E-16
ESE	300	PB-210	2.7E-12	4.9E-16	4.7E-15	5.1E-15
ESE	300	PO-210	2.7E-12	4.9E-16	4.7E-15	5.1E-15
ESE	300	RA-223	7.3E-13	1.3E-16	1.2E-15	1.4E-15
ESE	300	RA-224	2.9E-13	5.2E-17	4.9E-16	5.4E-16
ESE	300	RA-226	3.0E-12	5.5E-16	5.2E-15	5.7E-15
ESE	300	RA-228	3.2E-13	5.7E-17	5.4E-16	6.0E-16
ESE	300	TH-227	7.2E-14	1.3E-17	1.2E-16	1.4E-16
ESE	300	TH-228	5.9E-13	1.1E-16	1.0E-15	1.1E-15
ESE	300	TH-230	4.7E-11	8.5E-15	8.1E-14	8.9E-14
ESE	300	TH-231	9.2E-14	1.7E-17	1.6E-16	1.7E-16
ESE	300	TH-232	6.6E-13	1.2E-16	1.1E-15	1.2E-15
ESE	300	TH-234	1.4E-12	2.5E-16	2.4E-15	2.6E-15
ESE	300	U-234	1.4E-12	2.5E-16	2.3E-15	2.6E-15
ESE	300	U-235	9.2E-14	1.7E-17	1.6E-16	1.7E-16
ESE	300	U-236	9.2E-14	1.7E-17	1.6E-16	1.7E-16
ESE	300	U-238	1.4E-12	2.5E-16	2.4E-15	2.6E-15
ESE	500	RN-222	5.1E-04	0.0E+00	0.0E+00	0.0E+00
ESE	500	AC-227	9.3E-13	1.7E-16	7.4E-16	9.1E-16
ESE	500	AC-228	4.1E-13	7.3E-17	3.2E-16	3.9E-16
ESE	500	BI-210	3.5E-12	6.3E-16	2.8E-15	3.4E-15
ESE	500	FR-223	1.2E-14	2.1E-18	8.1E-18	1.0E-17
ESE	500	PA-231	6.3E-13	1.1E-16	5.0E-16	6.2E-16
ESE	500	PA-234	2.0E-15	3.6E-19	1.6E-18	1.9E-18
ESE	500	PA-234M	3.9E-13	6.9E-17	1.1E-16	1.8E-16
ESE	500	PB-210	3.5E-12	6.3E-16	2.8E-15	3.4E-15
ESE	500	PO-210	3.5E-12	6.3E-16	2.8E-15	3.4E-15
ESE	500	RA-223	9.3E-13	1.7E-16	7.4E-16	9.1E-16
ESE	500	RA-224	3.7E-13	6.6E-17	2.9E-16	3.6E-16
ESE	500	RA-226	3.9E-12	7.0E-16	3.1E-15	3.8E-15
ESE	500	RA-228	4.1E-13	7.3E-17	3.2E-16	4.0E-16
ESE	500	TH-227	9.2E-14	1.7E-17	7.4E-17	9.0E-17
ESE	500	TH-228	7.5E-13	1.4E-16	6.0E-16	7.3E-16
ESE	500	TH-230	6.1E-11	1.1E-14	4.8E-14	5.9E-14
ESE	500	TH-231	1.2E-13	2.1E-17	9.3E-17	1.1E-16
ESE	500	TH-232	8.5E-13	1.5E-16	6.7E-16	8.3E-16
ESE	500	TH-234	1.8E-12	3.2E-16	1.4E-15	1.7E-15
ESE	500	U-234	1.7E-12	3.1E-16	1.4E-15	1.7E-15
ESE	500	U-235	1.2E-13	2.1E-17	9.4E-17	1.1E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ESE	500	U-236	1.2E-13	2.1E-17	9.4E-17	1.1E-16
ESE	500	U-238	1.8E-12	3.2E-16	1.4E-15	1.7E-15
ESE	700	RN-222	6.5E-04	0.0E+00	0.0E+00	0.0E+00
ESE	700	AC-227	1.2E-12	2.1E-16	5.3E-16	7.4E-16
ESE	700	AC-228	5.1E-13	9.2E-17	2.3E-16	3.2E-16
ESE	700	BI-210	4.4E-12	8.0E-16	2.0E-15	2.8E-15
ESE	700	FR-223	1.4E-14	2.5E-18	5.3E-18	7.7E-18
ESE	700	PA-231	8.0E-13	1.4E-16	3.6E-16	5.0E-16
ESE	700	PA-234	2.5E-15	4.5E-19	1.1E-18	1.6E-18
ESE	700	PA-234M	2.7E-13	4.9E-17	4.9E-17	9.8E-17
ESE	700	PB-210	4.4E-12	8.0E-16	2.0E-15	2.8E-15
ESE	700	PO-210	4.4E-12	8.0E-16	2.0E-15	2.8E-15
ESE	700	RA-223	1.2E-12	2.1E-16	5.3E-16	7.4E-16
ESE	700	RA-224	4.7E-13	8.4E-17	2.1E-16	2.9E-16
ESE	700	RA-226	4.9E-12	8.8E-16	2.2E-15	3.1E-15
ESE	700	RA-228	5.2E-13	9.3E-17	2.3E-16	3.2E-16
ESE	700	TH-227	1.2E-13	2.1E-17	5.2E-17	7.4E-17
ESE	700	TH-228	9.5E-13	1.7E-16	4.3E-16	6.0E-16
ESE	700	TH-230	7.7E-11	1.4E-14	3.4E-14	4.8E-14
ESE	700	TH-231	1.5E-13	2.7E-17	6.6E-17	9.3E-17
ESE	700	TH-232	1.1E-12	1.9E-16	4.8E-16	6.7E-16
ESE	700	TH-234	2.3E-12	4.1E-16	1.0E-15	1.4E-15
ESE	700	U-234	2.2E-12	4.0E-16	9.9E-16	1.4E-15
ESE	700	U-235	1.5E-13	2.7E-17	6.7E-17	9.3E-17
ESE	700	U-236	1.5E-13	2.7E-17	6.7E-17	9.3E-17
ESE	700	U-238	2.3E-12	4.1E-16	1.0E-15	1.4E-15
ESE	1000	RN-222	7.1E-04	0.0E+00	0.0E+00	0.0E+00
ESE	1000	AC-227	1.3E-12	2.3E-16	3.7E-16	6.0E-16
ESE	1000	AC-228	5.5E-13	1.0E-16	1.6E-16	2.6E-16
ESE	1000	BI-210	4.8E-12	8.7E-16	1.4E-15	2.3E-15
ESE	1000	FR-223	1.4E-14	2.4E-18	3.2E-18	5.6E-18
ESE	1000	PA-231	8.7E-13	1.6E-16	2.5E-16	4.1E-16
ESE	1000	PA-234	2.7E-15	4.9E-19	7.7E-19	1.3E-18
ESE	1000	PA-234M	1.4E-13	2.5E-17	1.8E-17	4.3E-17
ESE	1000	PB-210	4.8E-12	8.7E-16	1.4E-15	2.3E-15
ESE	1000	PO-210	4.8E-12	8.7E-16	1.4E-15	2.3E-15
ESE	1000	RA-223	1.3E-12	2.3E-16	3.7E-16	6.0E-16
ESE	1000	RA-224	5.1E-13	9.2E-17	1.5E-16	2.4E-16
ESE	1000	RA-226	5.4E-12	9.6E-16	1.5E-15	2.5E-15
ESE	1000	RA-228	5.6E-13	1.0E-16	1.6E-16	2.6E-16
ESE	1000	TH-227	1.3E-13	2.3E-17	3.7E-17	6.0E-17
ESE	1000	TH-228	1.0E-12	1.9E-16	3.0E-16	4.8E-16
ESE	1000	TH-230	8.3E-11	1.5E-14	2.4E-14	3.9E-14
ESE	1000	TH-231	1.6E-13	2.9E-17	4.6E-17	7.5E-17
ESE	1000	TH-232	1.2E-12	2.1E-16	3.3E-16	5.4E-16
ESE	1000	TH-234	2.5E-12	4.4E-16	7.1E-16	1.2E-15
ESE	1000	U-234	2.4E-12	4.3E-16	6.9E-16	1.1E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ESE	1000	U-235	1.6E-13	2.9E-17	4.7E-17	7.6E-17
ESE	1000	U-236	1.6E-13	2.9E-17	4.7E-17	7.6E-17
ESE	1000	U-238	2.5E-12	4.4E-16	7.1E-16	1.2E-15
ESE	1300	RN-222	6.3E-04	0.0E+00	0.0E+00	0.0E+00
ESE	1300	AC-227	1.1E-12	2.0E-16	2.8E-16	4.8E-16
ESE	1300	AC-228	4.8E-13	8.7E-17	1.2E-16	2.1E-16
ESE	1300	BI-210	4.2E-12	7.6E-16	1.1E-15	1.8E-15
ESE	1300	FR-223	1.1E-14	1.9E-18	2.1E-18	4.1E-18
ESE	1300	PA-231	7.6E-13	1.4E-16	1.9E-16	3.3E-16
ESE	1300	PA-234	2.4E-15	4.3E-19	5.9E-19	1.0E-18
ESE	1300	PA-234M	6.6E-14	1.2E-17	7.7E-18	2.0E-17
ESE	1300	PB-210	4.2E-12	7.6E-16	1.1E-15	1.8E-15
ESE	1300	PO-210	4.2E-12	7.6E-16	1.1E-15	1.8E-15
ESE	1300	RA-223	1.1E-12	2.0E-16	2.8E-16	4.8E-16
ESE	1300	RA-224	4.5E-13	8.0E-17	1.1E-16	1.9E-16
ESE	1300	RA-226	4.7E-12	8.5E-16	1.2E-15	2.0E-15
ESE	1300	RA-228	4.9E-13	8.9E-17	1.2E-16	2.1E-16
ESE	1300	TH-227	1.1E-13	2.0E-17	2.8E-17	4.8E-17
ESE	1300	TH-228	9.1E-13	1.6E-16	2.3E-16	3.9E-16
ESE	1300	TH-230	7.3E-11	1.3E-14	1.8E-14	3.2E-14
ESE	1300	TH-231	1.4E-13	2.5E-17	3.5E-17	6.1E-17
ESE	1300	TH-232	1.0E-12	1.8E-16	2.6E-16	4.4E-16
ESE	1300	TH-234	2.2E-12	3.9E-16	5.4E-16	9.3E-16
ESE	1300	U-234	2.1E-12	3.8E-16	5.3E-16	9.1E-16
ESE	1300	U-235	1.4E-13	2.6E-17	3.6E-17	6.1E-17
ESE	1300	U-236	1.4E-13	2.6E-17	3.6E-17	6.1E-17
ESE	1300	U-238	2.2E-12	3.9E-16	5.4E-16	9.3E-16
ESE	1500	RN-222	5.7E-04	0.0E+00	0.0E+00	0.0E+00
ESE	1500	AC-227	1.0E-12	1.8E-16	2.4E-16	4.3E-16
ESE	1500	AC-228	4.4E-13	7.9E-17	1.0E-16	1.8E-16
ESE	1500	BI-210	3.8E-12	6.9E-16	9.2E-16	1.6E-15
ESE	1500	FR-223	9.2E-15	1.7E-18	1.7E-18	3.4E-18
ESE	1500	PA-231	6.9E-13	1.2E-16	1.7E-16	2.9E-16
ESE	1500	PA-234	2.2E-15	3.9E-19	5.0E-19	8.9E-19
ESE	1500	PA-234M	4.0E-14	7.3E-18	4.6E-18	1.2E-17
ESE	1500	PB-210	3.8E-12	6.9E-16	9.2E-16	1.6E-15
ESE	1500	PO-210	3.8E-12	6.9E-16	9.2E-16	1.6E-15
ESE	1500	RA-223	1.0E-12	1.8E-16	2.4E-16	4.3E-16
ESE	1500	RA-224	4.1E-13	7.3E-17	9.7E-17	1.7E-16
ESE	1500	RA-226	4.3E-12	7.7E-16	1.0E-15	1.8E-15
ESE	1500	RA-228	4.5E-13	8.1E-17	1.1E-16	1.9E-16
ESE	1500	TH-227	1.0E-13	1.8E-17	2.4E-17	4.3E-17
ESE	1500	TH-228	8.2E-13	1.5E-16	2.0E-16	3.4E-16
ESE	1500	TH-230	6.7E-11	1.2E-14	1.6E-14	2.8E-14
ESE	1500	TH-231	1.3E-13	2.3E-17	3.0E-17	5.4E-17
ESE	1500	TH-232	9.3E-13	1.7E-16	2.2E-16	3.9E-16
ESE	1500	TH-234	2.0E-12	3.5E-16	4.7E-16	8.2E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ESE	1500	U-234	1.9E-12	3.4E-16	4.6E-16	8.0E-16
ESE	1500	U-235	1.3E-13	2.3E-17	3.1E-17	5.4E-17
ESE	1500	U-236	1.3E-13	2.3E-17	3.1E-17	5.4E-17
ESE	1500	U-238	2.0E-12	3.5E-16	4.7E-16	8.2E-16
ESE	1700	RN-222	5.2E-04	0.0E+00	0.0E+00	0.0E+00
ESE	1700	AC-227	9.3E-13	1.7E-16	2.1E-16	3.8E-16
ESE	1700	AC-228	4.0E-13	7.1E-17	9.0E-17	1.6E-16
ESE	1700	BI-210	3.5E-12	6.3E-16	8.1E-16	1.4E-15
ESE	1700	FR-223	7.9E-15	1.4E-18	1.4E-18	2.8E-18
ESE	1700	PA-231	6.3E-13	1.1E-16	1.5E-16	2.6E-16
ESE	1700	PA-234	2.0E-15	3.5E-19	4.4E-19	7.9E-19
ESE	1700	PA-234M	2.5E-14	4.5E-18	2.8E-18	7.3E-18
ESE	1700	PB-210	3.5E-12	6.3E-16	8.1E-16	1.4E-15
ESE	1700	PO-210	3.5E-12	6.3E-16	8.1E-16	1.4E-15
ESE	1700	RA-223	9.3E-13	1.7E-16	2.1E-16	3.8E-16
ESE	1700	RA-224	3.7E-13	6.7E-17	8.5E-17	1.5E-16
ESE	1700	RA-226	3.9E-12	7.0E-16	8.9E-16	1.6E-15
ESE	1700	RA-228	4.1E-13	7.4E-17	9.4E-17	1.7E-16
ESE	1700	TH-227	9.3E-14	1.7E-17	2.1E-17	3.8E-17
ESE	1700	TH-228	7.5E-13	1.4E-16	1.7E-16	3.1E-16
ESE	1700	TH-230	6.1E-11	1.1E-14	1.4E-14	2.5E-14
ESE	1700	TH-231	1.2E-13	2.1E-17	2.7E-17	4.8E-17
ESE	1700	TH-232	8.5E-13	1.5E-16	1.9E-16	3.5E-16
ESE	1700	TH-234	1.8E-12	3.2E-16	4.1E-16	7.3E-16
ESE	1700	U-234	1.7E-12	3.1E-16	4.0E-16	7.2E-16
ESE	1700	U-235	1.2E-13	2.1E-17	2.7E-17	4.8E-17
ESE	1700	U-236	1.2E-13	2.1E-17	2.7E-17	4.8E-17
ESE	1700	U-238	1.8E-12	3.2E-16	4.1E-16	7.3E-16
ESE	2000	RN-222	4.6E-04	0.0E+00	0.0E+00	0.0E+00
ESE	2000	AC-227	8.2E-13	1.5E-16	1.8E-16	3.3E-16
ESE	2000	AC-228	3.5E-13	6.3E-17	7.5E-17	1.4E-16
ESE	2000	BI-210	3.1E-12	5.6E-16	6.8E-16	1.2E-15
ESE	2000	FR-223	6.2E-15	1.1E-18	1.0E-18	2.2E-18
ESE	2000	PA-231	5.6E-13	1.0E-16	1.2E-16	2.2E-16
ESE	2000	PA-234	1.7E-15	3.1E-19	3.7E-19	6.8E-19
ESE	2000	PA-234M	1.2E-14	2.2E-18	1.4E-18	3.6E-18
ESE	2000	PB-210	3.1E-12	5.6E-16	6.8E-16	1.2E-15
ESE	2000	PO-210	3.1E-12	5.6E-16	6.8E-16	1.2E-15
ESE	2000	RA-223	8.2E-13	1.5E-16	1.8E-16	3.3E-16
ESE	2000	RA-224	3.3E-13	5.9E-17	7.2E-17	1.3E-16
ESE	2000	RA-226	3.4E-12	6.2E-16	7.6E-16	1.4E-15
ESE	2000	RA-228	3.6E-13	6.5E-17	7.9E-17	1.4E-16
ESE	2000	TH-227	8.2E-14	1.5E-17	1.8E-17	3.3E-17
ESE	2000	TH-228	6.6E-13	1.2E-16	1.5E-16	2.7E-16
ESE	2000	TH-230	5.4E-11	9.7E-15	1.2E-14	2.1E-14
ESE	2000	TH-231	1.0E-13	1.9E-17	2.3E-17	4.1E-17
ESE	2000	TH-232	7.5E-13	1.3E-16	1.6E-16	3.0E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ESE	2000	TH-234	1.6E-12	2.8E-16	3.5E-16	6.3E-16
ESE	2000	U-234	1.5E-12	2.8E-16	3.4E-16	6.2E-16
ESE	2000	U-235	1.0E-13	1.9E-17	2.3E-17	4.2E-17
ESE	2000	U-236	1.0E-13	1.9E-17	2.3E-17	4.2E-17
ESE	2000	U-238	1.6E-12	2.8E-16	3.5E-16	6.3E-16
ESE	2300	RN-222	4.2E-04	0.0E+00	0.0E+00	0.0E+00
ESE	2300	AC-227	7.4E-13	1.3E-16	1.6E-16	2.9E-16
ESE	2300	AC-228	3.1E-13	5.6E-17	6.4E-17	1.2E-16
ESE	2300	BI-210	2.8E-12	5.0E-16	5.9E-16	1.1E-15
ESE	2300	FR-223	5.0E-15	9.1E-19	7.9E-19	1.7E-18
ESE	2300	PA-231	5.0E-13	9.1E-17	1.1E-16	2.0E-16
ESE	2300	PA-234	1.5E-15	2.8E-19	3.2E-19	5.9E-19
ESE	2300	PA-234M	6.4E-15	1.1E-18	7.1E-19	1.9E-18
ESE	2300	PB-210	2.8E-12	5.0E-16	5.9E-16	1.1E-15
ESE	2300	PO-210	2.8E-12	5.0E-16	5.9E-16	1.1E-15
ESE	2300	RA-223	7.4E-13	1.3E-16	1.6E-16	2.9E-16
ESE	2300	RA-224	3.0E-13	5.3E-17	6.2E-17	1.2E-16
ESE	2300	RA-226	3.1E-12	5.6E-16	6.5E-16	1.2E-15
ESE	2300	RA-228	3.3E-13	5.9E-17	6.9E-17	1.3E-16
ESE	2300	TH-227	7.4E-14	1.3E-17	1.6E-17	2.9E-17
ESE	2300	TH-228	6.0E-13	1.1E-16	1.3E-16	2.3E-16
ESE	2300	TH-230	4.8E-11	8.7E-15	1.0E-14	1.9E-14
ESE	2300	TH-231	9.3E-14	1.7E-17	1.9E-17	3.6E-17
ESE	2300	TH-232	6.8E-13	1.2E-16	1.4E-16	2.6E-16
ESE	2300	TH-234	1.4E-12	2.6E-16	3.0E-16	5.6E-16
ESE	2300	U-234	1.4E-12	2.5E-16	2.9E-16	5.4E-16
ESE	2300	U-235	9.4E-14	1.7E-17	2.0E-17	3.7E-17
ESE	2300	U-236	9.4E-14	1.7E-17	2.0E-17	3.7E-17
ESE	2300	U-238	1.4E-12	2.6E-16	3.0E-16	5.6E-16
ESE	2400	RN-222	4.1E-04	0.0E+00	0.0E+00	0.0E+00
ESE	2400	AC-227	7.2E-13	1.3E-16	1.5E-16	2.8E-16
ESE	2400	AC-228	3.0E-13	5.4E-17	6.1E-17	1.2E-16
ESE	2400	BI-210	2.7E-12	4.9E-16	5.6E-16	1.1E-15
ESE	2400	FR-223	4.7E-15	8.5E-19	7.3E-19	1.6E-18
ESE	2400	PA-231	4.9E-13	8.8E-17	1.0E-16	1.9E-16
ESE	2400	PA-234	1.5E-15	2.7E-19	3.0E-19	5.7E-19
ESE	2400	PA-234M	5.1E-15	9.2E-19	5.7E-19	1.5E-18
ESE	2400	PB-210	2.7E-12	4.9E-16	5.6E-16	1.1E-15
ESE	2400	PO-210	2.7E-12	4.9E-16	5.6E-16	1.1E-15
ESE	2400	RA-223	7.2E-13	1.3E-16	1.5E-16	2.8E-16
ESE	2400	RA-224	2.9E-13	5.2E-17	6.0E-17	1.1E-16
ESE	2400	RA-226	3.0E-12	5.4E-16	6.3E-16	1.2E-15
ESE	2400	RA-228	3.2E-13	5.7E-17	6.6E-17	1.2E-16
ESE	2400	TH-227	7.2E-14	1.3E-17	1.5E-17	2.8E-17
ESE	2400	TH-228	5.8E-13	1.0E-16	1.2E-16	2.3E-16
ESE	2400	TH-230	4.7E-11	8.5E-15	9.8E-15	1.8E-14
ESE	2400	TH-231	9.0E-14	1.6E-17	1.9E-17	3.5E-17

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ESE	2400	TH-232	6.6E-13	1.2E-16	1.4E-16	2.5E-16
ESE	2400	TH-234	1.4E-12	2.5E-16	2.9E-16	5.4E-16
ESE	2400	U-234	1.4E-12	2.4E-16	2.8E-16	5.2E-16
ESE	2400	U-235	9.1E-14	1.6E-17	1.9E-17	3.5E-17
ESE	2400	U-236	9.1E-14	1.6E-17	1.9E-17	3.5E-17
ESE	2400	U-238	1.4E-12	2.5E-16	2.9E-16	5.4E-16
ESE	2600	RN-222	3.9E-04	0.0E+00	0.0E+00	0.0E+00
ESE	2600	AC-227	6.8E-13	1.2E-16	1.4E-16	2.6E-16
ESE	2600	AC-228	2.8E-13	5.1E-17	5.6E-17	1.1E-16
ESE	2600	BI-210	2.6E-12	4.6E-16	5.2E-16	9.8E-16
ESE	2600	FR-223	4.1E-15	7.4E-19	6.3E-19	1.4E-18
ESE	2600	PA-231	4.6E-13	8.3E-17	9.4E-17	1.8E-16
ESE	2600	PA-234	1.4E-15	2.5E-19	2.8E-19	5.3E-19
ESE	2600	PA-234M	3.3E-15	5.9E-19	3.7E-19	9.7E-19
ESE	2600	PB-210	2.6E-12	4.6E-16	5.2E-16	9.8E-16
ESE	2600	PO-210	2.6E-12	4.6E-16	5.2E-16	9.8E-16
ESE	2600	RA-223	6.8E-13	1.2E-16	1.4E-16	2.6E-16
ESE	2600	RA-224	2.7E-13	4.9E-17	5.5E-17	1.0E-16
ESE	2600	RA-226	2.9E-12	5.1E-16	5.8E-16	1.1E-15
ESE	2600	RA-228	3.0E-13	5.4E-17	6.0E-17	1.1E-16
ESE	2600	TH-227	6.8E-14	1.2E-17	1.4E-17	2.6E-17
ESE	2600	TH-228	5.5E-13	9.9E-17	1.1E-16	2.1E-16
ESE	2600	TH-230	4.4E-11	8.0E-15	9.0E-15	1.7E-14
ESE	2600	TH-231	8.5E-14	1.5E-17	1.7E-17	3.2E-17
ESE	2600	TH-232	6.2E-13	1.1E-16	1.3E-16	2.4E-16
ESE	2600	TH-234	1.3E-12	2.4E-16	2.7E-16	5.0E-16
ESE	2600	U-234	1.3E-12	2.3E-16	2.6E-16	4.9E-16
ESE	2600	U-235	8.6E-14	1.6E-17	1.7E-17	3.3E-17
ESE	2600	U-236	8.6E-14	1.6E-17	1.7E-17	3.3E-17
ESE	2600	U-238	1.3E-12	2.4E-16	2.7E-16	5.0E-16
ESE	2700	RN-222	3.8E-04	0.0E+00	0.0E+00	0.0E+00
ESE	2700	AC-227	6.7E-13	1.2E-16	1.3E-16	2.5E-16
ESE	2700	AC-228	2.8E-13	5.0E-17	5.4E-17	1.0E-16
ESE	2700	BI-210	2.5E-12	4.5E-16	5.0E-16	9.5E-16
ESE	2700	FR-223	3.8E-15	6.9E-19	5.8E-19	1.3E-18
ESE	2700	PA-231	4.5E-13	8.1E-17	9.0E-17	1.7E-16
ESE	2700	PA-234	1.4E-15	2.4E-19	2.7E-19	5.1E-19
ESE	2700	PA-234M	2.7E-15	4.8E-19	3.0E-19	7.8E-19
ESE	2700	PB-210	2.5E-12	4.5E-16	5.0E-16	9.5E-16
ESE	2700	PO-210	2.5E-12	4.5E-16	5.0E-16	9.5E-16
ESE	2700	RA-223	6.7E-13	1.2E-16	1.3E-16	2.5E-16
ESE	2700	RA-224	2.6E-13	4.8E-17	5.3E-17	1.0E-16
ESE	2700	RA-226	2.8E-12	5.0E-16	5.5E-16	1.1E-15
ESE	2700	RA-228	2.9E-13	5.3E-17	5.8E-17	1.1E-16
ESE	2700	TH-227	6.6E-14	1.2E-17	1.3E-17	2.5E-17
ESE	2700	TH-228	5.4E-13	9.7E-17	1.1E-16	2.0E-16
ESE	2700	TH-230	4.3E-11	7.8E-15	8.6E-15	1.6E-14

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ESE	2700	TH-231	8.3E-14	1.5E-17	1.6E-17	3.1E-17
ESE	2700	TH-232	6.1E-13	1.1E-16	1.2E-16	2.3E-16
ESE	2700	TH-234	1.3E-12	2.3E-16	2.5E-16	4.9E-16
ESE	2700	U-234	1.2E-12	2.2E-16	2.5E-16	4.7E-16
ESE	2700	U-235	8.4E-14	1.5E-17	1.7E-17	3.2E-17
ESE	2700	U-236	8.4E-14	1.5E-17	1.7E-17	3.2E-17
ESE	2700	U-238	1.3E-12	2.3E-16	2.5E-16	4.9E-16
ESE	3500	RN-222	3.1E-04	0.0E+00	0.0E+00	0.0E+00
ESE	3500	AC-227	5.4E-13	9.7E-17	1.0E-16	2.0E-16
ESE	3500	AC-228	2.2E-13	3.9E-17	4.0E-17	7.9E-17
ESE	3500	BI-210	2.0E-12	3.7E-16	3.8E-16	7.5E-16
ESE	3500	FR-223	2.3E-15	4.2E-19	3.4E-19	7.6E-19
ESE	3500	PA-231	3.7E-13	6.6E-17	6.8E-17	1.3E-16
ESE	3500	PA-234	1.1E-15	1.9E-19	2.0E-19	3.9E-19
ESE	3500	PA-234M	5.0E-16	9.1E-20	6.1E-20	1.5E-19
ESE	3500	PB-210	2.0E-12	3.7E-16	3.8E-16	7.5E-16
ESE	3500	PO-210	2.0E-12	3.7E-16	3.8E-16	7.5E-16
ESE	3500	RA-223	5.4E-13	9.7E-17	1.0E-16	2.0E-16
ESE	3500	RA-224	2.1E-13	3.9E-17	4.0E-17	7.9E-17
ESE	3500	RA-226	2.3E-12	4.1E-16	4.2E-16	8.3E-16
ESE	3500	RA-228	2.4E-13	4.3E-17	4.4E-17	8.7E-17
ESE	3500	TH-227	5.4E-14	9.7E-18	1.0E-17	2.0E-17
ESE	3500	TH-228	4.4E-13	7.9E-17	8.1E-17	1.6E-16
ESE	3500	TH-230	3.5E-11	6.3E-15	6.6E-15	1.3E-14
ESE	3500	TH-231	6.7E-14	1.2E-17	1.2E-17	2.4E-17
ESE	3500	TH-232	4.9E-13	8.9E-17	9.2E-17	1.8E-16
ESE	3500	TH-234	1.0E-12	1.9E-16	1.9E-16	3.8E-16
ESE	3500	U-234	1.0E-12	1.8E-16	1.9E-16	3.7E-16
ESE	3500	U-235	6.8E-14	1.2E-17	1.3E-17	2.5E-17
ESE	3500	U-236	6.8E-14	1.2E-17	1.3E-17	2.5E-17
ESE	3500	U-238	1.0E-12	1.9E-16	1.9E-16	3.8E-16
E	300	RN-222	6.5E-04	0.0E+00	0.0E+00	0.0E+00
E	300	AC-227	1.2E-12	2.1E-16	1.4E-15	1.7E-15
E	300	AC-228	5.1E-13	9.2E-17	6.3E-16	7.2E-16
E	300	BI-210	4.4E-12	7.9E-16	5.4E-15	6.2E-15
E	300	FR-223	1.5E-14	2.8E-18	1.7E-17	2.0E-17
E	300	PA-231	7.9E-13	1.4E-16	9.8E-16	1.1E-15
E	300	PA-234	2.5E-15	4.5E-19	3.1E-18	3.5E-18
E	300	PA-234M	7.9E-13	1.4E-16	4.0E-16	5.5E-16
E	300	PB-210	4.4E-12	7.9E-16	5.4E-15	6.2E-15
E	300	PO-210	4.4E-12	7.9E-16	5.4E-15	6.2E-15
E	300	RA-223	1.2E-12	2.1E-16	1.4E-15	1.7E-15
E	300	RA-224	4.6E-13	8.4E-17	5.7E-16	6.5E-16
E	300	RA-226	4.9E-12	8.8E-16	6.0E-15	6.9E-15
E	300	RA-228	5.1E-13	9.2E-17	6.3E-16	7.2E-16
E	300	TH-227	1.2E-13	2.1E-17	1.4E-16	1.6E-16
E	300	TH-228	9.4E-13	1.7E-16	1.2E-15	1.3E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	300	TH-230	7.6E-11	1.4E-14	9.4E-14	1.1E-13
E	300	TH-231	1.5E-13	2.7E-17	1.8E-16	2.1E-16
E	300	TH-232	1.1E-12	1.9E-16	1.3E-15	1.5E-15
E	300	TH-234	2.3E-12	4.1E-16	2.8E-15	3.2E-15
E	300	U-234	2.2E-12	4.0E-16	2.7E-15	3.1E-15
E	300	U-235	1.5E-13	2.7E-17	1.8E-16	2.1E-16
E	300	U-236	1.5E-13	2.7E-17	1.8E-16	2.1E-16
E	300	U-238	2.3E-12	4.1E-16	2.8E-15	3.2E-15
E	500	RN-222	7.0E-04	0.0E+00	0.0E+00	0.0E+00
E	500	AC-227	1.3E-12	2.3E-16	8.6E-16	1.1E-15
E	500	AC-228	5.6E-13	1.0E-16	3.7E-16	4.7E-16
E	500	BI-210	4.8E-12	8.6E-16	3.2E-15	4.1E-15
E	500	FR-223	1.6E-14	2.8E-18	9.5E-18	1.2E-17
E	500	PA-231	8.6E-13	1.6E-16	5.8E-16	7.4E-16
E	500	PA-234	2.7E-15	4.9E-19	1.8E-18	2.3E-18
E	500	PA-234M	4.6E-13	8.3E-17	1.3E-16	2.1E-16
E	500	PB-210	4.8E-12	8.6E-16	3.2E-15	4.1E-15
E	500	PO-210	4.8E-12	8.6E-16	3.2E-15	4.1E-15
E	500	RA-223	1.3E-12	2.3E-16	8.6E-16	1.1E-15
E	500	RA-224	5.1E-13	9.1E-17	3.4E-16	4.3E-16
E	500	RA-226	5.3E-12	9.6E-16	3.6E-15	4.6E-15
E	500	RA-228	5.6E-13	1.0E-16	3.8E-16	4.8E-16
E	500	TH-227	1.3E-13	2.3E-17	8.6E-17	1.1E-16
E	500	TH-228	1.0E-12	1.8E-16	7.0E-16	8.8E-16
E	500	TH-230	8.3E-11	1.5E-14	5.6E-14	7.1E-14
E	500	TH-231	1.6E-13	2.9E-17	1.1E-16	1.4E-16
E	500	TH-232	1.2E-12	2.1E-16	7.8E-16	9.9E-16
E	500	TH-234	2.4E-12	4.4E-16	1.7E-15	2.1E-15
E	500	U-234	2.4E-12	4.3E-16	1.6E-15	2.0E-15
E	500	U-235	1.6E-13	2.9E-17	1.1E-16	1.4E-16
E	500	U-236	1.6E-13	2.9E-17	1.1E-16	1.4E-16
E	500	U-238	2.4E-12	4.4E-16	1.7E-15	2.1E-15
E	700	RN-222	8.4E-04	0.0E+00	0.0E+00	0.0E+00
E	700	AC-227	1.5E-12	2.7E-16	6.1E-16	8.9E-16
E	700	AC-228	6.6E-13	1.2E-16	2.6E-16	3.8E-16
E	700	BI-210	5.7E-12	1.0E-15	2.3E-15	3.3E-15
E	700	FR-223	1.7E-14	3.1E-18	6.2E-18	9.3E-18
E	700	PA-231	1.0E-12	1.9E-16	4.2E-16	6.0E-16
E	700	PA-234	3.2E-15	5.8E-19	1.3E-18	1.9E-18
E	700	PA-234M	3.1E-13	5.6E-17	5.7E-17	1.1E-16
E	700	PB-210	5.7E-12	1.0E-15	2.3E-15	3.3E-15
E	700	PO-210	5.7E-12	1.0E-15	2.3E-15	3.3E-15
E	700	RA-223	1.5E-12	2.7E-16	6.1E-16	8.9E-16
E	700	RA-224	6.0E-13	1.1E-16	2.4E-16	3.5E-16
E	700	RA-226	6.3E-12	1.1E-15	2.6E-15	3.7E-15
E	700	RA-228	6.7E-13	1.2E-16	2.7E-16	3.9E-16
E	700	TH-227	1.5E-13	2.7E-17	6.1E-17	8.8E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	700	TH-228	1.2E-12	2.2E-16	5.0E-16	7.2E-16
E	700	TH-230	9.9E-11	1.8E-14	4.0E-14	5.8E-14
E	700	TH-231	1.9E-13	3.4E-17	7.7E-17	1.1E-16
E	700	TH-232	1.4E-12	2.5E-16	5.6E-16	8.1E-16
E	700	TH-234	2.9E-12	5.3E-16	1.2E-15	1.7E-15
E	700	U-234	2.8E-12	5.1E-16	1.2E-15	1.7E-15
E	700	U-235	1.9E-13	3.5E-17	7.8E-17	1.1E-16
E	700	U-236	1.9E-13	3.5E-17	7.8E-17	1.1E-16
E	700	U-238	2.9E-12	5.3E-16	1.2E-15	1.7E-15
E	1000	RN-222	9.1E-04	0.0E+00	0.0E+00	0.0E+00
E	1000	AC-227	1.6E-12	2.9E-16	4.3E-16	7.2E-16
E	1000	AC-228	7.0E-13	1.3E-16	1.8E-16	3.1E-16
E	1000	BI-210	6.1E-12	1.1E-15	1.6E-15	2.7E-15
E	1000	FR-223	1.7E-14	3.0E-18	3.8E-18	6.8E-18
E	1000	PA-231	1.1E-12	2.0E-16	2.9E-16	4.9E-16
E	1000	PA-234	3.5E-15	6.2E-19	9.0E-19	1.5E-18
E	1000	PA-234M	1.6E-13	2.9E-17	2.1E-17	5.0E-17
E	1000	PB-210	6.1E-12	1.1E-15	1.6E-15	2.7E-15
E	1000	PO-210	6.1E-12	1.1E-15	1.6E-15	2.7E-15
E	1000	RA-223	1.6E-12	2.9E-16	4.3E-16	7.2E-16
E	1000	RA-224	6.5E-13	1.2E-16	1.7E-16	2.9E-16
E	1000	RA-226	6.8E-12	1.2E-15	1.8E-15	3.0E-15
E	1000	RA-228	7.2E-13	1.3E-16	1.9E-16	3.2E-16
E	1000	TH-227	1.6E-13	2.9E-17	4.3E-17	7.2E-17
E	1000	TH-228	1.3E-12	2.4E-16	3.5E-16	5.8E-16
E	1000	TH-230	1.1E-10	1.9E-14	2.8E-14	4.7E-14
E	1000	TH-231	2.1E-13	3.7E-17	5.4E-17	9.1E-17
E	1000	TH-232	1.5E-12	2.7E-16	3.9E-16	6.6E-16
E	1000	TH-234	3.1E-12	5.6E-16	8.2E-16	1.4E-15
E	1000	U-234	3.1E-12	5.5E-16	8.0E-16	1.4E-15
E	1000	U-235	2.1E-13	3.7E-17	5.4E-17	9.1E-17
E	1000	U-236	2.1E-13	3.7E-17	5.4E-17	9.1E-17
E	1000	U-238	3.1E-12	5.6E-16	8.2E-16	1.4E-15
E	1300	RN-222	8.0E-04	0.0E+00	0.0E+00	0.0E+00
E	1300	AC-227	1.4E-12	2.6E-16	3.3E-16	5.9E-16
E	1300	AC-228	6.1E-13	1.1E-16	1.4E-16	2.5E-16
E	1300	BI-210	5.4E-12	9.7E-16	1.2E-15	2.2E-15
E	1300	FR-223	1.3E-14	2.4E-18	2.5E-18	4.9E-18
E	1300	PA-231	9.7E-13	1.7E-16	2.2E-16	4.0E-16
E	1300	PA-234	3.0E-15	5.4E-19	6.8E-19	1.2E-18
E	1300	PA-234M	7.6E-14	1.4E-17	9.2E-18	2.3E-17
E	1300	PB-210	5.4E-12	9.7E-16	1.2E-15	2.2E-15
E	1300	PO-210	5.4E-12	9.7E-16	1.2E-15	2.2E-15
E	1300	RA-223	1.4E-12	2.6E-16	3.3E-16	5.9E-16
E	1300	RA-224	5.7E-13	1.0E-16	1.3E-16	2.3E-16
E	1300	RA-226	6.0E-12	1.1E-15	1.4E-15	2.4E-15
E	1300	RA-228	6.3E-13	1.1E-16	1.4E-16	2.6E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	1300	TH-227	1.4E-13	2.6E-17	3.3E-17	5.8E-17
E	1300	TH-228	1.2E-12	2.1E-16	2.6E-16	4.7E-16
E	1300	TH-230	9.3E-11	1.7E-14	2.1E-14	3.8E-14
E	1300	TH-231	1.8E-13	3.2E-17	4.1E-17	7.3E-17
E	1300	TH-232	1.3E-12	2.3E-16	3.0E-16	5.3E-16
E	1300	TH-234	2.8E-12	5.0E-16	6.3E-16	1.1E-15
E	1300	U-234	2.7E-12	4.8E-16	6.1E-16	1.1E-15
E	1300	U-235	1.8E-13	3.3E-17	4.1E-17	7.4E-17
E	1300	U-236	1.8E-13	3.3E-17	4.1E-17	7.4E-17
E	1300	U-238	2.8E-12	5.0E-16	6.3E-16	1.1E-15
E	1500	RN-222	7.3E-04	0.0E+00	0.0E+00	0.0E+00
E	1500	AC-227	1.3E-12	2.3E-16	2.8E-16	5.2E-16
E	1500	AC-228	5.6E-13	1.0E-16	1.2E-16	2.2E-16
E	1500	BI-210	4.9E-12	8.8E-16	1.1E-15	1.9E-15
E	1500	FR-223	1.1E-14	2.0E-18	2.0E-18	4.1E-18
E	1500	PA-231	8.8E-13	1.6E-16	1.9E-16	3.5E-16
E	1500	PA-234	2.7E-15	4.9E-19	5.9E-19	1.1E-18
E	1500	PA-234M	4.7E-14	8.5E-18	5.5E-18	1.4E-17
E	1500	PB-210	4.9E-12	8.8E-16	1.1E-15	1.9E-15
E	1500	PO-210	4.9E-12	8.8E-16	1.1E-15	1.9E-15
E	1500	RA-223	1.3E-12	2.3E-16	2.8E-16	5.2E-16
E	1500	RA-224	5.2E-13	9.3E-17	1.1E-16	2.1E-16
E	1500	RA-226	5.4E-12	9.8E-16	1.2E-15	2.2E-15
E	1500	RA-228	5.7E-13	1.0E-16	1.2E-16	2.3E-16
E	1500	TH-227	1.3E-13	2.3E-17	2.8E-17	5.1E-17
E	1500	TH-228	1.1E-12	1.9E-16	2.3E-16	4.2E-16
E	1500	TH-230	8.5E-11	1.5E-14	1.8E-14	3.4E-14
E	1500	TH-231	1.6E-13	2.9E-17	3.5E-17	6.5E-17
E	1500	TH-232	1.2E-12	2.1E-16	2.6E-16	4.7E-16
E	1500	TH-234	2.5E-12	4.5E-16	5.4E-16	9.9E-16
E	1500	U-234	2.4E-12	4.4E-16	5.3E-16	9.7E-16
E	1500	U-235	1.6E-13	3.0E-17	3.6E-17	6.5E-17
E	1500	U-236	1.6E-13	3.0E-17	3.6E-17	6.5E-17
E	1500	U-238	2.5E-12	4.5E-16	5.4E-16	9.9E-16
E	1700	RN-222	6.7E-04	0.0E+00	0.0E+00	0.0E+00
E	1700	AC-227	1.2E-12	2.1E-16	2.5E-16	4.6E-16
E	1700	AC-228	5.0E-13	9.1E-17	1.0E-16	1.9E-16
E	1700	BI-210	4.5E-12	8.0E-16	9.4E-16	1.7E-15
E	1700	FR-223	9.6E-15	1.7E-18	1.6E-18	3.4E-18
E	1700	PA-231	8.0E-13	1.4E-16	1.7E-16	3.1E-16
E	1700	PA-234	2.5E-15	4.5E-19	5.1E-19	9.6E-19
E	1700	PA-234M	3.0E-14	5.3E-18	3.4E-18	8.7E-18
E	1700	PB-210	4.5E-12	8.0E-16	9.4E-16	1.7E-15
E	1700	PO-210	4.5E-12	8.0E-16	9.4E-16	1.7E-15
E	1700	RA-223	1.2E-12	2.1E-16	2.5E-16	4.6E-16
E	1700	RA-224	4.7E-13	8.5E-17	9.9E-17	1.8E-16
E	1700	RA-226	5.0E-12	8.9E-16	1.0E-15	1.9E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	1700	RA-228	5.2E-13	9.4E-17	1.1E-16	2.0E-16
E	1700	TH-227	1.2E-13	2.1E-17	2.5E-17	4.6E-17
E	1700	TH-228	9.6E-13	1.7E-16	2.0E-16	3.7E-16
E	1700	TH-230	7.7E-11	1.4E-14	1.6E-14	3.0E-14
E	1700	TH-231	1.5E-13	2.7E-17	3.1E-17	5.8E-17
E	1700	TH-232	1.1E-12	1.9E-16	2.3E-16	4.2E-16
E	1700	TH-234	2.3E-12	4.1E-16	4.8E-16	8.9E-16
E	1700	U-234	2.2E-12	4.0E-16	4.7E-16	8.7E-16
E	1700	U-235	1.5E-13	2.7E-17	3.1E-17	5.8E-17
E	1700	U-236	1.5E-13	2.7E-17	3.1E-17	5.8E-17
E	1700	U-238	2.3E-12	4.1E-16	4.8E-16	8.9E-16
E	2000	RN-222	5.9E-04	0.0E+00	0.0E+00	0.0E+00
E	2000	AC-227	1.0E-12	1.9E-16	2.1E-16	4.0E-16
E	2000	AC-228	4.4E-13	7.9E-17	8.8E-17	1.7E-16
E	2000	BI-210	3.9E-12	7.1E-16	7.9E-16	1.5E-15
E	2000	FR-223	7.6E-15	1.4E-18	1.2E-18	2.6E-18
E	2000	PA-231	7.1E-13	1.3E-16	1.4E-16	2.7E-16
E	2000	PA-234	2.2E-15	3.9E-19	4.3E-19	8.2E-19
E	2000	PA-234M	1.5E-14	2.7E-18	1.7E-18	4.4E-18
E	2000	PB-210	3.9E-12	7.1E-16	7.9E-16	1.5E-15
E	2000	PO-210	3.9E-12	7.1E-16	7.9E-16	1.5E-15
E	2000	RA-223	1.0E-12	1.9E-16	2.1E-16	4.0E-16
E	2000	RA-224	4.1E-13	7.5E-17	8.4E-17	1.6E-16
E	2000	RA-226	4.4E-12	7.8E-16	8.8E-16	1.7E-15
E	2000	RA-228	4.6E-13	8.2E-17	9.2E-17	1.7E-16
E	2000	TH-227	1.0E-13	1.9E-17	2.1E-17	4.0E-17
E	2000	TH-228	8.4E-13	1.5E-16	1.7E-16	3.2E-16
E	2000	TH-230	6.8E-11	1.2E-14	1.4E-14	2.6E-14
E	2000	TH-231	1.3E-13	2.4E-17	2.6E-17	5.0E-17
E	2000	TH-232	9.5E-13	1.7E-16	1.9E-16	3.6E-16
E	2000	TH-234	2.0E-12	3.6E-16	4.1E-16	7.7E-16
E	2000	U-234	2.0E-12	3.5E-16	3.9E-16	7.5E-16
E	2000	U-235	1.3E-13	2.4E-17	2.7E-17	5.0E-17
E	2000	U-236	1.3E-13	2.4E-17	2.7E-17	5.0E-17
E	2000	U-238	2.0E-12	3.6E-16	4.1E-16	7.7E-16
E	2300	RN-222	5.3E-04	0.0E+00	0.0E+00	0.0E+00
E	2300	AC-227	9.4E-13	1.7E-16	1.8E-16	3.5E-16
E	2300	AC-228	3.9E-13	7.0E-17	7.5E-17	1.5E-16
E	2300	BI-210	3.5E-12	6.3E-16	6.9E-16	1.3E-15
E	2300	FR-223	6.1E-15	1.1E-18	9.5E-19	2.0E-18
E	2300	PA-231	6.3E-13	1.1E-16	1.2E-16	2.4E-16
E	2300	PA-234	1.9E-15	3.5E-19	3.7E-19	7.2E-19
E	2300	PA-234M	7.7E-15	1.4E-18	8.9E-19	2.3E-18
E	2300	PB-210	3.5E-12	6.3E-16	6.9E-16	1.3E-15
E	2300	PO-210	3.5E-12	6.3E-16	6.9E-16	1.3E-15
E	2300	RA-223	9.4E-13	1.7E-16	1.8E-16	3.5E-16
E	2300	RA-224	3.7E-13	6.7E-17	7.2E-17	1.4E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	2300	RA-226	3.9E-12	7.0E-16	7.6E-16	1.5E-15
E	2300	RA-228	4.1E-13	7.4E-17	8.0E-17	1.5E-16
E	2300	TH-227	9.3E-14	1.7E-17	1.8E-17	3.5E-17
E	2300	TH-228	7.6E-13	1.4E-16	1.5E-16	2.8E-16
E	2300	TH-230	6.1E-11	1.1E-14	1.2E-14	2.3E-14
E	2300	TH-231	1.2E-13	2.1E-17	2.3E-17	4.4E-17
E	2300	TH-232	8.5E-13	1.5E-16	1.7E-16	3.2E-16
E	2300	TH-234	1.8E-12	3.2E-16	3.5E-16	6.7E-16
E	2300	U-234	1.8E-12	3.2E-16	3.4E-16	6.6E-16
E	2300	U-235	1.2E-13	2.1E-17	2.3E-17	4.4E-17
E	2300	U-236	1.2E-13	2.1E-17	2.3E-17	4.4E-17
E	2300	U-238	1.8E-12	3.2E-16	3.5E-16	6.7E-16
E	2400	RN-222	5.2E-04	0.0E+00	0.0E+00	0.0E+00
E	2400	AC-227	9.1E-13	1.6E-16	1.7E-16	3.4E-16
E	2400	AC-228	3.8E-13	6.8E-17	7.2E-17	1.4E-16
E	2400	BI-210	3.4E-12	6.1E-16	6.6E-16	1.3E-15
E	2400	FR-223	5.7E-15	1.0E-18	8.8E-19	1.9E-18
E	2400	PA-231	6.1E-13	1.1E-16	1.2E-16	2.3E-16
E	2400	PA-234	1.9E-15	3.4E-19	3.5E-19	6.9E-19
E	2400	PA-234M	6.2E-15	1.1E-18	7.2E-19	1.8E-18
E	2400	PB-210	3.4E-12	6.1E-16	6.6E-16	1.3E-15
E	2400	PO-210	3.4E-12	6.1E-16	6.6E-16	1.3E-15
E	2400	RA-223	9.1E-13	1.6E-16	1.7E-16	3.4E-16
E	2400	RA-224	3.6E-13	6.5E-17	6.9E-17	1.3E-16
E	2400	RA-226	3.8E-12	6.8E-16	7.3E-16	1.4E-15
E	2400	RA-228	4.0E-13	7.1E-17	7.6E-17	1.5E-16
E	2400	TH-227	9.0E-14	1.6E-17	1.7E-17	3.4E-17
E	2400	TH-228	7.3E-13	1.3E-16	1.4E-16	2.7E-16
E	2400	TH-230	5.9E-11	1.1E-14	1.1E-14	2.2E-14
E	2400	TH-231	1.1E-13	2.0E-17	2.2E-17	4.2E-17
E	2400	TH-232	8.2E-13	1.5E-16	1.6E-16	3.1E-16
E	2400	TH-234	1.7E-12	3.1E-16	3.4E-16	6.5E-16
E	2400	U-234	1.7E-12	3.1E-16	3.3E-16	6.3E-16
E	2400	U-235	1.1E-13	2.1E-17	2.2E-17	4.3E-17
E	2400	U-236	1.1E-13	2.1E-17	2.2E-17	4.3E-17
E	2400	U-238	1.7E-12	3.1E-16	3.4E-16	6.5E-16
E	2600	RN-222	4.9E-04	0.0E+00	0.0E+00	0.0E+00
E	2600	AC-227	8.5E-13	1.5E-16	1.6E-16	3.1E-16
E	2600	AC-228	3.5E-13	6.4E-17	6.6E-17	1.3E-16
E	2600	BI-210	3.2E-12	5.8E-16	6.0E-16	1.2E-15
E	2600	FR-223	4.9E-15	8.9E-19	7.5E-19	1.6E-18
E	2600	PA-231	5.8E-13	1.0E-16	1.1E-16	2.1E-16
E	2600	PA-234	1.7E-15	3.1E-19	3.2E-19	6.4E-19
E	2600	PA-234M	4.0E-15	7.2E-19	4.7E-19	1.2E-18
E	2600	PB-210	3.2E-12	5.8E-16	6.0E-16	1.2E-15
E	2600	PO-210	3.2E-12	5.8E-16	6.0E-16	1.2E-15
E	2600	RA-223	8.5E-13	1.5E-16	1.6E-16	3.1E-16

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	2600	RA-224	3.4E-13	6.1E-17	6.4E-17	1.2E-16
E	2600	RA-226	3.6E-12	6.4E-16	6.7E-16	1.3E-15
E	2600	RA-228	3.7E-13	6.7E-17	7.0E-17	1.4E-16
E	2600	TH-227	8.5E-14	1.5E-17	1.6E-17	3.1E-17
E	2600	TH-228	6.9E-13	1.2E-16	1.3E-16	2.5E-16
E	2600	TH-230	5.6E-11	1.0E-14	1.0E-14	2.0E-14
E	2600	TH-231	1.1E-13	1.9E-17	2.0E-17	3.9E-17
E	2600	TH-232	7.8E-13	1.4E-16	1.5E-16	2.9E-16
E	2600	TH-234	1.6E-12	3.0E-16	3.1E-16	6.0E-16
E	2600	U-234	1.6E-12	2.9E-16	3.0E-16	5.9E-16
E	2600	U-235	1.1E-13	1.9E-17	2.0E-17	4.0E-17
E	2600	U-236	1.1E-13	1.9E-17	2.0E-17	4.0E-17
E	2600	U-238	1.6E-12	3.0E-16	3.1E-16	6.0E-16
E	2700	RN-222	4.7E-04	0.0E+00	0.0E+00	0.0E+00
E	2700	AC-227	8.3E-13	1.5E-16	1.5E-16	3.0E-16
E	2700	AC-228	3.4E-13	6.2E-17	6.3E-17	1.2E-16
E	2700	BI-210	3.1E-12	5.6E-16	5.8E-16	1.1E-15
E	2700	FR-223	4.6E-15	8.3E-19	7.0E-19	1.5E-18
E	2700	PA-231	5.6E-13	1.0E-16	1.0E-16	2.1E-16
E	2700	PA-234	1.7E-15	3.0E-19	3.1E-19	6.1E-19
E	2700	PA-234M	3.2E-15	5.8E-19	3.8E-19	9.7E-19
E	2700	PB-210	3.1E-12	5.6E-16	5.8E-16	1.1E-15
E	2700	PO-210	3.1E-12	5.6E-16	5.8E-16	1.1E-15
E	2700	RA-223	8.3E-13	1.5E-16	1.5E-16	3.0E-16
E	2700	RA-224	3.3E-13	5.9E-17	6.1E-17	1.2E-16
E	2700	RA-226	3.5E-12	6.2E-16	6.4E-16	1.3E-15
E	2700	RA-228	3.6E-13	6.5E-17	6.8E-17	1.3E-16
E	2700	TH-227	8.2E-14	1.5E-17	1.5E-17	3.0E-17
E	2700	TH-228	6.7E-13	1.2E-16	1.2E-16	2.4E-16
E	2700	TH-230	5.4E-11	9.7E-15	1.0E-14	2.0E-14
E	2700	TH-231	1.0E-13	1.9E-17	1.9E-17	3.8E-17
E	2700	TH-232	7.5E-13	1.4E-16	1.4E-16	2.8E-16
E	2700	TH-234	1.6E-12	2.9E-16	3.0E-16	5.8E-16
E	2700	U-234	1.6E-12	2.8E-16	2.9E-16	5.7E-16
E	2700	U-235	1.0E-13	1.9E-17	1.9E-17	3.8E-17
E	2700	U-236	1.0E-13	1.9E-17	1.9E-17	3.8E-17
E	2700	U-238	1.6E-12	2.9E-16	3.0E-16	5.8E-16
E	3500	RN-222	3.8E-04	0.0E+00	0.0E+00	0.0E+00
E	3500	AC-227	6.6E-13	1.2E-16	1.2E-16	2.4E-16
E	3500	AC-228	2.7E-13	4.8E-17	4.7E-17	9.5E-17
E	3500	BI-210	2.5E-12	4.5E-16	4.4E-16	8.9E-16
E	3500	FR-223	2.7E-15	4.9E-19	4.1E-19	9.0E-19
E	3500	PA-231	4.5E-13	8.1E-17	8.0E-17	1.6E-16
E	3500	PA-234	1.3E-15	2.4E-19	2.3E-19	4.7E-19
E	3500	PA-234M	6.2E-16	1.1E-19	7.7E-20	1.9E-19
E	3500	PB-210	2.5E-12	4.5E-16	4.4E-16	8.9E-16
E	3500	PO-210	2.5E-12	4.5E-16	4.4E-16	8.9E-16

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
E	3500	RA-223	6.6E-13	1.2E-16	1.2E-16	2.4E-16
E	3500	RA-224	2.6E-13	4.7E-17	4.7E-17	9.4E-17
E	3500	RA-226	2.8E-12	5.0E-16	4.9E-16	9.9E-16
E	3500	RA-228	2.9E-13	5.2E-17	5.1E-17	1.0E-16
E	3500	TH-227	6.6E-14	1.2E-17	1.2E-17	2.4E-17
E	3500	TH-228	5.3E-13	9.6E-17	9.5E-17	1.9E-16
E	3500	TH-230	4.3E-11	7.8E-15	7.6E-15	1.5E-14
E	3500	TH-231	8.2E-14	1.5E-17	1.4E-17	2.9E-17
E	3500	TH-232	6.0E-13	1.1E-16	1.1E-16	2.2E-16
E	3500	TH-234	1.3E-12	2.3E-16	2.3E-16	4.5E-16
E	3500	U-234	1.2E-12	2.2E-16	2.2E-16	4.4E-16
E	3500	U-235	8.4E-14	1.5E-17	1.5E-17	3.0E-17
E	3500	U-236	8.4E-14	1.5E-17	1.5E-17	3.0E-17
E	3500	U-238	1.3E-12	2.3E-16	2.3E-16	4.5E-16
ENE	300	RN-222	8.0E-04	0.0E+00	0.0E+00	0.0E+00
ENE	300	AC-227	1.5E-12	2.6E-16	1.5E-15	1.8E-15
ENE	300	AC-228	6.4E-13	1.1E-16	6.7E-16	7.9E-16
ENE	300	BI-210	5.5E-12	9.9E-16	5.8E-15	6.8E-15
ENE	300	FR-223	1.9E-14	3.4E-18	1.9E-17	2.2E-17
ENE	300	PA-231	9.9E-13	1.8E-16	1.0E-15	1.2E-15
ENE	300	PA-234	3.1E-15	5.6E-19	3.3E-18	3.9E-18
ENE	300	PA-234M	9.1E-13	1.6E-16	4.2E-16	5.9E-16
ENE	300	PB-210	5.5E-12	9.9E-16	5.8E-15	6.8E-15
ENE	300	PO-210	5.5E-12	9.9E-16	5.8E-15	6.8E-15
ENE	300	RA-223	1.5E-12	2.6E-16	1.5E-15	1.8E-15
ENE	300	RA-224	5.8E-13	1.0E-16	6.1E-16	7.2E-16
ENE	300	RA-226	6.1E-12	1.1E-15	6.5E-15	7.6E-15
ENE	300	RA-228	6.4E-13	1.1E-16	6.8E-16	7.9E-16
ENE	300	TH-227	1.4E-13	2.6E-17	1.5E-16	1.8E-16
ENE	300	TH-228	1.2E-12	2.1E-16	1.2E-15	1.5E-15
ENE	300	TH-230	9.5E-11	1.7E-14	1.0E-13	1.2E-13
ENE	300	TH-231	1.8E-13	3.3E-17	2.0E-16	2.3E-16
ENE	300	TH-232	1.3E-12	2.4E-16	1.4E-15	1.6E-15
ENE	300	TH-234	2.8E-12	5.0E-16	3.0E-15	3.5E-15
ENE	300	U-234	2.7E-12	4.9E-16	2.9E-15	3.4E-15
ENE	300	U-235	1.8E-13	3.3E-17	2.0E-16	2.3E-16
ENE	300	U-236	1.8E-13	3.3E-17	2.0E-16	2.3E-16
ENE	300	U-238	2.8E-12	5.0E-16	3.0E-15	3.5E-15
ENE	500	RN-222	7.8E-04	0.0E+00	0.0E+00	0.0E+00
ENE	500	AC-227	1.4E-12	2.6E-16	9.3E-16	1.2E-15
ENE	500	AC-228	6.2E-13	1.1E-16	4.0E-16	5.1E-16
ENE	500	BI-210	5.3E-12	9.6E-16	3.5E-15	4.4E-15
ENE	500	FR-223	1.7E-14	3.1E-18	1.0E-17	1.3E-17
ENE	500	PA-231	9.6E-13	1.7E-16	6.3E-16	8.0E-16
ENE	500	PA-234	3.0E-15	5.5E-19	2.0E-18	2.5E-18
ENE	500	PA-234M	4.6E-13	8.2E-17	1.3E-16	2.1E-16
ENE	500	PB-210	5.3E-12	9.6E-16	3.5E-15	4.4E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ENE	500	PO-210	5.3E-12	9.6E-16	3.5E-15	4.4E-15
ENE	500	RA-223	1.4E-12	2.6E-16	9.3E-16	1.2E-15
ENE	500	RA-224	5.6E-13	1.0E-16	3.7E-16	4.7E-16
ENE	500	RA-226	5.9E-12	1.1E-15	3.9E-15	4.9E-15
ENE	500	RA-228	6.2E-13	1.1E-16	4.1E-16	5.2E-16
ENE	500	TH-227	1.4E-13	2.5E-17	9.2E-17	1.2E-16
ENE	500	TH-228	1.1E-12	2.1E-16	7.5E-16	9.5E-16
ENE	500	TH-230	9.2E-11	1.7E-14	6.0E-14	7.7E-14
ENE	500	TH-231	1.8E-13	3.2E-17	1.2E-16	1.5E-16
ENE	500	TH-232	1.3E-12	2.3E-16	8.4E-16	1.1E-15
ENE	500	TH-234	2.7E-12	4.9E-16	1.8E-15	2.3E-15
ENE	500	U-234	2.7E-12	4.8E-16	1.7E-15	2.2E-15
ENE	500	U-235	1.8E-13	3.2E-17	1.2E-16	1.5E-16
ENE	500	U-236	1.8E-13	3.2E-17	1.2E-16	1.5E-16
ENE	500	U-238	2.7E-12	4.9E-16	1.8E-15	2.3E-15
ENE	700	RN-222	9.2E-04	0.0E+00	0.0E+00	0.0E+00
ENE	700	AC-227	1.7E-12	3.0E-16	6.6E-16	9.6E-16
ENE	700	AC-228	7.2E-13	1.3E-16	2.8E-16	4.1E-16
ENE	700	BI-210	6.3E-12	1.1E-15	2.5E-15	3.6E-15
ENE	700	FR-223	1.9E-14	3.4E-18	6.7E-18	1.0E-17
ENE	700	PA-231	1.1E-12	2.0E-16	4.5E-16	6.5E-16
ENE	700	PA-234	3.5E-15	6.4E-19	1.4E-18	2.0E-18
ENE	700	PA-234M	2.9E-13	5.3E-17	5.9E-17	1.1E-16
ENE	700	PB-210	6.3E-12	1.1E-15	2.5E-15	3.6E-15
ENE	700	PO-210	6.3E-12	1.1E-15	2.5E-15	3.6E-15
ENE	700	RA-223	1.7E-12	3.0E-16	6.6E-16	9.6E-16
ENE	700	RA-224	6.6E-13	1.2E-16	2.6E-16	3.8E-16
ENE	700	RA-226	6.9E-12	1.3E-15	2.8E-15	4.0E-15
ENE	700	RA-228	7.3E-13	1.3E-16	2.9E-16	4.2E-16
ENE	700	TH-227	1.7E-13	3.0E-17	6.6E-17	9.5E-17
ENE	700	TH-228	1.3E-12	2.4E-16	5.3E-16	7.7E-16
ENE	700	TH-230	1.1E-10	2.0E-14	4.3E-14	6.2E-14
ENE	700	TH-231	2.1E-13	3.8E-17	8.3E-17	1.2E-16
ENE	700	TH-232	1.5E-12	2.7E-16	6.0E-16	8.7E-16
ENE	700	TH-234	3.2E-12	5.8E-16	1.3E-15	1.8E-15
ENE	700	U-234	3.1E-12	5.6E-16	1.2E-15	1.8E-15
ENE	700	U-235	2.1E-13	3.8E-17	8.3E-17	1.2E-16
ENE	700	U-236	2.1E-13	3.8E-17	8.3E-17	1.2E-16
ENE	700	U-238	3.2E-12	5.8E-16	1.3E-15	1.8E-15
ENE	1000	RN-222	1.0E-03	0.0E+00	0.0E+00	0.0E+00
ENE	1000	AC-227	1.8E-12	3.3E-16	4.6E-16	7.9E-16
ENE	1000	AC-228	7.9E-13	1.4E-16	2.0E-16	3.4E-16
ENE	1000	BI-210	6.9E-12	1.3E-15	1.7E-15	3.0E-15
ENE	1000	FR-223	1.8E-14	3.3E-18	4.1E-18	7.4E-18
ENE	1000	PA-231	1.3E-12	2.3E-16	3.1E-16	5.4E-16
ENE	1000	PA-234	3.9E-15	7.0E-19	9.7E-19	1.7E-18
ENE	1000	PA-234M	1.6E-13	2.8E-17	2.3E-17	5.1E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ENE	1000	PB-210	6.9E-12	1.3E-15	1.7E-15	3.0E-15
ENE	1000	PO-210	6.9E-12	1.3E-15	1.7E-15	3.0E-15
ENE	1000	RA-223	1.8E-12	3.3E-16	4.6E-16	7.9E-16
ENE	1000	RA-224	7.3E-13	1.3E-16	1.8E-16	3.1E-16
ENE	1000	RA-226	7.7E-12	1.4E-15	1.9E-15	3.3E-15
ENE	1000	RA-228	8.1E-13	1.5E-16	2.0E-16	3.5E-16
ENE	1000	TH-227	1.8E-13	3.3E-17	4.6E-17	7.9E-17
ENE	1000	TH-228	1.5E-12	2.7E-16	3.7E-16	6.4E-16
ENE	1000	TH-230	1.2E-10	2.2E-14	3.0E-14	5.2E-14
ENE	1000	TH-231	2.3E-13	4.2E-17	5.8E-17	1.0E-16
ENE	1000	TH-232	1.7E-12	3.0E-16	4.2E-16	7.2E-16
ENE	1000	TH-234	3.5E-12	6.4E-16	8.8E-16	1.5E-15
ENE	1000	U-234	3.5E-12	6.2E-16	8.6E-16	1.5E-15
ENE	1000	U-235	2.3E-13	4.2E-17	5.8E-17	1.0E-16
ENE	1000	U-236	2.3E-13	4.2E-17	5.8E-17	1.0E-16
ENE	1000	U-238	3.5E-12	6.4E-16	8.8E-16	1.5E-15
ENE	1300	RN-222	9.2E-04	0.0E+00	0.0E+00	0.0E+00
ENE	1300	AC-227	1.7E-12	3.0E-16	3.5E-16	6.5E-16
ENE	1300	AC-228	7.1E-13	1.3E-16	1.5E-16	2.8E-16
ENE	1300	BI-210	6.2E-12	1.1E-15	1.3E-15	2.4E-15
ENE	1300	FR-223	1.5E-14	2.6E-18	2.8E-18	5.4E-18
ENE	1300	PA-231	1.1E-12	2.0E-16	2.4E-16	4.4E-16
ENE	1300	PA-234	3.5E-15	6.3E-19	7.4E-19	1.4E-18
ENE	1300	PA-234M	7.8E-14	1.4E-17	9.9E-18	2.4E-17
ENE	1300	PB-210	6.2E-12	1.1E-15	1.3E-15	2.4E-15
ENE	1300	PO-210	6.2E-12	1.1E-15	1.3E-15	2.4E-15
ENE	1300	RA-223	1.7E-12	3.0E-16	3.5E-16	6.5E-16
ENE	1300	RA-224	6.6E-13	1.2E-16	1.4E-16	2.6E-16
ENE	1300	RA-226	6.9E-12	1.2E-15	1.5E-15	2.7E-15
ENE	1300	RA-228	7.2E-13	1.3E-16	1.5E-16	2.8E-16
ENE	1300	TH-227	1.6E-13	3.0E-17	3.5E-17	6.5E-17
ENE	1300	TH-228	1.3E-12	2.4E-16	2.8E-16	5.2E-16
ENE	1300	TH-230	1.1E-10	1.9E-14	2.3E-14	4.2E-14
ENE	1300	TH-231	2.1E-13	3.7E-17	4.4E-17	8.1E-17
ENE	1300	TH-232	1.5E-12	2.7E-16	3.2E-16	5.9E-16
ENE	1300	TH-234	3.2E-12	5.7E-16	6.8E-16	1.2E-15
ENE	1300	U-234	3.1E-12	5.6E-16	6.6E-16	1.2E-15
ENE	1300	U-235	2.1E-13	3.8E-17	4.5E-17	8.2E-17
ENE	1300	U-236	2.1E-13	3.8E-17	4.5E-17	8.2E-17
ENE	1300	U-238	3.2E-12	5.7E-16	6.8E-16	1.2E-15
ENE	1500	RN-222	8.5E-04	0.0E+00	0.0E+00	0.0E+00
ENE	1500	AC-227	1.5E-12	2.7E-16	3.0E-16	5.8E-16
ENE	1500	AC-228	6.4E-13	1.2E-16	1.3E-16	2.4E-16
ENE	1500	BI-210	5.7E-12	1.0E-15	1.1E-15	2.2E-15
ENE	1500	FR-223	1.2E-14	2.2E-18	2.2E-18	4.4E-18
ENE	1500	PA-231	1.0E-12	1.9E-16	2.1E-16	3.9E-16
ENE	1500	PA-234	3.2E-15	5.7E-19	6.3E-19	1.2E-18

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ENE	1500	PA-234M	5.0E-14	8.9E-18	6.0E-18	1.5E-17
ENE	1500	PB-210	5.7E-12	1.0E-15	1.1E-15	2.2E-15
ENE	1500	PO-210	5.7E-12	1.0E-15	1.1E-15	2.2E-15
ENE	1500	RA-223	1.5E-12	2.7E-16	3.0E-16	5.8E-16
ENE	1500	RA-224	6.0E-13	1.1E-16	1.2E-16	2.3E-16
ENE	1500	RA-226	6.3E-12	1.1E-15	1.3E-15	2.4E-15
ENE	1500	RA-228	6.6E-13	1.2E-16	1.3E-16	2.5E-16
ENE	1500	TH-227	1.5E-13	2.7E-17	3.0E-17	5.7E-17
ENE	1500	TH-228	1.2E-12	2.2E-16	2.5E-16	4.7E-16
ENE	1500	TH-230	9.9E-11	1.8E-14	2.0E-14	3.8E-14
ENE	1500	TH-231	1.9E-13	3.4E-17	3.8E-17	7.2E-17
ENE	1500	TH-232	1.4E-12	2.5E-16	2.8E-16	5.3E-16
ENE	1500	TH-234	2.9E-12	5.2E-16	5.8E-16	1.1E-15
ENE	1500	U-234	2.8E-12	5.1E-16	5.7E-16	1.1E-15
ENE	1500	U-235	1.9E-13	3.5E-17	3.8E-17	7.3E-17
ENE	1500	U-236	1.9E-13	3.5E-17	3.8E-17	7.3E-17
ENE	1500	U-238	2.9E-12	5.2E-16	5.8E-16	1.1E-15
ENE	1700	RN-222	7.8E-04	0.0E+00	0.0E+00	0.0E+00
ENE	1700	AC-227	1.4E-12	2.5E-16	2.7E-16	5.2E-16
ENE	1700	AC-228	5.9E-13	1.1E-16	1.1E-16	2.2E-16
ENE	1700	BI-210	5.2E-12	9.4E-16	1.0E-15	1.9E-15
ENE	1700	FR-223	1.0E-14	1.9E-18	1.8E-18	3.7E-18
ENE	1700	PA-231	9.4E-13	1.7E-16	1.8E-16	3.5E-16
ENE	1700	PA-234	2.9E-15	5.2E-19	5.5E-19	1.1E-18
ENE	1700	PA-234M	3.2E-14	5.7E-18	3.7E-18	9.4E-18
ENE	1700	PB-210	5.2E-12	9.4E-16	1.0E-15	1.9E-15
ENE	1700	PO-210	5.2E-12	9.4E-16	1.0E-15	1.9E-15
ENE	1700	RA-223	1.4E-12	2.5E-16	2.7E-16	5.2E-16
ENE	1700	RA-224	5.5E-13	9.9E-17	1.1E-16	2.1E-16
ENE	1700	RA-226	5.8E-12	1.0E-15	1.1E-15	2.2E-15
ENE	1700	RA-228	6.1E-13	1.1E-16	1.2E-16	2.3E-16
ENE	1700	TH-227	1.4E-13	2.5E-17	2.7E-17	5.2E-17
ENE	1700	TH-228	1.1E-12	2.0E-16	2.2E-16	4.2E-16
ENE	1700	TH-230	9.1E-11	1.6E-14	1.7E-14	3.4E-14
ENE	1700	TH-231	1.7E-13	3.1E-17	3.3E-17	6.5E-17
ENE	1700	TH-232	1.3E-12	2.3E-16	2.4E-16	4.7E-16
ENE	1700	TH-234	2.7E-12	4.8E-16	5.1E-16	1.0E-15
ENE	1700	U-234	2.6E-12	4.7E-16	5.0E-16	9.7E-16
ENE	1700	U-235	1.8E-13	3.2E-17	3.4E-17	6.5E-17
ENE	1700	U-236	1.8E-13	3.2E-17	3.4E-17	6.5E-17
ENE	1700	U-238	2.7E-12	4.8E-16	5.1E-16	1.0E-15
ENE	2000	RN-222	7.0E-04	0.0E+00	0.0E+00	0.0E+00
ENE	2000	AC-227	1.2E-12	2.2E-16	2.3E-16	4.5E-16
ENE	2000	AC-228	5.2E-13	9.3E-17	9.4E-17	1.9E-16
ENE	2000	BI-210	4.6E-12	8.3E-16	8.5E-16	1.7E-15
ENE	2000	FR-223	8.2E-15	1.5E-18	1.3E-18	2.8E-18
ENE	2000	PA-231	8.4E-13	1.5E-16	1.5E-16	3.0E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ENE	2000	PA-234	2.5E-15	4.6E-19	4.6E-19	9.2E-19
ENE	2000	PA-234M	1.6E-14	2.9E-18	1.9E-18	4.8E-18
ENE	2000	PB-210	4.6E-12	8.3E-16	8.5E-16	1.7E-15
ENE	2000	PO-210	4.6E-12	8.3E-16	8.5E-16	1.7E-15
ENE	2000	RA-223	1.2E-12	2.2E-16	2.3E-16	4.5E-16
ENE	2000	RA-224	4.9E-13	8.8E-17	9.0E-17	1.8E-16
ENE	2000	RA-226	5.1E-12	9.3E-16	9.5E-16	1.9E-15
ENE	2000	RA-228	5.4E-13	9.7E-17	9.9E-17	2.0E-16
ENE	2000	TH-227	1.2E-13	2.2E-17	2.3E-17	4.5E-17
ENE	2000	TH-228	9.9E-13	1.8E-16	1.8E-16	3.6E-16
ENE	2000	TH-230	8.0E-11	1.4E-14	1.5E-14	2.9E-14
ENE	2000	TH-231	1.5E-13	2.8E-17	2.8E-17	5.6E-17
ENE	2000	TH-232	1.1E-12	2.0E-16	2.1E-16	4.1E-16
ENE	2000	TH-234	2.4E-12	4.3E-16	4.4E-16	8.6E-16
ENE	2000	U-234	2.3E-12	4.2E-16	4.2E-16	8.4E-16
ENE	2000	U-235	1.6E-13	2.8E-17	2.9E-17	5.7E-17
ENE	2000	U-236	1.6E-13	2.8E-17	2.9E-17	5.7E-17
ENE	2000	U-238	2.4E-12	4.3E-16	4.4E-16	8.6E-16
ENE	2300	RN-222	6.3E-04	0.0E+00	0.0E+00	0.0E+00
ENE	2300	AC-227	1.1E-12	2.0E-16	2.0E-16	4.0E-16
ENE	2300	AC-228	4.6E-13	8.3E-17	8.1E-17	1.6E-16
ENE	2300	BI-210	4.2E-12	7.5E-16	7.4E-16	1.5E-15
ENE	2300	FR-223	6.6E-15	1.2E-18	1.0E-18	2.2E-18
ENE	2300	PA-231	7.5E-13	1.4E-16	1.3E-16	2.7E-16
ENE	2300	PA-234	2.3E-15	4.1E-19	4.0E-19	8.1E-19
ENE	2300	PA-234M	8.5E-15	1.5E-18	9.9E-19	2.5E-18
ENE	2300	PB-210	4.2E-12	7.5E-16	7.4E-16	1.5E-15
ENE	2300	PO-210	4.2E-12	7.5E-16	7.4E-16	1.5E-15
ENE	2300	RA-223	1.1E-12	2.0E-16	2.0E-16	4.0E-16
ENE	2300	RA-224	4.4E-13	7.9E-17	7.8E-17	1.6E-16
ENE	2300	RA-226	4.6E-12	8.3E-16	8.2E-16	1.6E-15
ENE	2300	RA-228	4.9E-13	8.7E-17	8.6E-17	1.7E-16
ENE	2300	TH-227	1.1E-13	2.0E-17	1.9E-17	3.9E-17
ENE	2300	TH-228	8.9E-13	1.6E-16	1.6E-16	3.2E-16
ENE	2300	TH-230	7.2E-11	1.3E-14	1.3E-14	2.6E-14
ENE	2300	TH-231	1.4E-13	2.5E-17	2.4E-17	4.9E-17
ENE	2300	TH-232	1.0E-12	1.8E-16	1.8E-16	3.6E-16
ENE	2300	TH-234	2.1E-12	3.8E-16	3.8E-16	7.6E-16
ENE	2300	U-234	2.1E-12	3.7E-16	3.7E-16	7.4E-16
ENE	2300	U-235	1.4E-13	2.5E-17	2.5E-17	5.0E-17
ENE	2300	U-236	1.4E-13	2.5E-17	2.5E-17	5.0E-17
ENE	2300	U-238	2.1E-12	3.8E-16	3.8E-16	7.6E-16
ENE	2400	RN-222	6.1E-04	0.0E+00	0.0E+00	0.0E+00
ENE	2400	AC-227	1.1E-12	1.9E-16	1.9E-16	3.8E-16
ENE	2400	AC-228	4.4E-13	8.0E-17	7.7E-17	1.6E-16
ENE	2400	BI-210	4.0E-12	7.3E-16	7.0E-16	1.4E-15
ENE	2400	FR-223	6.1E-15	1.1E-18	9.6E-19	2.1E-18

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ENE	2400	PA-231	7.3E-13	1.3E-16	1.3E-16	2.6E-16
ENE	2400	PA-234	2.2E-15	3.9E-19	3.8E-19	7.7E-19
ENE	2400	PA-234M	6.9E-15	1.2E-18	8.0E-19	2.0E-18
ENE	2400	PB-210	4.0E-12	7.3E-16	7.0E-16	1.4E-15
ENE	2400	PO-210	4.0E-12	7.3E-16	7.0E-16	1.4E-15
ENE	2400	RA-223	1.1E-12	1.9E-16	1.9E-16	3.8E-16
ENE	2400	RA-224	4.3E-13	7.7E-17	7.4E-17	1.5E-16
ENE	2400	RA-226	4.5E-12	8.0E-16	7.8E-16	1.6E-15
ENE	2400	RA-228	4.7E-13	8.4E-17	8.2E-17	1.7E-16
ENE	2400	TH-227	1.1E-13	1.9E-17	1.9E-17	3.8E-17
ENE	2400	TH-228	8.6E-13	1.6E-16	1.5E-16	3.1E-16
ENE	2400	TH-230	7.0E-11	1.3E-14	1.2E-14	2.5E-14
ENE	2400	TH-231	1.3E-13	2.4E-17	2.3E-17	4.7E-17
ENE	2400	TH-232	9.7E-13	1.8E-16	1.7E-16	3.5E-16
ENE	2400	TH-234	2.1E-12	3.7E-16	3.6E-16	7.3E-16
ENE	2400	U-234	2.0E-12	3.6E-16	3.5E-16	7.1E-16
ENE	2400	U-235	1.4E-13	2.4E-17	2.4E-17	4.8E-17
ENE	2400	U-236	1.4E-13	2.4E-17	2.4E-17	4.8E-17
ENE	2400	U-238	2.1E-12	3.7E-16	3.6E-16	7.3E-16
ENE	2600	RN-222	5.8E-04	0.0E+00	0.0E+00	0.0E+00
ENE	2600	AC-227	1.0E-12	1.8E-16	1.7E-16	3.5E-16
ENE	2600	AC-228	4.1E-13	7.5E-17	7.1E-17	1.5E-16
ENE	2600	BI-210	3.8E-12	6.8E-16	6.5E-16	1.3E-15
ENE	2600	FR-223	5.3E-15	9.5E-19	8.2E-19	1.8E-18
ENE	2600	PA-231	6.8E-13	1.2E-16	1.2E-16	2.4E-16
ENE	2600	PA-234	2.0E-15	3.7E-19	3.5E-19	7.2E-19
ENE	2600	PA-234M	4.5E-15	8.1E-19	5.3E-19	1.3E-18
ENE	2600	PB-210	3.8E-12	6.8E-16	6.5E-16	1.3E-15
ENE	2600	PO-210	3.8E-12	6.8E-16	6.5E-16	1.3E-15
ENE	2600	RA-223	1.0E-12	1.8E-16	1.7E-16	3.5E-16
ENE	2600	RA-224	4.0E-13	7.2E-17	6.8E-17	1.4E-16
ENE	2600	RA-226	4.2E-12	7.6E-16	7.2E-16	1.5E-15
ENE	2600	RA-228	4.4E-13	7.9E-17	7.5E-17	1.5E-16
ENE	2600	TH-227	1.0E-13	1.8E-17	1.7E-17	3.5E-17
ENE	2600	TH-228	8.1E-13	1.5E-16	1.4E-16	2.9E-16
ENE	2600	TH-230	6.5E-11	1.2E-14	1.1E-14	2.3E-14
ENE	2600	TH-231	1.3E-13	2.3E-17	2.1E-17	4.4E-17
ENE	2600	TH-232	9.2E-13	1.6E-16	1.6E-16	3.2E-16
ENE	2600	TH-234	1.9E-12	3.5E-16	3.3E-16	6.8E-16
ENE	2600	U-234	1.9E-12	3.4E-16	3.2E-16	6.6E-16
ENE	2600	U-235	1.3E-13	2.3E-17	2.2E-17	4.5E-17
ENE	2600	U-236	1.3E-13	2.3E-17	2.2E-17	4.5E-17
ENE	2600	U-238	1.9E-12	3.5E-16	3.3E-16	6.8E-16
ENE	2700	RN-222	5.6E-04	0.0E+00	0.0E+00	0.0E+00
ENE	2700	AC-227	9.8E-13	1.8E-16	1.7E-16	3.4E-16
ENE	2700	AC-228	4.0E-13	7.2E-17	6.8E-17	1.4E-16
ENE	2700	BI-210	3.7E-12	6.6E-16	6.2E-16	1.3E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
ENE	2700	FR-223	4.9E-15	8.9E-19	7.6E-19	1.6E-18
ENE	2700	PA-231	6.6E-13	1.2E-16	1.1E-16	2.3E-16
ENE	2700	PA-234	2.0E-15	3.6E-19	3.3E-19	6.9E-19
ENE	2700	PA-234M	3.6E-15	6.5E-19	4.3E-19	1.1E-18
ENE	2700	PB-210	3.7E-12	6.6E-16	6.2E-16	1.3E-15
ENE	2700	PO-210	3.7E-12	6.6E-16	6.2E-16	1.3E-15
ENE	2700	RA-223	9.8E-13	1.8E-16	1.7E-16	3.4E-16
ENE	2700	RA-224	3.9E-13	7.0E-17	6.6E-17	1.4E-16
ENE	2700	RA-226	4.1E-12	7.3E-16	6.9E-16	1.4E-15
ENE	2700	RA-228	4.3E-13	7.7E-17	7.3E-17	1.5E-16
ENE	2700	TH-227	9.7E-14	1.7E-17	1.6E-17	3.4E-17
ENE	2700	TH-228	7.9E-13	1.4E-16	1.3E-16	2.8E-16
ENE	2700	TH-230	6.4E-11	1.1E-14	1.1E-14	2.2E-14
ENE	2700	TH-231	1.2E-13	2.2E-17	2.1E-17	4.2E-17
ENE	2700	TH-232	8.9E-13	1.6E-16	1.5E-16	3.1E-16
ENE	2700	TH-234	1.9E-12	3.4E-16	3.2E-16	6.6E-16
ENE	2700	U-234	1.8E-12	3.3E-16	3.1E-16	6.4E-16
ENE	2700	U-235	1.2E-13	2.2E-17	2.1E-17	4.3E-17
ENE	2700	U-236	1.2E-13	2.2E-17	2.1E-17	4.3E-17
ENE	2700	U-238	1.9E-12	3.4E-16	3.2E-16	6.6E-16
ENE	3500	RN-222	4.5E-04	0.0E+00	0.0E+00	0.0E+00
ENE	3500	AC-227	7.7E-13	1.4E-16	1.3E-16	2.6E-16
ENE	3500	AC-228	3.1E-13	5.6E-17	5.0E-17	1.1E-16
ENE	3500	BI-210	2.9E-12	5.2E-16	4.7E-16	1.0E-15
ENE	3500	FR-223	2.9E-15	5.2E-19	4.4E-19	9.6E-19
ENE	3500	PA-231	5.2E-13	9.4E-17	8.5E-17	1.8E-16
ENE	3500	PA-234	1.5E-15	2.8E-19	2.5E-19	5.2E-19
ENE	3500	PA-234M	7.0E-16	1.3E-19	8.7E-20	2.1E-19
ENE	3500	PB-210	2.9E-12	5.2E-16	4.7E-16	1.0E-15
ENE	3500	PO-210	2.9E-12	5.2E-16	4.7E-16	1.0E-15
ENE	3500	RA-223	7.7E-13	1.4E-16	1.3E-16	2.6E-16
ENE	3500	RA-224	3.1E-13	5.5E-17	5.0E-17	1.1E-16
ENE	3500	RA-226	3.2E-12	5.8E-16	5.3E-16	1.1E-15
ENE	3500	RA-228	3.4E-13	6.1E-17	5.5E-17	1.2E-16
ENE	3500	TH-227	7.7E-14	1.4E-17	1.3E-17	2.6E-17
ENE	3500	TH-228	6.2E-13	1.1E-16	1.0E-16	2.1E-16
ENE	3500	TH-230	5.0E-11	9.0E-15	8.2E-15	1.7E-14
ENE	3500	TH-231	9.5E-14	1.7E-17	1.6E-17	3.3E-17
ENE	3500	TH-232	7.0E-13	1.3E-16	1.1E-16	2.4E-16
ENE	3500	TH-234	1.5E-12	2.7E-16	2.4E-16	5.1E-16
ENE	3500	U-234	1.4E-12	2.6E-16	2.4E-16	5.0E-16
ENE	3500	U-235	9.7E-14	1.8E-17	1.6E-17	3.3E-17
ENE	3500	U-236	9.7E-14	1.8E-17	1.6E-17	3.3E-17
ENE	3500	U-238	1.5E-12	2.7E-16	2.4E-16	5.1E-16
NE	300	RN-222	8.5E-04	0.0E+00	0.0E+00	0.0E+00
NE	300	AC-227	1.5E-12	2.8E-16	1.5E-15	1.8E-15
NE	300	AC-228	6.8E-13	1.2E-16	6.5E-16	7.8E-16

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	300	BI-210	5.8E-12	1.0E-15	5.6E-15	6.7E-15
NE	300	FR-223	2.0E-14	3.6E-18	1.9E-17	2.2E-17
NE	300	PA-231	1.0E-12	1.9E-16	1.0E-15	1.2E-15
NE	300	PA-234	3.3E-15	6.0E-19	3.2E-18	3.8E-18
NE	300	PA-234M	1.1E-12	1.9E-16	5.4E-16	7.3E-16
NE	300	PB-210	5.8E-12	1.0E-15	5.6E-15	6.7E-15
NE	300	PO-210	5.8E-12	1.0E-15	5.6E-15	6.7E-15
NE	300	RA-223	1.5E-12	2.8E-16	1.5E-15	1.8E-15
NE	300	RA-224	6.1E-13	1.1E-16	5.9E-16	7.1E-16
NE	300	RA-226	6.4E-12	1.2E-15	6.3E-15	7.4E-15
NE	300	RA-228	6.8E-13	1.2E-16	6.6E-16	7.8E-16
NE	300	TH-227	1.5E-13	2.8E-17	1.5E-16	1.8E-16
NE	300	TH-228	1.2E-12	2.2E-16	1.2E-15	1.4E-15
NE	300	TH-230	1.0E-10	1.8E-14	9.8E-14	1.2E-13
NE	300	TH-231	1.9E-13	3.5E-17	1.9E-16	2.2E-16
NE	300	TH-232	1.4E-12	2.5E-16	1.4E-15	1.6E-15
NE	300	TH-234	3.0E-12	5.3E-16	2.9E-15	3.4E-15
NE	300	U-234	2.9E-12	5.2E-16	2.8E-15	3.3E-15
NE	300	U-235	2.0E-13	3.5E-17	1.9E-16	2.2E-16
NE	300	U-236	2.0E-13	3.5E-17	1.9E-16	2.2E-16
NE	300	U-238	3.0E-12	5.3E-16	2.9E-15	3.4E-15
NE	500	RN-222	8.7E-04	0.0E+00	0.0E+00	0.0E+00
NE	500	AC-227	1.6E-12	2.8E-16	9.0E-16	1.2E-15
NE	500	AC-228	6.8E-13	1.2E-16	3.9E-16	5.1E-16
NE	500	BI-210	5.9E-12	1.1E-15	3.4E-15	4.4E-15
NE	500	FR-223	1.9E-14	3.5E-18	1.0E-17	1.4E-17
NE	500	PA-231	1.1E-12	1.9E-16	6.1E-16	8.0E-16
NE	500	PA-234	3.4E-15	6.1E-19	1.9E-18	2.5E-18
NE	500	PA-234M	5.5E-13	1.0E-16	1.7E-16	2.7E-16
NE	500	PB-210	5.9E-12	1.1E-15	3.4E-15	4.4E-15
NE	500	PO-210	5.9E-12	1.1E-15	3.4E-15	4.4E-15
NE	500	RA-223	1.6E-12	2.8E-16	9.0E-16	1.2E-15
NE	500	RA-224	6.2E-13	1.1E-16	3.6E-16	4.7E-16
NE	500	RA-226	6.5E-12	1.2E-15	3.7E-15	4.9E-15
NE	500	RA-228	6.9E-13	1.2E-16	3.9E-16	5.2E-16
NE	500	TH-227	1.6E-13	2.8E-17	8.9E-17	1.2E-16
NE	500	TH-228	1.3E-12	2.3E-16	7.2E-16	9.5E-16
NE	500	TH-230	1.0E-10	1.8E-14	5.8E-14	7.7E-14
NE	500	TH-231	2.0E-13	3.6E-17	1.1E-16	1.5E-16
NE	500	TH-232	1.4E-12	2.6E-16	8.2E-16	1.1E-15
NE	500	TH-234	3.0E-12	5.4E-16	1.7E-15	2.3E-15
NE	500	U-234	2.9E-12	5.3E-16	1.7E-15	2.2E-15
NE	500	U-235	2.0E-13	3.6E-17	1.1E-16	1.5E-16
NE	500	U-236	2.0E-13	3.6E-17	1.1E-16	1.5E-16
NE	500	U-238	3.0E-12	5.4E-16	1.7E-15	2.3E-15
NE	700	RN-222	1.1E-03	0.0E+00	0.0E+00	0.0E+00
NE	700	AC-227	1.9E-12	3.4E-16	6.4E-16	9.8E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	700	AC-228	8.3E-13	1.5E-16	2.8E-16	4.3E-16
NE	700	BI-210	7.2E-12	1.3E-15	2.4E-15	3.7E-15
NE	700	FR-223	2.2E-14	3.9E-18	6.8E-18	1.1E-17
NE	700	PA-231	1.3E-12	2.3E-16	4.3E-16	6.7E-16
NE	700	PA-234	4.1E-15	7.3E-19	1.4E-18	2.1E-18
NE	700	PA-234M	3.6E-13	6.5E-17	7.5E-17	1.4E-16
NE	700	PB-210	7.2E-12	1.3E-15	2.4E-15	3.7E-15
NE	700	PO-210	7.2E-12	1.3E-15	2.4E-15	3.7E-15
NE	700	RA-223	1.9E-12	3.4E-16	6.4E-16	9.8E-16
NE	700	RA-224	7.6E-13	1.4E-16	2.5E-16	3.9E-16
NE	700	RA-226	8.0E-12	1.4E-15	2.7E-15	4.1E-15
NE	700	RA-228	8.4E-13	1.5E-16	2.8E-16	4.3E-16
NE	700	TH-227	1.9E-13	3.4E-17	6.4E-17	9.8E-17
NE	700	TH-228	1.5E-12	2.8E-16	5.2E-16	7.9E-16
NE	700	TH-230	1.2E-10	2.2E-14	4.2E-14	6.4E-14
NE	700	TH-231	2.4E-13	4.3E-17	8.1E-17	1.2E-16
NE	700	TH-232	1.7E-12	3.1E-16	5.8E-16	9.0E-16
NE	700	TH-234	3.7E-12	6.6E-16	1.2E-15	1.9E-15
NE	700	U-234	3.6E-12	6.4E-16	1.2E-15	1.8E-15
NE	700	U-235	2.4E-13	4.3E-17	8.1E-17	1.2E-16
NE	700	U-236	2.4E-13	4.3E-17	8.1E-17	1.2E-16
NE	700	U-238	3.7E-12	6.6E-16	1.2E-15	1.9E-15
NE	1000	RN-222	1.2E-03	0.0E+00	0.0E+00	0.0E+00
NE	1000	AC-227	2.2E-12	3.9E-16	4.5E-16	8.4E-16
NE	1000	AC-228	9.3E-13	1.7E-16	1.9E-16	3.6E-16
NE	1000	BI-210	8.1E-12	1.5E-15	1.7E-15	3.1E-15
NE	1000	FR-223	2.2E-14	4.0E-18	4.3E-18	8.2E-18
NE	1000	PA-231	1.5E-12	2.6E-16	3.0E-16	5.7E-16
NE	1000	PA-234	4.6E-15	8.2E-19	9.4E-19	1.8E-18
NE	1000	PA-234M	1.9E-13	3.5E-17	2.7E-17	6.2E-17
NE	1000	PB-210	8.1E-12	1.5E-15	1.7E-15	3.1E-15
NE	1000	PO-210	8.1E-12	1.5E-15	1.7E-15	3.1E-15
NE	1000	RA-223	2.2E-12	3.9E-16	4.5E-16	8.4E-16
NE	1000	RA-224	8.6E-13	1.5E-16	1.8E-16	3.3E-16
NE	1000	RA-226	9.0E-12	1.6E-15	1.9E-15	3.5E-15
NE	1000	RA-228	9.5E-13	1.7E-16	2.0E-16	3.7E-16
NE	1000	TH-227	2.1E-13	3.9E-17	4.4E-17	8.3E-17
NE	1000	TH-228	1.7E-12	3.1E-16	3.6E-16	6.7E-16
NE	1000	TH-230	1.4E-10	2.5E-14	2.9E-14	5.4E-14
NE	1000	TH-231	2.7E-13	4.9E-17	5.6E-17	1.0E-16
NE	1000	TH-232	2.0E-12	3.5E-16	4.1E-16	7.6E-16
NE	1000	TH-234	4.1E-12	7.5E-16	8.6E-16	1.6E-15
NE	1000	U-234	4.0E-12	7.3E-16	8.4E-16	1.6E-15
NE	1000	U-235	2.7E-13	4.9E-17	5.6E-17	1.1E-16
NE	1000	U-236	2.7E-13	4.9E-17	5.6E-17	1.1E-16
NE	1000	U-238	4.1E-12	7.5E-16	8.6E-16	1.6E-15
NE	1300	RN-222	1.1E-03	0.0E+00	0.0E+00	0.0E+00

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	1300	AC-227	1.9E-12	3.5E-16	3.4E-16	6.9E-16
NE	1300	AC-228	8.3E-13	1.5E-16	1.5E-16	2.9E-16
NE	1300	BI-210	7.3E-12	1.3E-15	1.3E-15	2.6E-15
NE	1300	FR-223	1.8E-14	3.2E-18	2.9E-18	6.2E-18
NE	1300	PA-231	1.3E-12	2.4E-16	2.3E-16	4.7E-16
NE	1300	PA-234	4.1E-15	7.3E-19	7.2E-19	1.5E-18
NE	1300	PA-234M	9.4E-14	1.7E-17	1.2E-17	2.9E-17
NE	1300	PB-210	7.3E-12	1.3E-15	1.3E-15	2.6E-15
NE	1300	PO-210	7.3E-12	1.3E-15	1.3E-15	2.6E-15
NE	1300	RA-223	1.9E-12	3.5E-16	3.4E-16	6.9E-16
NE	1300	RA-224	7.7E-13	1.4E-16	1.4E-16	2.7E-16
NE	1300	RA-226	8.1E-12	1.5E-15	1.4E-15	2.9E-15
NE	1300	RA-228	8.5E-13	1.5E-16	1.5E-16	3.0E-16
NE	1300	TH-227	1.9E-13	3.5E-17	3.4E-17	6.9E-17
NE	1300	TH-228	1.6E-12	2.8E-16	2.8E-16	5.6E-16
NE	1300	TH-230	1.3E-10	2.3E-14	2.2E-14	4.5E-14
NE	1300	TH-231	2.4E-13	4.4E-17	4.3E-17	8.7E-17
NE	1300	TH-232	1.8E-12	3.2E-16	3.1E-16	6.3E-16
NE	1300	TH-234	3.7E-12	6.7E-16	6.6E-16	1.3E-15
NE	1300	U-234	3.6E-12	6.5E-16	6.4E-16	1.3E-15
NE	1300	U-235	2.4E-13	4.4E-17	4.3E-17	8.7E-17
NE	1300	U-236	2.4E-13	4.4E-17	4.3E-17	8.7E-17
NE	1300	U-238	3.7E-12	6.7E-16	6.6E-16	1.3E-15
NE	1500	RN-222	9.9E-04	0.0E+00	0.0E+00	0.0E+00
NE	1500	AC-227	1.8E-12	3.2E-16	3.0E-16	6.1E-16
NE	1500	AC-228	7.5E-13	1.4E-16	1.3E-16	2.6E-16
NE	1500	BI-210	6.6E-12	1.2E-15	1.1E-15	2.3E-15
NE	1500	FR-223	1.5E-14	2.8E-18	2.4E-18	5.1E-18
NE	1500	PA-231	1.2E-12	2.2E-16	2.0E-16	4.2E-16
NE	1500	PA-234	3.7E-15	6.7E-19	6.2E-19	1.3E-18
NE	1500	PA-234M	5.9E-14	1.1E-17	7.0E-18	1.8E-17
NE	1500	PB-210	6.6E-12	1.2E-15	1.1E-15	2.3E-15
NE	1500	PO-210	6.6E-12	1.2E-15	1.1E-15	2.3E-15
NE	1500	RA-223	1.8E-12	3.2E-16	3.0E-16	6.1E-16
NE	1500	RA-224	7.0E-13	1.3E-16	1.2E-16	2.4E-16
NE	1500	RA-226	7.4E-12	1.3E-15	1.2E-15	2.6E-15
NE	1500	RA-228	7.7E-13	1.4E-16	1.3E-16	2.7E-16
NE	1500	TH-227	1.8E-13	3.2E-17	2.9E-17	6.1E-17
NE	1500	TH-228	1.4E-12	2.6E-16	2.4E-16	4.9E-16
NE	1500	TH-230	1.1E-10	2.1E-14	1.9E-14	4.0E-14
NE	1500	TH-231	2.2E-13	4.0E-17	3.7E-17	7.7E-17
NE	1500	TH-232	1.6E-12	2.9E-16	2.7E-16	5.6E-16
NE	1500	TH-234	3.4E-12	6.1E-16	5.7E-16	1.2E-15
NE	1500	U-234	3.3E-12	6.0E-16	5.5E-16	1.1E-15
NE	1500	U-235	2.2E-13	4.0E-17	3.7E-17	7.8E-17
NE	1500	U-236	2.2E-13	4.0E-17	3.7E-17	7.8E-17
NE	1500	U-238	3.4E-12	6.1E-16	5.7E-16	1.2E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	1700	RN-222	9.1E-04	0.0E+00	0.0E+00	0.0E+00
NE	1700	AC-227	1.6E-12	2.9E-16	2.6E-16	5.5E-16
NE	1700	AC-228	6.8E-13	1.2E-16	1.1E-16	2.3E-16
NE	1700	BI-210	6.1E-12	1.1E-15	9.8E-16	2.1E-15
NE	1700	FR-223	1.3E-14	2.4E-18	1.9E-18	4.3E-18
NE	1700	PA-231	1.1E-12	2.0E-16	1.8E-16	3.7E-16
NE	1700	PA-234	3.4E-15	6.1E-19	5.4E-19	1.1E-18
NE	1700	PA-234M	3.8E-14	6.8E-18	4.3E-18	1.1E-17
NE	1700	PB-210	6.1E-12	1.1E-15	9.8E-16	2.1E-15
NE	1700	PO-210	6.1E-12	1.1E-15	9.8E-16	2.1E-15
NE	1700	RA-223	1.6E-12	2.9E-16	2.6E-16	5.5E-16
NE	1700	RA-224	6.4E-13	1.2E-16	1.0E-16	2.2E-16
NE	1700	RA-226	6.7E-12	1.2E-15	1.1E-15	2.3E-15
NE	1700	RA-228	7.1E-13	1.3E-16	1.1E-16	2.4E-16
NE	1700	TH-227	1.6E-13	2.9E-17	2.6E-17	5.5E-17
NE	1700	TH-228	1.3E-12	2.3E-16	2.1E-16	4.4E-16
NE	1700	TH-230	1.0E-10	1.9E-14	1.7E-14	3.6E-14
NE	1700	TH-231	2.0E-13	3.6E-17	3.3E-17	6.9E-17
NE	1700	TH-232	1.5E-12	2.6E-16	2.4E-16	5.0E-16
NE	1700	TH-234	3.1E-12	5.6E-16	5.0E-16	1.1E-15
NE	1700	U-234	3.0E-12	5.4E-16	4.9E-16	1.0E-15
NE	1700	U-235	2.0E-13	3.7E-17	3.3E-17	7.0E-17
NE	1700	U-236	2.0E-13	3.7E-17	3.3E-17	7.0E-17
NE	1700	U-238	3.1E-12	5.6E-16	5.0E-16	1.1E-15
NE	2000	RN-222	8.0E-04	0.0E+00	0.0E+00	0.0E+00
NE	2000	AC-227	1.4E-12	2.5E-16	2.2E-16	4.7E-16
NE	2000	AC-228	6.0E-13	1.1E-16	9.2E-17	2.0E-16
NE	2000	BI-210	5.3E-12	9.6E-16	8.3E-16	1.8E-15
NE	2000	FR-223	1.0E-14	1.9E-18	1.5E-18	3.4E-18
NE	2000	PA-231	9.6E-13	1.7E-16	1.5E-16	3.2E-16
NE	2000	PA-234	2.9E-15	5.3E-19	4.5E-19	9.8E-19
NE	2000	PA-234M	1.9E-14	3.5E-18	2.2E-18	5.6E-18
NE	2000	PB-210	5.3E-12	9.6E-16	8.3E-16	1.8E-15
NE	2000	PO-210	5.3E-12	9.6E-16	8.3E-16	1.8E-15
NE	2000	RA-223	1.4E-12	2.5E-16	2.2E-16	4.7E-16
NE	2000	RA-224	5.6E-13	1.0E-16	8.7E-17	1.9E-16
NE	2000	RA-226	5.9E-12	1.1E-15	9.2E-16	2.0E-15
NE	2000	RA-228	6.2E-13	1.1E-16	9.6E-17	2.1E-16
NE	2000	TH-227	1.4E-13	2.5E-17	2.2E-17	4.7E-17
NE	2000	TH-228	1.1E-12	2.1E-16	1.8E-16	3.8E-16
NE	2000	TH-230	9.2E-11	1.7E-14	1.4E-14	3.1E-14
NE	2000	TH-231	1.8E-13	3.2E-17	2.7E-17	5.9E-17
NE	2000	TH-232	1.3E-12	2.3E-16	2.0E-16	4.3E-16
NE	2000	TH-234	2.7E-12	4.9E-16	4.2E-16	9.1E-16
NE	2000	U-234	2.7E-12	4.8E-16	4.1E-16	8.9E-16
NE	2000	U-235	1.8E-13	3.2E-17	2.8E-17	6.0E-17
NE	2000	U-236	1.8E-13	3.2E-17	2.8E-17	6.0E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	2000	U-238	2.7E-12	4.9E-16	4.2E-16	9.1E-16
NE	2300	RN-222	7.1E-04	0.0E+00	0.0E+00	0.0E+00
NE	2300	AC-227	1.3E-12	2.3E-16	1.9E-16	4.2E-16
NE	2300	AC-228	5.3E-13	9.5E-17	7.9E-17	1.7E-16
NE	2300	BI-210	4.7E-12	8.5E-16	7.2E-16	1.6E-15
NE	2300	FR-223	8.4E-15	1.5E-18	1.2E-18	2.7E-18
NE	2300	PA-231	8.5E-13	1.5E-16	1.3E-16	2.8E-16
NE	2300	PA-234	2.6E-15	4.7E-19	3.9E-19	8.6E-19
NE	2300	PA-234M	1.0E-14	1.8E-18	1.1E-18	2.9E-18
NE	2300	PB-210	4.7E-12	8.5E-16	7.2E-16	1.6E-15
NE	2300	PO-210	4.7E-12	8.5E-16	7.2E-16	1.6E-15
NE	2300	RA-223	1.3E-12	2.3E-16	1.9E-16	4.2E-16
NE	2300	RA-224	5.0E-13	9.0E-17	7.5E-17	1.7E-16
NE	2300	RA-226	5.2E-12	9.4E-16	7.9E-16	1.7E-15
NE	2300	RA-228	5.5E-13	9.9E-17	8.3E-17	1.8E-16
NE	2300	TH-227	1.2E-13	2.2E-17	1.9E-17	4.1E-17
NE	2300	TH-228	1.0E-12	1.8E-16	1.5E-16	3.4E-16
NE	2300	TH-230	8.2E-11	1.5E-14	1.2E-14	2.7E-14
NE	2300	TH-231	1.6E-13	2.8E-17	2.4E-17	5.2E-17
NE	2300	TH-232	1.1E-12	2.1E-16	1.7E-16	3.8E-16
NE	2300	TH-234	2.4E-12	4.3E-16	3.7E-16	8.0E-16
NE	2300	U-234	2.4E-12	4.2E-16	3.6E-16	7.8E-16
NE	2300	U-235	1.6E-13	2.9E-17	2.4E-17	5.3E-17
NE	2300	U-236	1.6E-13	2.9E-17	2.4E-17	5.3E-17
NE	2300	U-238	2.4E-12	4.3E-16	3.7E-16	8.0E-16
NE	2400	RN-222	6.9E-04	0.0E+00	0.0E+00	0.0E+00
NE	2400	AC-227	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NE	2400	AC-228	5.0E-13	9.1E-17	7.6E-17	1.7E-16
NE	2400	BI-210	4.5E-12	8.2E-16	6.8E-16	1.5E-15
NE	2400	FR-223	7.8E-15	1.4E-18	1.1E-18	2.5E-18
NE	2400	PA-231	8.2E-13	1.5E-16	1.2E-16	2.7E-16
NE	2400	PA-234	2.5E-15	4.5E-19	3.7E-19	8.2E-19
NE	2400	PA-234M	8.1E-15	1.5E-18	9.1E-19	2.4E-18
NE	2400	PB-210	4.5E-12	8.2E-16	6.8E-16	1.5E-15
NE	2400	PO-210	4.5E-12	8.2E-16	6.8E-16	1.5E-15
NE	2400	RA-223	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NE	2400	RA-224	4.8E-13	8.6E-17	7.2E-17	1.6E-16
NE	2400	RA-226	5.0E-12	9.1E-16	7.6E-16	1.7E-15
NE	2400	RA-228	5.3E-13	9.5E-17	8.0E-17	1.8E-16
NE	2400	TH-227	1.2E-13	2.2E-17	1.8E-17	4.0E-17
NE	2400	TH-228	9.7E-13	1.8E-16	1.5E-16	3.2E-16
NE	2400	TH-230	7.9E-11	1.4E-14	1.2E-14	2.6E-14
NE	2400	TH-231	1.5E-13	2.7E-17	2.3E-17	5.0E-17
NE	2400	TH-232	1.1E-12	2.0E-16	1.7E-16	3.6E-16
NE	2400	TH-234	2.3E-12	4.2E-16	3.5E-16	7.7E-16
NE	2400	U-234	2.3E-12	4.1E-16	3.4E-16	7.5E-16
NE	2400	U-235	1.5E-13	2.7E-17	2.3E-17	5.0E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	2400	U-236	1.5E-13	2.7E-17	2.3E-17	5.0E-17
NE	2400	U-238	2.3E-12	4.2E-16	3.5E-16	7.7E-16
NE	2600	RN-222	6.4E-04	0.0E+00	0.0E+00	0.0E+00
NE	2600	AC-227	1.1E-12	2.0E-16	1.7E-16	3.7E-16
NE	2600	AC-228	4.7E-13	8.4E-17	6.9E-17	1.5E-16
NE	2600	BI-210	4.2E-12	7.6E-16	6.3E-16	1.4E-15
NE	2600	FR-223	6.8E-15	1.2E-18	9.4E-19	2.2E-18
NE	2600	PA-231	7.6E-13	1.4E-16	1.1E-16	2.5E-16
NE	2600	PA-234	2.3E-15	4.1E-19	3.4E-19	7.6E-19
NE	2600	PA-234M	5.3E-15	9.5E-19	6.0E-19	1.5E-18
NE	2600	PB-210	4.2E-12	7.6E-16	6.3E-16	1.4E-15
NE	2600	PO-210	4.2E-12	7.6E-16	6.3E-16	1.4E-15
NE	2600	RA-223	1.1E-12	2.0E-16	1.7E-16	3.7E-16
NE	2600	RA-224	4.5E-13	8.0E-17	6.6E-17	1.5E-16
NE	2600	RA-226	4.7E-12	8.5E-16	7.0E-16	1.5E-15
NE	2600	RA-228	4.9E-13	8.9E-17	7.3E-17	1.6E-16
NE	2600	TH-227	1.1E-13	2.0E-17	1.7E-17	3.7E-17
NE	2600	TH-228	9.1E-13	1.6E-16	1.3E-16	3.0E-16
NE	2600	TH-230	7.3E-11	1.3E-14	1.1E-14	2.4E-14
NE	2600	TH-231	1.4E-13	2.5E-17	2.1E-17	4.6E-17
NE	2600	TH-232	1.0E-12	1.8E-16	1.5E-16	3.4E-16
NE	2600	TH-234	2.2E-12	3.9E-16	3.2E-16	7.1E-16
NE	2600	U-234	2.1E-12	3.8E-16	3.1E-16	6.9E-16
NE	2600	U-235	1.4E-13	2.6E-17	2.1E-17	4.7E-17
NE	2600	U-236	1.4E-13	2.6E-17	2.1E-17	4.7E-17
NE	2600	U-238	2.2E-12	3.9E-16	3.2E-16	7.1E-16
NE	2700	RN-222	6.2E-04	0.0E+00	0.0E+00	0.0E+00
NE	2700	AC-227	1.1E-12	2.0E-16	1.6E-16	3.6E-16
NE	2700	AC-228	4.5E-13	8.1E-17	6.6E-17	1.5E-16
NE	2700	BI-210	4.1E-12	7.4E-16	6.1E-16	1.3E-15
NE	2700	FR-223	6.3E-15	1.1E-18	8.7E-19	2.0E-18
NE	2700	PA-231	7.4E-13	1.3E-16	1.1E-16	2.4E-16
NE	2700	PA-234	2.2E-15	4.0E-19	3.3E-19	7.3E-19
NE	2700	PA-234M	4.3E-15	7.7E-19	4.9E-19	1.3E-18
NE	2700	PB-210	4.1E-12	7.4E-16	6.1E-16	1.3E-15
NE	2700	PO-210	4.1E-12	7.4E-16	6.1E-16	1.3E-15
NE	2700	RA-223	1.1E-12	2.0E-16	1.6E-16	3.6E-16
NE	2700	RA-224	4.3E-13	7.8E-17	6.4E-17	1.4E-16
NE	2700	RA-226	4.5E-12	8.2E-16	6.7E-16	1.5E-15
NE	2700	RA-228	4.8E-13	8.6E-17	7.0E-17	1.6E-16
NE	2700	TH-227	1.1E-13	1.9E-17	1.6E-17	3.5E-17
NE	2700	TH-228	8.8E-13	1.6E-16	1.3E-16	2.9E-16
NE	2700	TH-230	7.1E-11	1.3E-14	1.0E-14	2.3E-14
NE	2700	TH-231	1.4E-13	2.4E-17	2.0E-17	4.4E-17
NE	2700	TH-232	9.9E-13	1.8E-16	1.5E-16	3.2E-16
NE	2700	TH-234	2.1E-12	3.8E-16	3.1E-16	6.8E-16
NE	2700	U-234	2.0E-12	3.7E-16	3.0E-16	6.7E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NE	2700	U-235	1.4E-13	2.5E-17	2.0E-17	4.5E-17
NE	2700	U-236	1.4E-13	2.5E-17	2.0E-17	4.5E-17
NE	2700	U-238	2.1E-12	3.8E-16	3.1E-16	6.8E-16
NE	3500	RN-222	4.8E-04	0.0E+00	0.0E+00	0.0E+00
NE	3500	AC-227	8.4E-13	1.5E-16	1.2E-16	2.7E-16
NE	3500	AC-228	3.4E-13	6.1E-17	5.0E-17	1.1E-16
NE	3500	BI-210	3.1E-12	5.7E-16	4.6E-16	1.0E-15
NE	3500	FR-223	3.8E-15	6.8E-19	5.3E-19	1.2E-18
NE	3500	PA-231	5.7E-13	1.0E-16	8.3E-17	1.8E-16
NE	3500	PA-234	1.7E-15	3.0E-19	2.4E-19	5.5E-19
NE	3500	PA-234M	8.2E-16	1.5E-19	9.8E-20	2.5E-19
NE	3500	PB-210	3.1E-12	5.7E-16	4.6E-16	1.0E-15
NE	3500	PO-210	3.1E-12	5.7E-16	4.6E-16	1.0E-15
NE	3500	RA-223	8.4E-13	1.5E-16	1.2E-16	2.7E-16
NE	3500	RA-224	3.3E-13	6.0E-17	4.9E-17	1.1E-16
NE	3500	RA-226	3.5E-12	6.3E-16	5.1E-16	1.1E-15
NE	3500	RA-228	3.7E-13	6.6E-17	5.4E-17	1.2E-16
NE	3500	TH-227	8.3E-14	1.5E-17	1.2E-17	2.7E-17
NE	3500	TH-228	6.7E-13	1.2E-16	9.9E-17	2.2E-16
NE	3500	TH-230	5.4E-11	9.8E-15	8.0E-15	1.8E-14
NE	3500	TH-231	1.0E-13	1.9E-17	1.5E-17	3.4E-17
NE	3500	TH-232	7.6E-13	1.4E-16	1.1E-16	2.5E-16
NE	3500	TH-234	1.6E-12	2.9E-16	2.4E-16	5.2E-16
NE	3500	U-234	1.6E-12	2.8E-16	2.3E-16	5.1E-16
NE	3500	U-235	1.1E-13	1.9E-17	1.5E-17	3.4E-17
NE	3500	U-236	1.1E-13	1.9E-17	1.5E-17	3.4E-17
NE	3500	U-238	1.6E-12	2.9E-16	2.4E-16	5.2E-16
NNE	300	RN-222	6.7E-04	0.0E+00	0.0E+00	0.0E+00
NNE	300	AC-227	1.2E-12	2.2E-16	1.0E-15	1.3E-15
NNE	300	AC-228	5.3E-13	9.5E-17	4.6E-16	5.5E-16
NNE	300	BI-210	4.6E-12	8.2E-16	3.9E-15	4.8E-15
NNE	300	FR-223	1.6E-14	2.9E-18	1.3E-17	1.6E-17
NNE	300	PA-231	8.2E-13	1.5E-16	7.1E-16	8.6E-16
NNE	300	PA-234	2.6E-15	4.7E-19	2.2E-18	2.7E-18
NNE	300	PA-234M	8.3E-13	1.5E-16	4.5E-16	6.0E-16
NNE	300	PB-210	4.6E-12	8.2E-16	3.9E-15	4.8E-15
NNE	300	PO-210	4.6E-12	8.2E-16	3.9E-15	4.8E-15
NNE	300	RA-223	1.2E-12	2.2E-16	1.0E-15	1.3E-15
NNE	300	RA-224	4.8E-13	8.6E-17	4.2E-16	5.0E-16
NNE	300	RA-226	5.1E-12	9.1E-16	4.4E-15	5.3E-15
NNE	300	RA-228	5.3E-13	9.5E-17	4.6E-16	5.5E-16
NNE	300	TH-227	1.2E-13	2.2E-17	1.0E-16	1.3E-16
NNE	300	TH-228	9.8E-13	1.8E-16	8.5E-16	1.0E-15
NNE	300	TH-230	7.9E-11	1.4E-14	6.8E-14	8.2E-14
NNE	300	TH-231	1.5E-13	2.8E-17	1.3E-16	1.6E-16
NNE	300	TH-232	1.1E-12	2.0E-16	9.5E-16	1.2E-15
NNE	300	TH-234	2.3E-12	4.2E-16	2.0E-15	2.4E-15

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	300	U-234	2.3E-12	4.1E-16	2.0E-15	2.4E-15
NNE	300	U-235	1.5E-13	2.8E-17	1.3E-16	1.6E-16
NNE	300	U-236	1.5E-13	2.8E-17	1.3E-16	1.6E-16
NNE	300	U-238	2.3E-12	4.2E-16	2.0E-15	2.4E-15
NNE	500	RN-222	7.0E-04	0.0E+00	0.0E+00	0.0E+00
NNE	500	AC-227	1.3E-12	2.3E-16	6.3E-16	8.6E-16
NNE	500	AC-228	5.6E-13	1.0E-16	2.7E-16	3.7E-16
NNE	500	BI-210	4.8E-12	8.6E-16	2.4E-15	3.2E-15
NNE	500	FR-223	1.6E-14	2.8E-18	7.3E-18	1.0E-17
NNE	500	PA-231	8.6E-13	1.6E-16	4.3E-16	5.8E-16
NNE	500	PA-234	2.7E-15	4.9E-19	1.3E-18	1.8E-18
NNE	500	PA-234M	4.7E-13	8.4E-17	1.5E-16	2.4E-16
NNE	500	PB-210	4.8E-12	8.6E-16	2.4E-15	3.2E-15
NNE	500	PO-210	4.8E-12	8.6E-16	2.4E-15	3.2E-15
NNE	500	RA-223	1.3E-12	2.3E-16	6.3E-16	8.6E-16
NNE	500	RA-224	5.0E-13	9.1E-17	2.5E-16	3.4E-16
NNE	500	RA-226	5.3E-12	9.6E-16	2.6E-15	3.6E-15
NNE	500	RA-228	5.6E-13	1.0E-16	2.8E-16	3.8E-16
NNE	500	TH-227	1.3E-13	2.3E-17	6.2E-17	8.5E-17
NNE	500	TH-228	1.0E-12	1.8E-16	5.1E-16	6.9E-16
NNE	500	TH-230	8.3E-11	1.5E-14	4.1E-14	5.6E-14
NNE	500	TH-231	1.6E-13	2.9E-17	7.9E-17	1.1E-16
NNE	500	TH-232	1.2E-12	2.1E-16	5.7E-16	7.8E-16
NNE	500	TH-234	2.4E-12	4.4E-16	1.2E-15	1.6E-15
NNE	500	U-234	2.4E-12	4.3E-16	1.2E-15	1.6E-15
NNE	500	U-235	1.6E-13	2.9E-17	7.9E-17	1.1E-16
NNE	500	U-236	1.6E-13	2.9E-17	7.9E-17	1.1E-16
NNE	500	U-238	2.4E-12	4.4E-16	1.2E-15	1.6E-15
NNE	700	RN-222	8.6E-04	0.0E+00	0.0E+00	0.0E+00
NNE	700	AC-227	1.6E-12	2.8E-16	4.5E-16	7.3E-16
NNE	700	AC-228	6.8E-13	1.2E-16	1.9E-16	3.2E-16
NNE	700	BI-210	5.8E-12	1.1E-15	1.7E-15	2.7E-15
NNE	700	FR-223	1.8E-14	3.3E-18	4.8E-18	8.1E-18
NNE	700	PA-231	1.1E-12	1.9E-16	3.0E-16	4.9E-16
NNE	700	PA-234	3.3E-15	6.0E-19	9.5E-19	1.5E-18
NNE	700	PA-234M	3.2E-13	5.8E-17	6.8E-17	1.3E-16
NNE	700	PB-210	5.8E-12	1.1E-15	1.7E-15	2.7E-15
NNE	700	PO-210	5.8E-12	1.1E-15	1.7E-15	2.7E-15
NNE	700	RA-223	1.6E-12	2.8E-16	4.5E-16	7.3E-16
NNE	700	RA-224	6.2E-13	1.1E-16	1.8E-16	2.9E-16
NNE	700	RA-226	6.5E-12	1.2E-15	1.9E-15	3.0E-15
NNE	700	RA-228	6.8E-13	1.2E-16	2.0E-16	3.2E-16
NNE	700	TH-227	1.5E-13	2.8E-17	4.4E-17	7.2E-17
NNE	700	TH-228	1.3E-12	2.3E-16	3.6E-16	5.9E-16
NNE	700	TH-230	1.0E-10	1.8E-14	2.9E-14	4.7E-14
NNE	700	TH-231	2.0E-13	3.5E-17	5.6E-17	9.2E-17
NNE	700	TH-232	1.4E-12	2.5E-16	4.1E-16	6.6E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	700	TH-234	3.0E-12	5.4E-16	8.6E-16	1.4E-15
NNE	700	U-234	2.9E-12	5.2E-16	8.4E-16	1.4E-15
NNE	700	U-235	2.0E-13	3.5E-17	5.7E-17	9.2E-17
NNE	700	U-236	2.0E-13	3.5E-17	5.7E-17	9.2E-17
NNE	700	U-238	3.0E-12	5.4E-16	8.6E-16	1.4E-15
NNE	1000	RN-222	9.4E-04	0.0E+00	0.0E+00	0.0E+00
NNE	1000	AC-227	1.7E-12	3.1E-16	3.1E-16	6.2E-16
NNE	1000	AC-228	7.3E-13	1.3E-16	1.3E-16	2.7E-16
NNE	1000	BI-210	6.4E-12	1.1E-15	1.2E-15	2.3E-15
NNE	1000	FR-223	1.8E-14	3.2E-18	3.0E-18	6.3E-18
NNE	1000	PA-231	1.1E-12	2.1E-16	2.1E-16	4.2E-16
NNE	1000	PA-234	3.6E-15	6.5E-19	6.6E-19	1.3E-18
NNE	1000	PA-234M	1.7E-13	3.1E-17	2.5E-17	5.6E-17
NNE	1000	PB-210	6.4E-12	1.1E-15	1.2E-15	2.3E-15
NNE	1000	PO-210	6.4E-12	1.1E-15	1.2E-15	2.3E-15
NNE	1000	RA-223	1.7E-12	3.1E-16	3.1E-16	6.2E-16
NNE	1000	RA-224	6.7E-13	1.2E-16	1.2E-16	2.4E-16
NNE	1000	RA-226	7.1E-12	1.3E-15	1.3E-15	2.6E-15
NNE	1000	RA-228	7.4E-13	1.3E-16	1.4E-16	2.7E-16
NNE	1000	TH-227	1.7E-13	3.0E-17	3.1E-17	6.1E-17
NNE	1000	TH-228	1.4E-12	2.5E-16	2.5E-16	5.0E-16
NNE	1000	TH-230	1.1E-10	2.0E-14	2.0E-14	4.0E-14
NNE	1000	TH-231	2.1E-13	3.8E-17	3.9E-17	7.8E-17
NNE	1000	TH-232	1.5E-12	2.8E-16	2.8E-16	5.6E-16
NNE	1000	TH-234	3.3E-12	5.9E-16	6.0E-16	1.2E-15
NNE	1000	U-234	3.2E-12	5.7E-16	5.8E-16	1.2E-15
NNE	1000	U-235	2.1E-13	3.9E-17	3.9E-17	7.8E-17
NNE	1000	U-236	2.1E-13	3.9E-17	3.9E-17	7.8E-17
NNE	1000	U-238	3.3E-12	5.9E-16	6.0E-16	1.2E-15
NNE	1300	RN-222	8.3E-04	0.0E+00	0.0E+00	0.0E+00
NNE	1300	AC-227	1.5E-12	2.7E-16	2.4E-16	5.1E-16
NNE	1300	AC-228	6.4E-13	1.2E-16	1.0E-16	2.2E-16
NNE	1300	BI-210	5.6E-12	1.0E-15	9.0E-16	1.9E-15
NNE	1300	FR-223	1.4E-14	2.6E-18	2.1E-18	4.7E-18
NNE	1300	PA-231	1.0E-12	1.8E-16	1.6E-16	3.4E-16
NNE	1300	PA-234	3.1E-15	5.7E-19	5.0E-19	1.1E-18
NNE	1300	PA-234M	8.3E-14	1.5E-17	1.0E-17	2.5E-17
NNE	1300	PB-210	5.6E-12	1.0E-15	9.0E-16	1.9E-15
NNE	1300	PO-210	5.6E-12	1.0E-15	9.0E-16	1.9E-15
NNE	1300	RA-223	1.5E-12	2.7E-16	2.4E-16	5.1E-16
NNE	1300	RA-224	5.9E-13	1.1E-16	9.5E-17	2.0E-16
NNE	1300	RA-226	6.2E-12	1.1E-15	1.0E-15	2.1E-15
NNE	1300	RA-228	6.5E-13	1.2E-16	1.0E-16	2.2E-16
NNE	1300	TH-227	1.5E-13	2.7E-17	2.4E-17	5.0E-17
NNE	1300	TH-228	1.2E-12	2.2E-16	1.9E-16	4.1E-16
NNE	1300	TH-230	9.7E-11	1.7E-14	1.6E-14	3.3E-14
NNE	1300	TH-231	1.9E-13	3.4E-17	3.0E-17	6.4E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	1300	TH-232	1.4E-12	2.4E-16	2.2E-16	4.6E-16
NNE	1300	TH-234	2.9E-12	5.1E-16	4.6E-16	9.7E-16
NNE	1300	U-234	2.8E-12	5.0E-16	4.5E-16	9.5E-16
NNE	1300	U-235	1.9E-13	3.4E-17	3.0E-17	6.4E-17
NNE	1300	U-236	1.9E-13	3.4E-17	3.0E-17	6.4E-17
NNE	1300	U-238	2.9E-12	5.1E-16	4.6E-16	9.7E-16
NNE	1500	RN-222	7.5E-04	0.0E+00	0.0E+00	0.0E+00
NNE	1500	AC-227	1.3E-12	2.4E-16	2.1E-16	4.5E-16
NNE	1500	AC-228	5.8E-13	1.0E-16	8.8E-17	1.9E-16
NNE	1500	BI-210	5.1E-12	9.1E-16	7.8E-16	1.7E-15
NNE	1500	FR-223	1.2E-14	2.2E-18	1.7E-18	3.9E-18
NNE	1500	PA-231	9.1E-13	1.6E-16	1.4E-16	3.0E-16
NNE	1500	PA-234	2.8E-15	5.1E-19	4.3E-19	9.4E-19
NNE	1500	PA-234M	5.2E-14	9.3E-18	6.2E-18	1.6E-17
NNE	1500	PB-210	5.1E-12	9.1E-16	7.8E-16	1.7E-15
NNE	1500	PO-210	5.1E-12	9.1E-16	7.8E-16	1.7E-15
NNE	1500	RA-223	1.3E-12	2.4E-16	2.1E-16	4.5E-16
NNE	1500	RA-224	5.4E-13	9.6E-17	8.2E-17	1.8E-16
NNE	1500	RA-226	5.6E-12	1.0E-15	8.6E-16	1.9E-15
NNE	1500	RA-228	5.9E-13	1.1E-16	9.1E-17	2.0E-16
NNE	1500	TH-227	1.3E-13	2.4E-17	2.1E-17	4.5E-17
NNE	1500	TH-228	1.1E-12	2.0E-16	1.7E-16	3.6E-16
NNE	1500	TH-230	8.8E-11	1.6E-14	1.3E-14	2.9E-14
NNE	1500	TH-231	1.7E-13	3.0E-17	2.6E-17	5.6E-17
NNE	1500	TH-232	1.2E-12	2.2E-16	1.9E-16	4.1E-16
NNE	1500	TH-234	2.6E-12	4.7E-16	4.0E-16	8.6E-16
NNE	1500	U-234	2.5E-12	4.5E-16	3.9E-16	8.4E-16
NNE	1500	U-235	1.7E-13	3.1E-17	2.6E-17	5.7E-17
NNE	1500	U-236	1.7E-13	3.1E-17	2.6E-17	5.7E-17
NNE	1500	U-238	2.6E-12	4.7E-16	4.0E-16	8.6E-16
NNE	1700	RN-222	6.9E-04	0.0E+00	0.0E+00	0.0E+00
NNE	1700	AC-227	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NNE	1700	AC-228	5.2E-13	9.4E-17	7.7E-17	1.7E-16
NNE	1700	BI-210	4.6E-12	8.3E-16	6.8E-16	1.5E-15
NNE	1700	FR-223	1.1E-14	1.9E-18	1.4E-18	3.3E-18
NNE	1700	PA-231	8.3E-13	1.5E-16	1.2E-16	2.7E-16
NNE	1700	PA-234	2.6E-15	4.6E-19	3.8E-19	8.4E-19
NNE	1700	PA-234M	3.2E-14	5.8E-18	3.8E-18	9.6E-18
NNE	1700	PB-210	4.6E-12	8.3E-16	6.8E-16	1.5E-15
NNE	1700	PO-210	4.6E-12	8.3E-16	6.8E-16	1.5E-15
NNE	1700	RA-223	1.2E-12	2.2E-16	1.8E-16	4.0E-16
NNE	1700	RA-224	4.8E-13	8.7E-17	7.2E-17	1.6E-16
NNE	1700	RA-226	5.1E-12	9.2E-16	7.6E-16	1.7E-15
NNE	1700	RA-228	5.4E-13	9.6E-17	8.0E-17	1.8E-16
NNE	1700	TH-227	1.2E-13	2.2E-17	1.8E-17	4.0E-17
NNE	1700	TH-228	9.9E-13	1.8E-16	1.5E-16	3.2E-16
NNE	1700	TH-230	8.0E-11	1.4E-14	1.2E-14	2.6E-14

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	1700	TH-231	1.5E-13	2.8E-17	2.3E-17	5.0E-17
NNE	1700	TH-232	1.1E-12	2.0E-16	1.7E-16	3.7E-16
NNE	1700	TH-234	2.3E-12	4.2E-16	3.5E-16	7.7E-16
NNE	1700	U-234	2.3E-12	4.1E-16	3.4E-16	7.5E-16
NNE	1700	U-235	1.5E-13	2.8E-17	2.3E-17	5.1E-17
NNE	1700	U-236	1.5E-13	2.8E-17	2.3E-17	5.1E-17
NNE	1700	U-238	2.3E-12	4.2E-16	3.5E-16	7.7E-16
NNE	2000	RN-222	6.0E-04	0.0E+00	0.0E+00	0.0E+00
NNE	2000	AC-227	1.1E-12	1.9E-16	1.5E-16	3.4E-16
NNE	2000	AC-228	4.5E-13	8.1E-17	6.5E-17	1.5E-16
NNE	2000	BI-210	4.0E-12	7.2E-16	5.8E-16	1.3E-15
NNE	2000	FR-223	8.4E-15	1.5E-18	1.1E-18	2.6E-18
NNE	2000	PA-231	7.2E-13	1.3E-16	1.0E-16	2.3E-16
NNE	2000	PA-234	2.2E-15	4.0E-19	3.2E-19	7.2E-19
NNE	2000	PA-234M	1.6E-14	3.0E-18	1.9E-18	4.9E-18
NNE	2000	PB-210	4.0E-12	7.2E-16	5.8E-16	1.3E-15
NNE	2000	PO-210	4.0E-12	7.2E-16	5.8E-16	1.3E-15
NNE	2000	RA-223	1.1E-12	1.9E-16	1.5E-16	3.4E-16
NNE	2000	RA-224	4.2E-13	7.6E-17	6.1E-17	1.4E-16
NNE	2000	RA-226	4.4E-12	8.0E-16	6.4E-16	1.4E-15
NNE	2000	RA-228	4.7E-13	8.4E-17	6.7E-17	1.5E-16
NNE	2000	TH-227	1.1E-13	1.9E-17	1.5E-17	3.4E-17
NNE	2000	TH-228	8.6E-13	1.5E-16	1.2E-16	2.8E-16
NNE	2000	TH-230	6.9E-11	1.2E-14	1.0E-14	2.2E-14
NNE	2000	TH-231	1.3E-13	2.4E-17	1.9E-17	4.3E-17
NNE	2000	TH-232	9.7E-13	1.7E-16	1.4E-16	3.1E-16
NNE	2000	TH-234	2.0E-12	3.7E-16	3.0E-16	6.6E-16
NNE	2000	U-234	2.0E-12	3.6E-16	2.9E-16	6.5E-16
NNE	2000	U-235	1.3E-13	2.4E-17	1.9E-17	4.4E-17
NNE	2000	U-236	1.3E-13	2.4E-17	1.9E-17	4.4E-17
NNE	2000	U-238	2.0E-12	3.7E-16	3.0E-16	6.6E-16
NNE	2300	RN-222	5.3E-04	0.0E+00	0.0E+00	0.0E+00
NNE	2300	AC-227	9.3E-13	1.7E-16	1.3E-16	3.0E-16
NNE	2300	AC-228	3.9E-13	7.1E-17	5.6E-17	1.3E-16
NNE	2300	BI-210	3.5E-12	6.3E-16	5.0E-16	1.1E-15
NNE	2300	FR-223	6.8E-15	1.2E-18	8.7E-19	2.1E-18
NNE	2300	PA-231	6.3E-13	1.1E-16	9.0E-17	2.0E-16
NNE	2300	PA-234	1.9E-15	3.5E-19	2.7E-19	6.2E-19
NNE	2300	PA-234M	8.5E-15	1.5E-18	9.9E-19	2.5E-18
NNE	2300	PB-210	3.5E-12	6.3E-16	5.0E-16	1.1E-15
NNE	2300	PO-210	3.5E-12	6.3E-16	5.0E-16	1.1E-15
NNE	2300	RA-223	9.3E-13	1.7E-16	1.3E-16	3.0E-16
NNE	2300	RA-224	3.7E-13	6.7E-17	5.3E-17	1.2E-16
NNE	2300	RA-226	3.9E-12	7.0E-16	5.6E-16	1.3E-15
NNE	2300	RA-228	4.1E-13	7.4E-17	5.8E-17	1.3E-16
NNE	2300	TH-227	9.3E-14	1.7E-17	1.3E-17	3.0E-17
NNE	2300	TH-228	7.5E-13	1.4E-16	1.1E-16	2.4E-16

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	2300	TH-230	6.1E-11	1.1E-14	8.7E-15	2.0E-14
NNE	2300	TH-231	1.2E-13	2.1E-17	1.7E-17	3.8E-17
NNE	2300	TH-232	8.5E-13	1.5E-16	1.2E-16	2.7E-16
NNE	2300	TH-234	1.8E-12	3.2E-16	2.6E-16	5.8E-16
NNE	2300	U-234	1.7E-12	3.1E-16	2.5E-16	5.6E-16
NNE	2300	U-235	1.2E-13	2.1E-17	1.7E-17	3.8E-17
NNE	2300	U-236	1.2E-13	2.1E-17	1.7E-17	3.8E-17
NNE	2300	U-238	1.8E-12	3.2E-16	2.6E-16	5.8E-16
NNE	2400	RN-222	5.1E-04	0.0E+00	0.0E+00	0.0E+00
NNE	2400	AC-227	9.0E-13	1.6E-16	1.3E-16	2.9E-16
NNE	2400	AC-228	3.8E-13	6.8E-17	5.3E-17	1.2E-16
NNE	2400	BI-210	3.4E-12	6.1E-16	4.8E-16	1.1E-15
NNE	2400	FR-223	6.3E-15	1.1E-18	8.1E-19	1.9E-18
NNE	2400	PA-231	6.1E-13	1.1E-16	8.6E-17	2.0E-16
NNE	2400	PA-234	1.9E-15	3.3E-19	2.6E-19	5.9E-19
NNE	2400	PA-234M	6.9E-15	1.2E-18	8.0E-19	2.0E-18
NNE	2400	PB-210	3.4E-12	6.1E-16	4.8E-16	1.1E-15
NNE	2400	PO-210	3.4E-12	6.1E-16	4.8E-16	1.1E-15
NNE	2400	RA-223	9.0E-13	1.6E-16	1.3E-16	2.9E-16
NNE	2400	RA-224	3.6E-13	6.4E-17	5.1E-17	1.1E-16
NNE	2400	RA-226	3.7E-12	6.7E-16	5.3E-16	1.2E-15
NNE	2400	RA-228	3.9E-13	7.1E-17	5.6E-17	1.3E-16
NNE	2400	TH-227	8.9E-14	1.6E-17	1.3E-17	2.9E-17
NNE	2400	TH-228	7.2E-13	1.3E-16	1.0E-16	2.3E-16
NNE	2400	TH-230	5.8E-11	1.0E-14	8.3E-15	1.9E-14
NNE	2400	TH-231	1.1E-13	2.0E-17	1.6E-17	3.6E-17
NNE	2400	TH-232	8.1E-13	1.5E-16	1.2E-16	2.6E-16
NNE	2400	TH-234	1.7E-12	3.1E-16	2.4E-16	5.5E-16
NNE	2400	U-234	1.7E-12	3.0E-16	2.4E-16	5.4E-16
NNE	2400	U-235	1.1E-13	2.0E-17	1.6E-17	3.6E-17
NNE	2400	U-236	1.1E-13	2.0E-17	1.6E-17	3.6E-17
NNE	2400	U-238	1.7E-12	3.1E-16	2.4E-16	5.5E-16
NNE	2600	RN-222	4.7E-04	0.0E+00	0.0E+00	0.0E+00
NNE	2600	AC-227	8.3E-13	1.5E-16	1.2E-16	2.7E-16
NNE	2600	AC-228	3.5E-13	6.2E-17	4.9E-17	1.1E-16
NNE	2600	BI-210	3.1E-12	5.6E-16	4.4E-16	1.0E-15
NNE	2600	FR-223	5.5E-15	9.9E-19	7.1E-19	1.7E-18
NNE	2600	PA-231	5.6E-13	1.0E-16	7.9E-17	1.8E-16
NNE	2600	PA-234	1.7E-15	3.1E-19	2.4E-19	5.5E-19
NNE	2600	PA-234M	4.5E-15	8.1E-19	5.2E-19	1.3E-18
NNE	2600	PB-210	3.1E-12	5.6E-16	4.4E-16	1.0E-15
NNE	2600	PO-210	3.1E-12	5.6E-16	4.4E-16	1.0E-15
NNE	2600	RA-223	8.3E-13	1.5E-16	1.2E-16	2.7E-16
NNE	2600	RA-224	3.3E-13	5.9E-17	4.6E-17	1.1E-16
NNE	2600	RA-226	3.5E-12	6.2E-16	4.9E-16	1.1E-15
NNE	2600	RA-228	3.6E-13	6.5E-17	5.1E-17	1.2E-16
NNE	2600	TH-227	8.2E-14	1.5E-17	1.2E-17	2.6E-17

ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	2600	TH-228	6.7E-13	1.2E-16	9.4E-17	2.1E-16
NNE	2600	TH-230	5.4E-11	9.7E-15	7.6E-15	1.7E-14
NNE	2600	TH-231	1.0E-13	1.9E-17	1.5E-17	3.3E-17
NNE	2600	TH-232	7.5E-13	1.4E-16	1.1E-16	2.4E-16
NNE	2600	TH-234	1.6E-12	2.9E-16	2.3E-16	5.1E-16
NNE	2600	U-234	1.6E-12	2.8E-16	2.2E-16	5.0E-16
NNE	2600	U-235	1.0E-13	1.9E-17	1.5E-17	3.4E-17
NNE	2600	U-236	1.0E-13	1.9E-17	1.5E-17	3.4E-17
NNE	2600	U-238	1.6E-12	2.9E-16	2.3E-16	5.1E-16
NNE	2700	RN-222	4.6E-04	0.0E+00	0.0E+00	0.0E+00
NNE	2700	AC-227	8.0E-13	1.4E-16	1.1E-16	2.6E-16
NNE	2700	AC-228	3.3E-13	6.0E-17	4.7E-17	1.1E-16
NNE	2700	BI-210	3.0E-12	5.4E-16	4.2E-16	9.6E-16
NNE	2700	FR-223	5.1E-15	9.2E-19	6.6E-19	1.6E-18
NNE	2700	PA-231	5.4E-13	9.7E-17	7.6E-17	1.7E-16
NNE	2700	PA-234	1.6E-15	3.0E-19	2.3E-19	5.3E-19
NNE	2700	PA-234M	3.6E-15	6.5E-19	4.3E-19	1.1E-18
NNE	2700	PB-210	3.0E-12	5.4E-16	4.2E-16	9.6E-16
NNE	2700	PO-210	3.0E-12	5.4E-16	4.2E-16	9.6E-16
NNE	2700	RA-223	8.0E-13	1.4E-16	1.1E-16	2.6E-16
NNE	2700	RA-224	3.2E-13	5.7E-17	4.5E-17	1.0E-16
NNE	2700	RA-226	3.3E-12	6.0E-16	4.7E-16	1.1E-15
NNE	2700	RA-228	3.5E-13	6.3E-17	4.9E-17	1.1E-16
NNE	2700	TH-227	7.9E-14	1.4E-17	1.1E-17	2.5E-17
NNE	2700	TH-228	6.4E-13	1.2E-16	9.1E-17	2.1E-16
NNE	2700	TH-230	5.2E-11	9.4E-15	7.3E-15	1.7E-14
NNE	2700	TH-231	1.0E-13	1.8E-17	1.4E-17	3.2E-17
NNE	2700	TH-232	7.3E-13	1.3E-16	1.0E-16	2.3E-16
NNE	2700	TH-234	1.5E-12	2.8E-16	2.2E-16	4.9E-16
NNE	2700	U-234	1.5E-12	2.7E-16	2.1E-16	4.8E-16
NNE	2700	U-235	1.0E-13	1.8E-17	1.4E-17	3.2E-17
NNE	2700	U-236	1.0E-13	1.8E-17	1.4E-17	3.2E-17
NNE	2700	U-238	1.5E-12	2.8E-16	2.2E-16	4.9E-16
NNE	3500	RN-222	3.5E-04	0.0E+00	0.0E+00	0.0E+00
NNE	3500	AC-227	6.1E-13	1.1E-16	8.6E-17	1.9E-16
NNE	3500	AC-228	2.5E-13	4.5E-17	3.5E-17	7.9E-17
NNE	3500	BI-210	2.3E-12	4.1E-16	3.2E-16	7.3E-16
NNE	3500	FR-223	3.1E-15	5.6E-19	4.1E-19	9.7E-19
NNE	3500	PA-231	4.1E-13	7.4E-17	5.8E-17	1.3E-16
NNE	3500	PA-234	1.2E-15	2.2E-19	1.7E-19	3.9E-19
NNE	3500	PA-234M	7.0E-16	1.3E-19	8.6E-20	2.1E-19
NNE	3500	PB-210	2.3E-12	4.1E-16	3.2E-16	7.3E-16
NNE	3500	PO-210	2.3E-12	4.1E-16	3.2E-16	7.3E-16
NNE	3500	RA-223	6.1E-13	1.1E-16	8.6E-17	1.9E-16
NNE	3500	RA-224	2.4E-13	4.3E-17	3.4E-17	7.7E-17
NNE	3500	RA-226	2.5E-12	4.6E-16	3.6E-16	8.1E-16
NNE	3500	RA-228	2.7E-13	4.8E-17	3.8E-17	8.5E-17

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ESTIMATED RADIONUCLIDE CONCENTRATIONS
AT VARIOUS LOCATIONS IN THE ENVIRONMENT

Wind Toward	Distance (meters)	Nuclide	Air Concentration (pCi/L)	Dry Deposition Rate (pCi/cm2/s)	Wet Deposition Rate (pCi/cm2/s)	Ground Deposition Rate (pCi/cm2/s)
NNE	3500	TH-227	6.0E-14	1.1E-17	8.5E-18	1.9E-17
NNE	3500	TH-228	4.9E-13	8.8E-17	6.9E-17	1.6E-16
NNE	3500	TH-230	3.9E-11	7.1E-15	5.6E-15	1.3E-14
NNE	3500	TH-231	7.5E-14	1.4E-17	1.1E-17	2.4E-17
NNE	3500	TH-232	5.5E-13	9.9E-17	7.8E-17	1.8E-16
NNE	3500	TH-234	1.2E-12	2.1E-16	1.6E-16	3.7E-16
NNE	3500	U-234	1.1E-12	2.0E-16	1.6E-16	3.7E-16
NNE	3500	U-235	7.7E-14	1.4E-17	1.1E-17	2.5E-17
NNE	3500	U-236	7.7E-14	1.4E-17	1.1E-17	2.5E-17
NNE	3500	U-238	1.2E-12	2.1E-16	1.6E-16	3.7E-16

C A P 8 8 - P C

Version 2.00

Clean Air Act Assessment Package - 1988

C H I / Q   T A B L E S

Radon Individual Assessment
Mar 11, 2002 02:42 pm

Facility: Fernald Silo 3 Particulates/Radon Stack Release
Address: Fernald
City: Fernald
State: OH   Zip:

Source Category:
Source Type: Stack
Emission Year: 2002

Comments:

Dataset Name: Fernald Silo 3
Dataset Date: Mar 11, 2002 02:42 pm
Wind File: C:\CAP88PC2\WNDFILES\NEWFREDB.WND

GROUND-LEVEL CHI/Q VALUES FOR RN-222
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.077E-07	3.180E-07	3.921E-07	4.430E-07	3.957E-07	3.615E-07	3.296E-07
NNW	1.521E-07	1.758E-07	2.349E-07	2.806E-07	2.566E-07	2.368E-07	2.175E-07
NW	1.231E-07	1.396E-07	1.749E-07	2.062E-07	1.914E-07	1.787E-07	1.662E-07
WNW	1.812E-07	1.863E-07	2.109E-07	2.289E-07	2.074E-07	1.919E-07	1.775E-07
W	3.444E-07	3.435E-07	3.757E-07	3.974E-07	3.571E-07	3.299E-07	3.052E-07
WSW	5.716E-07	6.464E-07	7.567E-07	7.719E-07	6.650E-07	5.987E-07	5.405E-07
SW	3.942E-07	4.582E-07	5.122E-07	4.799E-07	3.961E-07	3.484E-07	3.082E-07
SSW	2.139E-07	3.189E-07	3.854E-07	3.750E-07	3.132E-07	2.770E-07	2.461E-07
S	1.976E-07	2.880E-07	3.498E-07	3.538E-07	3.021E-07	2.702E-07	2.422E-07
SSE	2.402E-07	3.118E-07	3.835E-07	4.101E-07	3.610E-07	3.290E-07	3.007E-07
SE	3.094E-07	3.760E-07	4.546E-07	4.909E-07	4.362E-07	4.001E-07	3.685E-07
ESE	3.648E-07	4.672E-07	5.920E-07	6.468E-07	5.707E-07	5.201E-07	4.756E-07
E	5.879E-07	6.401E-07	7.653E-07	8.250E-07	7.276E-07	6.631E-07	6.059E-07
ENE	7.301E-07	7.129E-07	8.382E-07	9.337E-07	8.401E-07	7.734E-07	7.121E-07
NE	7.745E-07	7.880E-07	9.620E-07	1.091E-06	9.798E-07	8.991E-07	8.237E-07
NNE	6.075E-07	6.389E-07	7.814E-07	8.558E-07	7.544E-07	6.856E-07	6.230E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.885E-07	2.552E-07	2.456E-07	2.282E-07	2.203E-07	1.699E-07
NNW	1.920E-07	1.710E-07	1.649E-07	1.538E-07	1.487E-07	1.159E-07
NW	1.494E-07	1.355E-07	1.314E-07	1.240E-07	1.206E-07	9.661E-08
WNW	1.592E-07	1.447E-07	1.406E-07	1.333E-07	1.300E-07	1.058E-07
W	2.744E-07	2.499E-07	2.430E-07	2.304E-07	2.246E-07	1.824E-07
WSW	4.684E-07	4.115E-07	3.952E-07	3.659E-07	3.527E-07	2.691E-07
SW	2.601E-07	2.235E-07	2.133E-07	1.953E-07	1.873E-07	1.395E-07
SSW	2.092E-07	1.811E-07	1.732E-07	1.593E-07	1.532E-07	1.158E-07
S	2.079E-07	1.812E-07	1.736E-07	1.602E-07	1.542E-07	1.171E-07
SSE	2.660E-07	2.392E-07	2.316E-07	2.181E-07	2.120E-07	1.696E-07
SE	3.308E-07	3.028E-07	2.951E-07	2.816E-07	2.756E-07	2.288E-07
ESE	4.223E-07	3.829E-07	3.722E-07	3.534E-07	3.452E-07	2.842E-07
E	5.362E-07	4.831E-07	4.684E-07	4.423E-07	4.307E-07	3.485E-07
ENE	6.344E-07	5.727E-07	5.550E-07	5.232E-07	5.088E-07	4.075E-07
NE	7.263E-07	6.471E-07	6.242E-07	5.827E-07	5.638E-07	4.395E-07
NNE	5.437E-07	4.800E-07	4.616E-07	4.285E-07	4.135E-07	3.178E-07

GROUND-LEVEL CHI/Q VALUES FOR AC-227
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2,816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

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GROUND-LEVEL CHI/Q VALUES FOR AC-228
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.054E-07	3.140E-07	3.850E-07	4.308E-07	3.808E-07	3.453E-07	3.125E-07
NNW	1.504E-07	1.730E-07	2.296E-07	2.712E-07	2.448E-07	2.240E-07	2.039E-07
NW	1.216E-07	1.371E-07	1.705E-07	1.983E-07	1.814E-07	1.676E-07	1.543E-07
WNW	1.791E-07	1.828E-07	2.053E-07	2.197E-07	1.961E-07	1.795E-07	1.643E-07
W	3.410E-07	3.378E-07	3.668E-07	3.829E-07	3.392E-07	3.103E-07	2.843E-07
WSW	5.674E-07	6.389E-07	7.440E-07	7.517E-07	6.409E-07	5.728E-07	5.133E-07
SW	3.915E-07	4.531E-07	5.040E-07	4.680E-07	3.826E-07	3.343E-07	2.937E-07
SSW	2.126E-07	3.159E-07	3.799E-07	3.666E-07	3.035E-07	2.667E-07	2.355E-07
S	1.965E-07	2.855E-07	3.451E-07	3.460E-07	2.926E-07	2.600E-07	2.315E-07
SSE	2.388E-07	3.087E-07	3.774E-07	3.992E-07	3.475E-07	3.141E-07	2.848E-07
SE	3.075E-07	3.721E-07	4.471E-07	4.774E-07	4.192E-07	3.813E-07	3.481E-07
ESE	3.627E-07	4.625E-07	5.827E-07	6.302E-07	5.501E-07	4.976E-07	4.514E-07
E	5.840E-07	6.326E-07	7.518E-07	8.018E-07	6.993E-07	6.323E-07	5.730E-07
ENE	7.249E-07	7.039E-07	8.219E-07	9.046E-07	8.036E-07	7.334E-07	6.692E-07
NE	7.697E-07	7.790E-07	9.451E-07	1.060E-06	9.420E-07	8.578E-07	7.797E-07
NNE	6.037E-07	6.319E-07	7.687E-07	8.341E-07	7.279E-07	6.570E-07	5.928E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.704E-07	2.364E-07	2.266E-07	2.089E-07	2.008E-07	1.499E-07
NNW	1.775E-07	1.559E-07	1.497E-07	1.383E-07	1.331E-07	9.977E-08
NW	1.365E-07	1.219E-07	1.176E-07	1.098E-07	1.063E-07	8.157E-08
WNW	1.449E-07	1.296E-07	1.252E-07	1.174E-07	1.138E-07	8.858E-08
W	2.516E-07	2.257E-07	2.183E-07	2.048E-07	1.987E-07	1.548E-07
WSW	4.397E-07	3.818E-07	3.652E-07	3.354E-07	3.219E-07	2.377E-07
SW	2.453E-07	2.086E-07	1.983E-07	1.802E-07	1.722E-07	1.244E-07
SSW	1.981E-07	1.698E-07	1.618E-07	1.478E-07	1.416E-07	1.039E-07
S	1.966E-07	1.695E-07	1.618E-07	1.482E-07	1.421E-07	1.046E-07
SSE	2.487E-07	2.208E-07	2.129E-07	1.987E-07	1.923E-07	1.484E-07
SE	3.082E-07	2.782E-07	2.698E-07	2.550E-07	2.483E-07	1.981E-07
ESE	3.958E-07	3.541E-07	3.426E-07	3.222E-07	3.132E-07	2.480E-07
E	5.006E-07	4.451E-07	4.296E-07	4.019E-07	3.895E-07	3.035E-07
ENE	5.880E-07	5.235E-07	5.050E-07	4.716E-07	4.564E-07	3.518E-07
NE	6.793E-07	5.980E-07	5.744E-07	5.318E-07	5.125E-07	3.862E-07
NNE	5.116E-07	4.466E-07	4.278E-07	3.941E-07	3.788E-07	2.819E-07

GROUND-LEVEL CHI/Q VALUES FOR BI-210
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

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GROUND-LEVEL CHI/Q VALUES FOR FR-223
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	2.827E-07	2.752E-07	3.170E-07	3.228E-07	2.613E-07	2.238E-07	1.912E-07
NNW	1.349E-07	1.458E-07	1.799E-07	1.894E-07	1.533E-07	1.305E-07	1.107E-07
NW	1.078E-07	1.127E-07	1.286E-07	1.298E-07	1.037E-07	8.758E-08	7.368E-08
WNW	1.590E-07	1.491E-07	1.530E-07	1.414E-07	1.094E-07	9.101E-08	7.567E-08
W	3.082E-07	2.834E-07	2.841E-07	2.589E-07	2.011E-07	1.685E-07	1.413E-07
WSW	5.270E-07	5.651E-07	6.225E-07	5.740E-07	4.486E-07	3.783E-07	3.197E-07
SW	3.643E-07	4.023E-07	4.252E-07	3.640E-07	2.752E-07	2.282E-07	1.904E-07
SSW	1.996E-07	2.845E-07	3.265E-07	2.922E-07	2.251E-07	1.886E-07	1.587E-07
S	1.858E-07	2.594E-07	2.986E-07	2.755E-07	2.156E-07	1.819E-07	1.538E-07
SSE	2.248E-07	2.767E-07	3.180E-07	3.032E-07	2.397E-07	2.033E-07	1.727E-07
SE	2.885E-07	3.328E-07	3.752E-07	3.585E-07	2.842E-07	2.413E-07	2.053E-07
ESE	3.420E-07	4.149E-07	4.917E-07	4.827E-07	3.856E-07	3.286E-07	2.803E-07
E	5.456E-07	5.586E-07	6.221E-07	5.990E-07	4.753E-07	4.035E-07	3.430E-07
ENE	6.751E-07	6.163E-07	6.663E-07	6.500E-07	5.175E-07	4.394E-07	3.729E-07
NE	7.222E-07	6.900E-07	7.810E-07	7.907E-07	6.399E-07	5.481E-07	4.687E-07
NNE	5.662E-07	5.626E-07	6.450E-07	6.411E-07	5.159E-07	4.413E-07	3.772E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	1,517E-07	1.215E-07	1.131E-07	9.831E-08	9.180E-08	5.504E-08
NNW	8.663E-08	6.838E-08	6.332E-08	5.449E-08	5.063E-08	2.915E-08
NW	5.700E-08	4.448E-08	4.103E-08	3.503E-08	3.241E-08	1.776E-08
WNW	5.773E-08	4.455E-08	4.096E-08	3.476E-08	3.207E-08	1.713E-08
W	1.095E-07	8.589E-08	7.942E-08	6.813E-08	6.321E-08	3.519E-08
WSW	2.505E-07	1.988E-07	1.846E-07	1.596E-07	1.487E-07	8.815E-08
SW	1.469E-07	1.153E-07	1.067E-07	9.182E-08	8.537E-08	5.025E-08
SSW	1.239E-07	9.836E-08	9.136E-08	7.916E-08	7.383E-08	4.446E-08
S	1.207E-07	9.601E-08	8.921E-08	7.734E-08	7.215E-08	4.339E-08
SSE	1.366E-07	1.094E-07	1.019E-07	8.870E-08	8.288E-08	4.952E-08
SE	1.627E-07	1.308E-07	1.219E-07	1.062E-07	9.935E-08	5.910E-08
ESE	2.229E-07	1.796E-07	1.675E-07	1.463E-07	1.369E-07	8.268E-08
E	2.711E-07	2.170E-07	2.020E-07	1.757E-07	1.641E-07	9.772E-08
ENE	2.937E-07	2.339E-07	2.174E-07	1.883E-07	1.756E-07	1.026E-07
NE	3.724E-07	2.987E-07	2.782E-07	2.420E-07	2.260E-07	1.351E-07
NNE	2.999E-07	2.408E-07	2.243E-07	1.954E-07	1.826E-07	1.107E-07

GROUND-LEVEL CHI/Q VALUES FOR PA-231
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR PA-234
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

	Distance (meters)						
Dir	300	500	700	1000	1300	1500	1700
N	3.055E-07	3.143E-07	3.855E-07	4.315E-07	3.816E-07	3.462E-07	3.134E-07
NNW	1.505E-07	1.731E-07	2.300E-07	2.718E-07	2.455E-07	2.247E-07	2.046E-07
NW	1.217E-07	1.372E-07	1.707E-07	1.987E-07	1.819E-07	1.682E-07	1.549E-07
WNW	1.792E-07	1.830E-07	2.056E-07	2.202E-07	1.967E-07	1.802E-07	1.650E-07
W	3.412E-07	3.381E-07	3.673E-07	3.837E-07	3.402E-07	3.114E-07	2.854E-07
WSW	5.677E-07	6.393E-07	7.448E-07	7.528E-07	6.422E-07	5.742E-07	5.147E-07
SW	3.916E-07	4.534E-07	5.045E-07	4.687E-07	3.833E-07	3.350E-07	2.944E-07
SSW	2.127E-07	3.160E-07	3.802E-07	3.671E-07	3.040E-07	2.673E-07	2.361E-07
S	1.966E-07	2.856E-07	3.454E-07	3.464E-07	2.932E-07	2.605E-07	2.321E-07
SSE	2.388E-07	3.088E-07	3.778E-07	3.999E-07	3.482E-07	3.149E-07	2.856E-07
SE	3.076E-07	3.724E-07	4.476E-07	4.782E-07	4.201E-07	3.823E-07	3.492E-07
ESE	3.628E-07	4.628E-07	5.832E-07	6.311E-07	5.512E-07	4.988E-07	4.527E-07
E	5.842E-07	6.330E-07	7.526E-07	8.032E-07	7.008E-07	6.340E-07	5.748E-07
ENE	7.252E-07	7.044E-07	8.229E-07	9.063E-07	8.056E-07	7.356E-07	6.715E-07
NE	7.699E-07	7.796E-07	9.461E-07	1.062E-06	9.441E-07	8.600E-07	7.820E-07
NNE	6.039E-07	6.323E-07	7.695E-07	8.353E-07	7.294E-07	6.585E-07	5.944E-07

	Distance (meters)					
Dir	2000	2300	2400	2600	2700	3500
N	2.713E-07	2.373E-07	2.275E-07	2.098E-07	2.018E-07	1.509E-07
NNW	1.783E-07	1.567E-07	1.504E-07	1.391E-07	1.339E-07	1.005E-07
NW	1.372E-07	1.226E-07	1.184E-07	1.106E-07	1.070E-07	8.232E-08
WNW	1.457E-07	1.304E-07	1.260E-07	1.182E-07	1.147E-07	8.944E-08
W	2.528E-07	2.270E-07	2.196E-07	2.062E-07	2.001E-07	1.562E-07
WSW	4.412E-07	3.833E-07	3.667E-07	3.369E-07	3.235E-07	2.392E-07
SW	2.460E-07	2.093E-07	1.991E-07	1.810E-07	1.729E-07	1.251E-07
SSW	1.987E-07	1.703E-07	1.624E-07	1.484E-07	1.422E-07	1.044E-07
S	1.972E-07	1.701E-07	1.624E-07	1.488E-07	1.427E-07	1.052E-07
SSE	2.496E-07	2.218E-07	2.139E-07	1.997E-07	1.933E-07	1.494E-07
SE	3.094E-07	2.795E-07	2.712E-07	2.564E-07	2.497E-07	1.997E-07
ESE	3.972E-07	3.556E-07	3.441E-07	3.238E-07	3.148E-07	2.499E-07
E	5.024E-07	4.471E-07	4.316E-07	4.040E-07	3.916E-07	3.057E-07
ENE	5.904E-07	5.261E-07	5.076E-07	4.742E-07	4.591E-07	3.546E-07
NE	6.817E-07	6.005E-07	5.770E-07	5.344E-07	5.150E-07	3.888E-07
NNE	5.132E-07	4.483E-07	4.296E-07	3.958E-07	3.805E-07	2.836E-07

GROUND-LEVEL CHI/Q VALUES FOR PA-234M
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	9.056E-08	4.959E-08	3.478E-08	1.976E-08	9.808E-09	6.205E-09	3.954E-09
NNW	2.825E-08	1.951E-08	1.601E-08	1.040E-08	5.562E-09	3.629E-09	2.360E-09
NW	1.815E-08	1.087E-08	8.082E-09	5.075E-09	2.741E-09	1.796E-09	1.172E-09
WNW	2.755E-08	1.298E-08	8.587E-09	4.943E-09	2.588E-09	1.673E-09	1.081E-09
W	7.330E-08	3.549E-08	2.187E-08	1.119E-08	5.535E-09	3.505E-09	2.235E-09
WSW	1.766E-07	1.129E-07	7.621E-08	3.625E-08	1.627E-08	9.794E-09	6.012E-09
SW	1.238E-07	7.995E-08	5.082E-08	2.193E-08	9.232E-09	5.371E-09	3.205E-09
SSW	7.470E-08	6.471E-08	4.566E-08	2.084E-08	8.863E-09	5.144E-09	3.052E-09
S	7.768E-08	6.600E-08	4.566E-08	2.073E-08	8.800E-09	5.092E-09	3.009E-09
SSE	8.930E-08	6.308E-08	4.287E-08	2.090E-08	9.551E-09	5.791E-09	3.567E-09
SE	1.130E-07	7.691E-08	5.138E-08	2.490E-08	1.140E-08	6.920E-09	4.267E-09
ESE	1.432E-07	1.005E-07	7.135E-08	3.669E-08	1.717E-08	1.051E-08	6.516E-09
E	2.049E-07	1.206E-07	8.124E-08	4.179E-08	1.989E-08	1.232E-08	7.711E-09
ENE	2.385E-07	1.194E-07	7.620E-08	4.090E-08	2.037E-08	1.292E-08	8.246E-09
NE	2.794E-07	1.445E-07	9.406E-08	5.033E-08	2.456E-08	1.543E-08	9.784E-09
NNE	2.155E-07	1.218E-07	8.439E-08	4.531E-08	2.166E-08	1.343E-08	8.431E-09

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.037E-09	1.063E-09	8.584E-10	5.612E-10	4.546E-10	8.792E-11
NNW	1.239E-09	6.533E-10	5.286E-10	3.468E-10	2.812E-10	5.458E-11
NW	6.172E-10	3.261E-10	2.639E-10	1.733E-10	1.405E-10	2.725E-11
WNW	5.631E-10	2.953E-10	2.385E-10	1.560E-10	1.263E-10	2.427E-11
W	1.149E-09	5.983E-10	4.823E-10	3.145E-10	2.544E-10	4.859E-11
WSW	2.982E-09	1.523E-09	1.224E-09	7.950E-10	6.425E-10	1.234E-10
SW	1.536E-09	7.636E-10	6.086E-10	3.895E-10	3.126E-10	5.788E-11
SSW	1.447E-09	7.118E-10	5.656E-10	3.601E-10	2.884E-10	5.292E-11
S	1.416E-09	6.917E-10	5.484E-10	3.477E-10	2.780E-10	5.041E-11
SSE	1.769E-09	8.997E-10	7.214E-10	4.663E-10	3.759E-10	7.109E-11
SE	2.118E-09	1.077E-09	8.636E-10	5.582E-10	4.499E-10	8.499E-11
ESE	3.251E-09	1.658E-09	1.330E-09	8.605E-10	6.938E-10	1.313E-10
E	3.892E-09	2.001E-09	1.609E-09	1.044E-09	8.433E-10	1.605E-10
ENE	4.248E-09	2.215E-09	1.787E-09	1.167E-09	9.447E-10	1.817E-10
NE	5.012E-09	2.607E-09	2.102E-09	1.372E-09	1.110E-09	2.139E-10
NNE	4.279E-09	2.217E-09	1.787E-09	1.167E-09	9.452E-10	1.833E-10

GROUND-LEVEL CHI/Q VALUES FOR PB-210
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR PO-210
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR RA-223
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

	Distance (meters)						
Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

	Distance (meters)					
Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR RA-224
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

	Distance (meters)						
Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

	Distance (meters)					
Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR RA-226
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

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GROUND-LEVEL CHI/Q VALUES FOR RA-228
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

	Distance (meters)						
Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

	Distance (meters)					
Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR TH-227
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR TH-228
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR TH-230
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

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GROUND-LEVEL CHI/Q VALUES FOR TH-231
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.065E-07	3.161E-07	3.888E-07	4.372E-07	3.882E-07	3.532E-07	3.207E-07
NNW	1.512E-07	1.744E-07	2.324E-07	2.762E-07	2.507E-07	2.302E-07	2.105E-07
NW	1.224E-07	1.384E-07	1.728E-07	2.025E-07	1.865E-07	1.732E-07	1.601E-07
WNW	1.802E-07	1.846E-07	2.083E-07	2.245E-07	2.018E-07	1.857E-07	1.707E-07
W	3.427E-07	3.407E-07	3.714E-07	3.904E-07	3.482E-07	3.200E-07	2.945E-07
WSW	5.695E-07	6.428E-07	7.506E-07	7.620E-07	6.527E-07	5.853E-07	5.262E-07
SW	3.928E-07	4.557E-07	5.083E-07	4.740E-07	3.891E-07	3.410E-07	3.004E-07
SSW	2.132E-07	3.175E-07	3.828E-07	3.708E-07	3.082E-07	2.716E-07	2.405E-07
S	1.971E-07	2.868E-07	3.476E-07	3.500E-07	2.973E-07	2.649E-07	2.366E-07
SSE	2.395E-07	3.103E-07	3.806E-07	4.049E-07	3.542E-07	3.214E-07	2.924E-07
SE	3.084E-07	3.742E-07	4.511E-07	4.844E-07	4.277E-07	3.906E-07	3.580E-07
ESE	3.638E-07	4.650E-07	5.876E-07	6.388E-07	5.603E-07	5.085E-07	4.630E-07
E	5.860E-07	6.365E-07	7.589E-07	8.138E-07	7.133E-07	6.473E-07	5.888E-07
ENE	7.275E-07	7.086E-07	8.306E-07	9.198E-07	8.219E-07	7.531E-07	6.899E-07
NE	7.720E-07	7.837E-07	9.541E-07	1.076E-06	9.609E-07	8.780E-07	8.008E-07
NNE	6.056E-07	6.355E-07	7.755E-07	8.453E-07	7.410E-07	6.708E-07	6.071E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.789E-07	2.451E-07	2.353E-07	2.177E-07	2.098E-07	1.589E-07
NNW	1.844E-07	1.629E-07	1.567E-07	1.454E-07	1.403E-07	1.070E-07
NW	1.427E-07	1.284E-07	1.242E-07	1.165E-07	1.130E-07	8.849E-08
WNW	1.518E-07	1.368E-07	1.326E-07	1.249E-07	1.215E-07	9.662E-08
W	2.626E-07	2.373E-07	2.301E-07	2.170E-07	2.110E-07	1.676E-07
WSW	4.531E-07	3.956E-07	3.791E-07	3.495E-07	3.361E-07	2.519E-07
SW	2.521E-07	2.154E-07	2.052E-07	1.871E-07	1.790E-07	1.312E-07
SSW	2.032E-07	1.749E-07	1.670E-07	1.531E-07	1.469E-07	1.093E-07
S	2.019E-07	1.749E-07	1.673E-07	1.537E-07	1.476E-07	1.103E-07
SSE	2.569E-07	2.295E-07	2.217E-07	2.078E-07	2.015E-07	1.582E-07
SE	3.190E-07	2.900E-07	2.819E-07	2.677E-07	2.614E-07	2.127E-07
ESE	4.083E-07	3.677E-07	3.566E-07	3.370E-07	3.284E-07	2.652E-07
E	5.174E-07	4.630E-07	4.478E-07	4.209E-07	4.089E-07	3.245E-07
ENE	6.100E-07	5.467E-07	5.285E-07	4.957E-07	4.809E-07	3.774E-07
NE	7.014E-07	6.209E-07	5.976E-07	5.553E-07	5.362E-07	4.103E-07
NNE	5.265E-07	4.620E-07	4.434E-07	4.099E-07	3.947E-07	2.981E-07

GROUND-LEVEL CHI/Q VALUES FOR TH-232
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR TH-234
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR U-234
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

	Distance (meters)						
Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

	Distance (meters)					
Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR U-235
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
SE	3.226E-07	2.938E-07	2.859E-07	2.719E-07	2.657E-07	2.175E-07
ESE	4.124E-07	3.722E-07	3.612E-07	3.419E-07	3.334E-07	2.709E-07
E	5.228E-07	4.689E-07	4.538E-07	4.271E-07	4.153E-07	3.315E-07
ENE	6.172E-07	5.543E-07	5.362E-07	5.037E-07	4.890E-07	3.859E-07
NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR U-236
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

Distance (meters)

Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
SW	3.933E-07	4.566E-07	5.097E-07	4.759E-07	3.912E-07	3.431E-07	3.026E-07
SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
ENE	7.283E-07	7.100E-07	8.333E-07	9.247E-07	8.278E-07	7.594E-07	6.966E-07
NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

Distance (meters)

Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
NNW	1.866E-07	1.652E-07	1.590E-07	1.478E-07	1.427E-07	1.094E-07
NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
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NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

GROUND-LEVEL CHI/Q VALUES FOR U-238
CHI/Q TOWARD INDICATED DIRECTION (SEC/CUBIC METER)

	Distance (meters)						
Dir	300	500	700	1000	1300	1500	1700
N	3.069E-07	3.167E-07	3.900E-07	4.392E-07	3.906E-07	3.557E-07	3.233E-07
NNW	1.515E-07	1.749E-07	2.333E-07	2.777E-07	2.526E-07	2.323E-07	2.126E-07
NW	1.226E-07	1.388E-07	1.736E-07	2.038E-07	1.881E-07	1.750E-07	1.620E-07
WNW	1.805E-07	1.851E-07	2.092E-07	2.260E-07	2.036E-07	1.877E-07	1.729E-07
W	3.433E-07	3.417E-07	3.729E-07	3.928E-07	3.511E-07	3.232E-07	2.979E-07
WSW	5.701E-07	6.440E-07	7.528E-07	7.653E-07	6.565E-07	5.893E-07	5.304E-07
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SSW	2.134E-07	3.180E-07	3.837E-07	3.722E-07	3.097E-07	2.731E-07	2.421E-07
S	1.972E-07	2.872E-07	3.484E-07	3.513E-07	2.988E-07	2.665E-07	2.382E-07
SSE	2.397E-07	3.108E-07	3.817E-07	4.067E-07	3.564E-07	3.237E-07	2.949E-07
SE	3.088E-07	3.748E-07	4.523E-07	4.867E-07	4.304E-07	3.935E-07	3.612E-07
ESE	3.641E-07	4.658E-07	5.892E-07	6.415E-07	5.636E-07	5.121E-07	4.667E-07
E	5.866E-07	6.377E-07	7.612E-07	8.176E-07	7.178E-07	6.521E-07	5.939E-07
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NE	7.728E-07	7.852E-07	9.569E-07	1.081E-06	9.669E-07	8.845E-07	8.076E-07
NNE	6.062E-07	6.367E-07	7.776E-07	8.489E-07	7.452E-07	6.752E-07	6.118E-07

	Distance (meters)					
Dir	2000	2300	2400	2600	2700	3500
N	2.816E-07	2.479E-07	2.382E-07	2.207E-07	2.127E-07	1.619E-07
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NW	1.448E-07	1.305E-07	1.263E-07	1.187E-07	1.152E-07	9.080E-08
WNW	1.540E-07	1.392E-07	1.350E-07	1.274E-07	1.240E-07	9.932E-08
W	2.662E-07	2.411E-07	2.339E-07	2.210E-07	2.151E-07	1.719E-07
WSW	4.575E-07	4.001E-07	3.836E-07	3.541E-07	3.407E-07	2.566E-07
SW	2.543E-07	2.176E-07	2.074E-07	1.893E-07	1.813E-07	1.334E-07
SSW	2.048E-07	1.766E-07	1.687E-07	1.548E-07	1.486E-07	1.111E-07
S	2.036E-07	1.766E-07	1.690E-07	1.555E-07	1.495E-07	1.122E-07
SSE	2.596E-07	2.323E-07	2.246E-07	2.108E-07	2.046E-07	1.614E-07
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NE	7.085E-07	6.283E-07	6.051E-07	5.630E-07	5.439E-07	4.183E-07
NNE	5.314E-07	4.671E-07	4.485E-07	4.151E-07	4.000E-07	3.034E-07

SILOS PROJECTS

ENVIRONMENTAL MONITORING PLAN
40000-PL-0010

Revision 2

Signature Page

Prepared by:		
	S. Beckman, Silos Project Environmental Compliance	Date
Reviewed by:		
	M. Frank, Manager Environmental Monitoring	Date
Approved by:		
	R. Corradi, Project Director, Silos Project	Date

RECORD OF ISSUE/REVISIONS

Issue Authorization Date	Effective Date	PCN No.	Rev. No.	Description
	May 17, 2000		0	Initial issue
	November 1, 2000		1	Minor revision in response to comments on AWR RD package – Monitoring station designations in Sections 3.1.3 and 3.1.4 and Attachment A corrected to agree with new light pole numbers; IEMP reporting clarified in Section 4.
			2	Minor revision to update for inclusion in revised Silos Projects Remedial Design Packages

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SILOS PROJECTS

ENVIRONMENTAL MONITORING PLAN
40000-PL-0010

Revision 2

TABLE OF CONTENTS

SECTION

ACRONYM LIST

ALARA	As Low As Reasonably Achievable
ARAR	Applicable, Relevant, and Appropriate
ASL	Analytical Support Level
AWR	Accelerated Waste Retrieval
AWWT	Advanced Waste Water Treatment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOE	Department of Energy
FEMP	Fernald Environmental Management Project
HAMDC	Highest allowable minimal detectable concentration
IEMP	Integrated Environmental Management Plan
ISER	Integrated Site Environmental Report
OU4	Operable Unit 4
pCi	pico curie
SCQ	Sitewide CERCLA Quality assurance plan
TLD	Thermoluminescent Dosimeter
WAC	Waste Acceptance Criteria
WPRAP	Waste Pits Remedial Action Plan

SILOS PROJECTS ENVIRONMENTAL MONITORING PLAN

1.0 General

The current focus of environmental monitoring at the Fernald Environmental Management Project (FEMP) is the implementation of site-wide environmental monitoring and project-specific environmental monitoring. Site-wide environmental monitoring is addressed in the Integrated Environmental Monitoring Plan (IEMP) while project-specific requirements are addressed within the environmental control plans, process control plans, and other design documents which constitute the project's remedial design package. For the Silo 3 Project, Silos 1 and 2 Accelerated Waste Retrieval Project (AWR Project), and Silos 1 and 2 Project, modifications to the site-wide environmental program are necessary to support project activities. Therefore, the focus of this plan is to establish the integrated environmental monitoring requirements for Operable Unit 4 (OU4) during the conduct of both projects.

2.0 Integrated Environmental Monitoring

The IEMP focuses on monitoring air, direct radiation, groundwater, and surface water to ensure protection of human health and the environment during the conduct of site-wide remediation activities. The IEMP incorporates regulatory requirements for site-wide monitoring, trending, reporting, and it serves as the central reporting mechanism to the regulators and stakeholders for the ongoing emission control/ monitoring activities at the FEMP. It is important to note that Site-wide reporting under the IEMP does not preclude project-specific reporting for Silos Projects.

3.0 Project-Specific Environmental Monitoring

Project-specific environmental monitoring requirements are identified in the applicable design documentation for both the Silo 3 Project and the AWR Project (References 1 and 2). These requirements for the Silos 1 and 2 Project will be identified in the RD package for that project. Fluor Fernald Inc. has identified additional enhancements to the existing site monitoring program that are integral to all three projects. As a result, this project-specific environmental monitoring plan documents the additional requirements addressing air, direct radiation, and project wastewater (i.e., slurry wastewater and decontamination wastewater) monitoring within and surrounding specified project boundaries that will be established by Fluor Fernald, Inc. The need and extent of project-specific monitoring has been evaluated based on the following criteria:

- Project complexity, extent of contamination, and scope;
- Applicable, Relevant, and Appropriate Requirements (ARARs) compliance strategy;
- DOE Orders compliance strategy; and,
- Existing monitoring data, modeling, and monitoring programs.

This project-specific environmental monitoring plan considers the location of the Operable Unit 4 (OU4) projects with respect to other remediation activities [e.g. the Waste Pit Remedial Action Plan (WPRAP) project] and the FEMP boundary. The plan also considers project-specific constraints such as the contaminants of concern; the characteristics of the OU4 wastes; and the material transfer, handling, and storage processes. Project-specific emission modeling of both normal and upset conditions have provided the basis for identifying and instituting process emission controls that are protective to the workers, public, and the environment (References 6 and 7). The effectiveness of the project-specific emission controls will be evaluated through analysis of monitoring results to identify whether increased or altered emission control methods are necessary. Project-specific environmental monitoring summary results will be provided in project completion reports.

3.1 Environmental Radiological Air Emissions Monitoring

Environmental radiological air monitoring during the Silos Projects will consist of three programs: 1) Project-specific stack monitoring programs; 2) the IEMP Air Monitoring Program including the environmental radon monitoring network; and 3) the project-specific air monitoring program.

3.1.1 The Silo 3 Stabilization Project and AWR Stack Monitoring Program

The Silo 3 and Silos 1 and 2 AWR Project stack monitoring requirements are described in the RD Packages for the projects. Stack monitoring for the Silos 1 and 2 project will be addressed in the Silos 1 and 2 RD Package. All thee projects will deploy isokinetic sampling for particulate radionuclides, monitoring, and recording of stack exhaust that is compliant with Title 40 of the Code of Federal Regulations (CFR), Part 61, Subpart H, and DOE Order 5400.5, Section IV.6.B. Additionally, the stack exhaust from will be continuously monitored for radon to verify that emissions are controlled in a manner that will not cause the point source to result in a contribution to the fence line radon concentration of greater than 0.5 pCi/L, as an annual average above background. Radiological contaminants represent the primary contaminants of concern, therefore the focus of stack air monitoring will be for radionuclides; however, monitoring for other contaminants of concern will be added, as warranted.

3.1.2 The IEMP Air Monitoring Program

The IEMP Air Monitoring Program is an established program that will continue throughout remediation. Within the IEMP Air Monitoring Program, the radiological air particulate monitoring program provides a fenceline monitoring network for assessing the collective site-wide impact of FEMP multiple concurrent remediation activities. This program demonstrates FEMP compliance with all ARARs and provides early warning feedback regarding the cumulative sitewide effectiveness of project-specific emission controls. The radiological air particulate monitoring program is reviewed annually in order to account for changes in remediation projects at the FEMP.

Additionally, within the IEMP Air Monitoring Program, the radon monitoring network has been designed to focus on monitoring Silos 1 and 2 headspaces, environmental radon levels in the vicinity of the silos, as well as radon levels at the site fenceline. In support of the Silo 3 and AWR projects and in anticipation of treatment of Silo1 and 2 material, the IEMP environmental radon monitoring network is being modified as described below.

3.1.3 The IEMP Environmental Radon Monitoring Network

During the Silo 3 Project and the AWR Project, remediation activities directed toward the removal, processing, and storage of radon-generating wastes creates the potential for the release of radon to the environment. Modifications and additions to the existing IEMP environmental radon monitoring network are necessary to accommodate construction activities associated with the AWR Project and to better monitor levels around the Silo 1 and 2 area during the OU4 remediation.

Three existing radon monitoring stations near the K-65 Silos were re-located to accommodate construction activities. The monitoring stations were re-located as follows:

- KNW at the K-65 exclusion fence was moved to the western side of the road, re-designated KNW-A.
- KSW at the K-65 exclusion fence was moved to the western side of the road, re-designated KSW-A.
- T28 northeast of the K-65 exclusion fence was moved across the road, in the prevailing wind direction from the K-65 Silos, re-designated T28A.

To better monitor radon levels in the K-65 area, five radon monitoring locations were added to the existing IEMP radon network. The monitors will provide additional monitoring of radon levels in the vicinity of the silos during the Silo 3 and AWR projects and subsequent operations for the Silos 1 and 2 material. The locations and designations for the monitors are:

- North of Silo 2 at the K-65 exclusion fence, designated KNO.
- South of Silo 1 near the new south camera tower, designated KSO.
- East of Silo 4 and in the prevailing wind direction from Silo 3, designated LP2.
- Southwest of the High Nitrate Storage Tank, near pole #543 at Trailer #117 designated T117.

- An additional station was selected on the FEMP's west fenceline to supplement the established IEMP monitoring network. The monitor (PR-1) is co-located with the WPTH-2 air particulate monitor, on the western perimeter of the facility.

The detail of the OU4 radon monitoring locations is shown on Dwg. 94X-5500-SK-5527 (Attachment A). The map of the entire IEMP radon monitoring network is shown Attachment B.

Data from selected radon monitors will be accessible via a secure Internet address. The data will include the date and time of the most recent transmission, location, and latest radon concentration. This data will be sent from the monitoring instrumentation without review or validation. Data review and validation will be conducted in a manner consistent with the current methods used under the IEMP Fluor Fernald Inc. radon monitoring program.

3.1.4 Project-Specific Air Particulate Monitoring Program

The IEMP air particulate monitoring program, which is based on air monitors located at the FEMP's perimeter fenceline, provides early warning feedback regarding the cumulative sitewide effectiveness of all remediation project emission controls. The project-specific air particulate monitoring program will provide data that confirms the performance of the emissions controls used for the Projects. In addition to providing confirmatory data, the monitoring program will also provide data to quantify the nature and extent of releases from both projects in the event of an upset condition. The program will consist of four high-volume particulate air samplers that will be co-located with the radon monitors at the Bio-surge lagoon, LP2, T117, and KNW-A locations shown on Attachment A. These samplers maintain a consistent air sample flow rate between 40 and 50 cubic feet per minute through an 8 by 10-inch filter.

The sampling and analysis program will consist of bi-weekly isotopic thorium, radium-226, and total particulate analyses. Results from the isotopic thorium analysis (thorium-228, thorium-230, and thorium-232) will be used to specifically monitor Th-230, the primary isotope of concern within the Silo 3 residues. The radium-226 analysis will be used to assess the effectiveness of process-control measures during the Silo 3 and AWR projects. Total particulate analysis will be used to determine if the results are indicative of project emissions or reflect the measurement of fugitive emissions from other sources (e.g. dust from construction vehicle traffic).

Samples will be analyzed according to the requirements for Analytical Support Level (ASL) B in the Sitewide CERCLA Quality (SCQ) assurance plan. The highest allowable minimal detectable concentrations (HAMDCs) for ASL B are 9.0 pCi/filter for isotopic thorium analyses and 4.0 pCi/filter for radium-226 analysis.

3.2 Direct Radiation Monitoring

In addition to airborne emissions, exposure to direct radiation is also a radiological hazard at the FEMP, particularly in the vicinity of Silo 1 and Silo 2. Direct, (a.k.a. penetrating) radiation is emitted from the radioactive materials stored onsite. The largest source of penetrating radiation at the FEMP results from the transformation of radium-bearing materials stored in Silos 1 and 2.

The IEMP environmental monitoring network includes thirty-two locations that monitor direct radiation levels associated with the storage of radionuclides at the FEMP. The monitoring is conducted using thermoluminescent dosimeters (TLDs). The monitoring network is well established and the locations were strategically chosen to ensure a monitoring envelope for each radiation source. During the AWR Project, major sources of direct radiation at the FEMP will undergo change. The operation of the Radon Control System (RCS) will result in elevated direct radiation adjacent to the carbon beds. The removal of the berm surrounding Silos 1 and 2 will result is changes to existing radiation shielding. These processes, together with the removal and relocation of the silo wastes to the Transfer Tank Area (TTA) will require an expansion of the IEMP TLD network to ensure adequate coverage of direct radiation sources.

The existing IEMP TLD monitoring network will be modified to take into account the relocation of the wastes stored in the K-65 silos. As necessary, current TLD locations will be adjusted and new TLD locations will be added to adequately characterize and monitor the direct radiation in the vicinity of the AWR project and the site fenceline. The background and technical justification for modifications to the IEMP TLD monitoring network will be provided through the IEMP annual review process.

3.3 Wastewater Monitoring

All wastewater from the Silo 3 Project and AWR Project will be discharged to the FEMP Advanced Wastewater Treatment (AWWT) facility, after sampling to confirm that it is acceptable for transfer. If the wastewater characterization indicates the wastewater stream is not acceptable for transfer to the AWWT, it will be held until appropriate disposition is determined.

Groundwater Monitoring

Groundwater monitoring is currently managed by the Aquifer Restoration Project (ARP). The ARP provides the monitoring necessary to identify the effect of FEMP remediation activities. This monitoring is adequate for assessing potential impacts on groundwater quality due to the

Silo 3 and AWR projects. In the event that collection of groundwater samples is needed to support the projects (or to assess any incidental releases), ARP managers will be notified to coordinate the appropriate groundwater monitoring activity.

4.0 Reporting

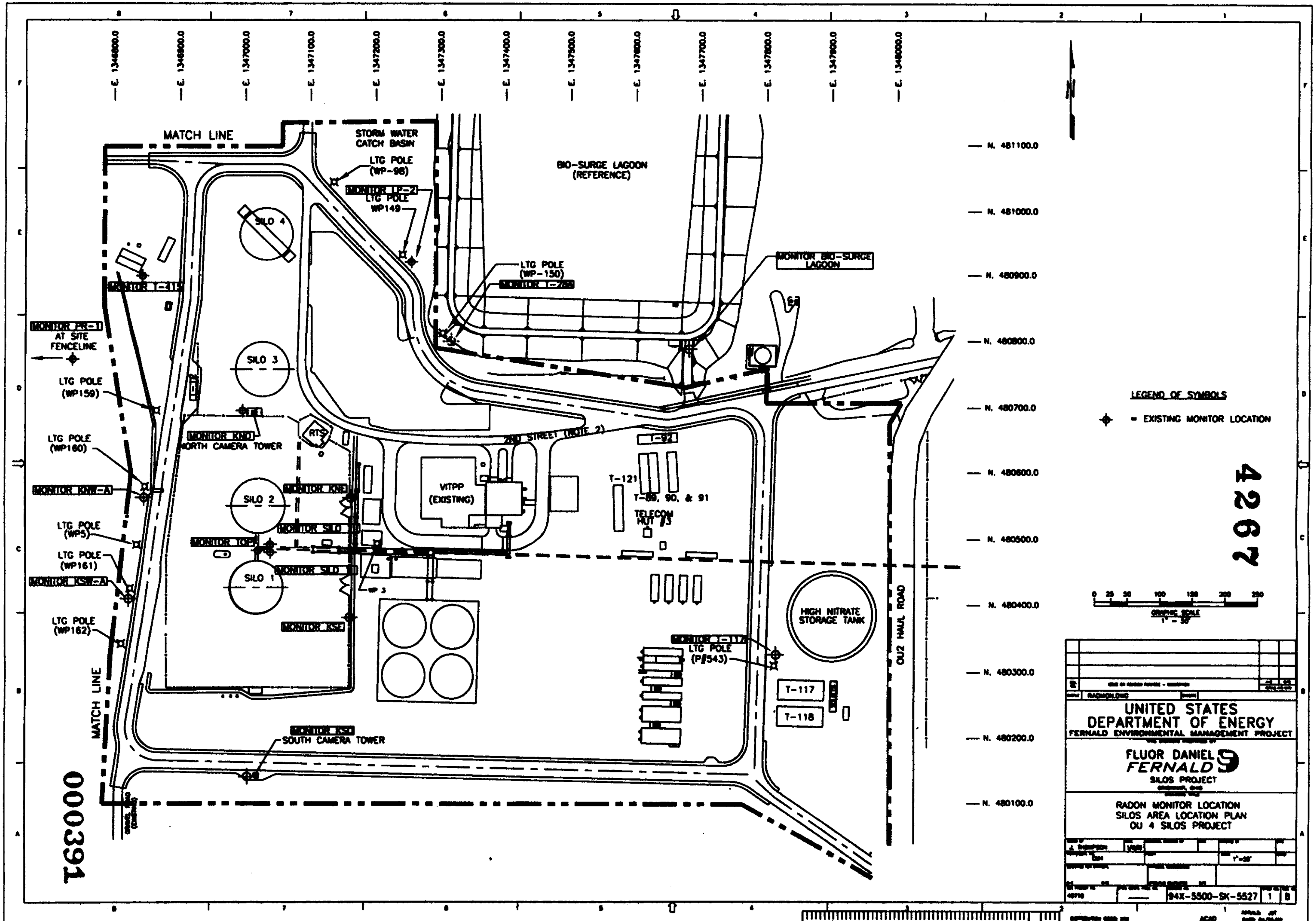
All project-specific environmental monitoring will be reported in Project Completion Reports, which will include a summary of the results generated during the projects. For radon monitoring, the report will identify each of the radon monitoring locations and the minimum, maximum, and average radon levels at each of those locations. For project-specific air monitoring, the report will identify each of the monitoring locations and the minimum, maximum, and average levels of each analyte at each of the locations. For direct radiation monitoring, the report will include TLD locations and a summary of quarterly results.

Data from the new radon and particulate monitors discussed in Sections 3.1.3 and 3.1.4 will be reported in the IEMP quarterly status and the Integrated Site Environmental Report (ISER). In addition, other project-specific data may be reported as necessary in IEMP quarterly status reports and the ISER to explain significant changes in the data from the fenceline IEMP environmental monitoring program.

5.0 References

1) Revised Silo 3 Project Remedial Design Package, 40430-RDP-0001, May 2002.
2) Revised Silos 1 and 2 Accelerated Waste Retrieval Project Remedial Design Package, June 2002
3) Environmental Control Plan for the Silos 1 and 2 Accelerated Waste Retrieval Project, 40710-PL-0007, June 2002.
4) Silo 3 Project Environmental Control Plan, 40430-PL-0005, April 2002.

Attachment A


MATCH LINE
STORM WATER CATCH BASIN
LTG POLE (WP-98)
MONITOR LP-2
LTG POLE WP149
BIO-SURGE LAGOON (REFERENCE)
SILO 4
SILO 3
SILO 2
SILO 1
MONITOR T-41
MONITOR PR-1 AT SITE FENCELINE
LTG POLE (WP159)
LTG POLE (WP160)
MONITOR KNW-A
LTG POLE (WP5)
LTG POLE (WP161)
MONITOR KSW-A
LTG POLE (WP162)
MONITOR KNO
NORTH CAMERA TOWER
RTS
MONITOR KNE
MONITOR SILO
MONITOR TOP
MONITOR KSE
WP 3
LTG POLE (WP-150)
MONITOR BIO-SURGE LAGOON
2ND STREET (NOTE 2)
VITPP (EXISTING)
T-92
T-121
T-89, 90, & 91
TELECOM HUT #3
HIGH NITRATE STORAGE TANK
LTG POLE (P#543)
T-117
T-118
OU2 HAUL ROAD
MONITOR KSD
SOUTH CAMERA TOWER
E. 1346800.0
E. 1346900.0
E. 1347000.0
E. 1347100.0
E. 1347200.0
E. 1347300.0
E. 1347400.0
E. 1347500.0
E. 1347600.0
E. 1347700.0
E. 1347800.0
E. 1347900.0
E. 1348000.0
N. 481100.0
N. 481000.0
N. 480900.0
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LEGEND OF SYMBOLS
= EXISTING MONITOR LOCATION
GRAPHIC SCALE 1" = 50'
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UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FLUOR DANIEL FERNALD
SILOS PROJECT
RADON MONITOR LOCATION
SILOS AREA LOCATION PLAN
OU 4 SILOS PROJECT
94X-5500-SK-5527
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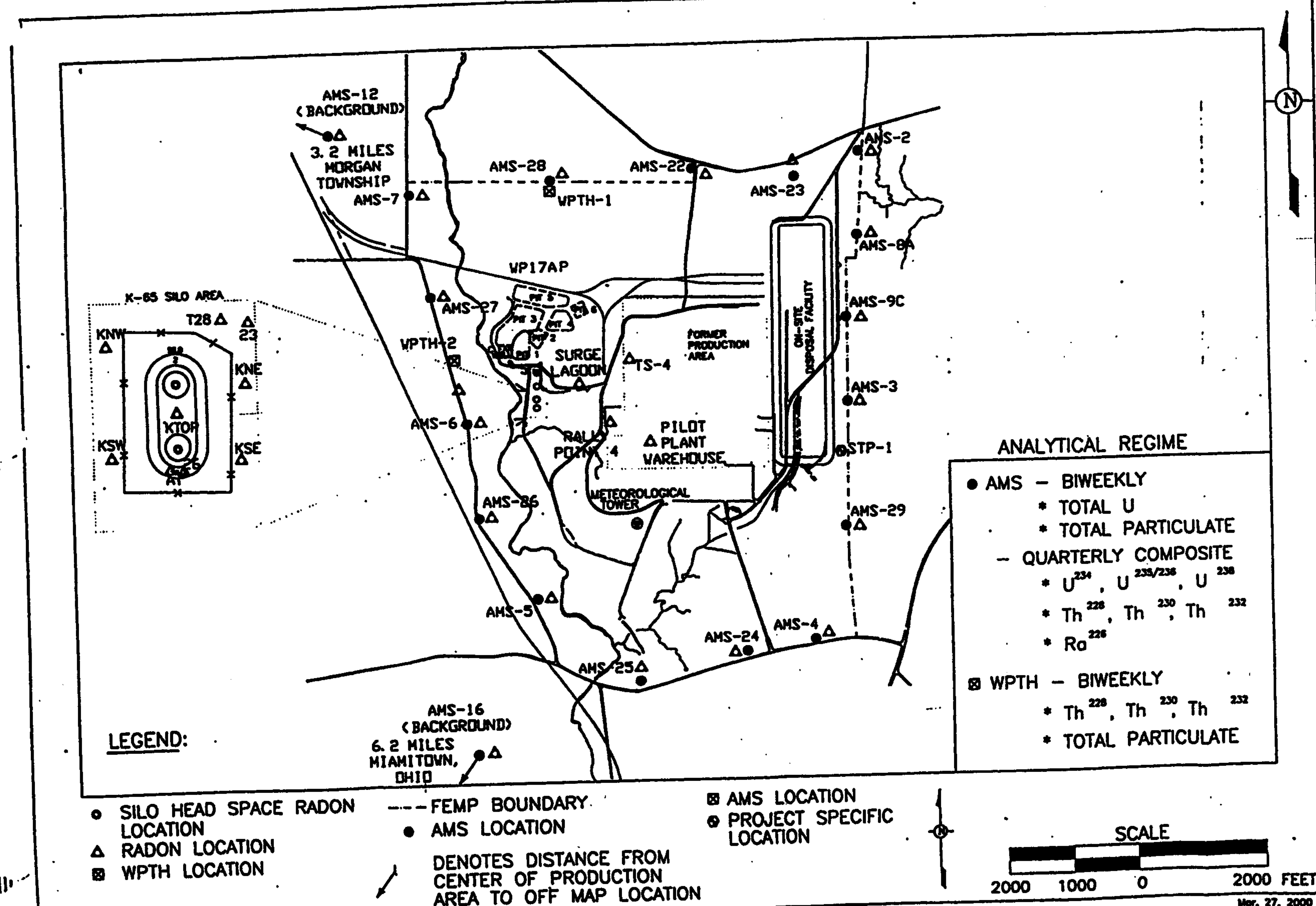
Attachment B

RADIOLOGICAL AIR MONITORING LOCATIONS



LOCATION MAP FOR AIR MONITORING LOCATIONS

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SILO 3 GROSS DECONTAMINATION PLAN

Prior to shutdown of the Silo 3 Project and before the subsequent dismantlement of Silo 3 and the new Silo 3 facilities/systems, visible Silo 3 material will be removed from the interior of the silo and from accessible areas of the new facilities/systems.

The general method for this material removal will be pneumatic vacuum cleanup, using the existing HEPA/ULPA-filtered pneumatic retrieval system and/or portable HEPA/ULPA-filtered vacuum units. The mechanical retrieval system, including the remotely controlled excavator, may also be used to mechanically loosen material from surfaces (by raking, brushing, etc.) and to prepare the material for vacuum pickup. The excavator may be used to manipulate the vacuum hoses. Operating personnel entry into the silo and other contamination areas will be minimized to the extent practical and will be strictly controlled.

CCTV-type cameras will be used to inspect the silo interior and other areas, and will be used to view the gross decontamination operations.

The material will be collected, packaged, and shipped off-site for disposal in a manner similar and consistent with the processing of the bulk of the retrieved Silo 3 material. The generation of secondary waste is not anticipated and, if necessary to generate, the detailed plans and procedures will focus on minimization of secondary waste.

Detailed plans and procedures will be developed when the bulk of the Silo 3 material has been removed from the silo.

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SILOS PROJECT

Health and Safety Controls

40000-PL-0014

MARCH 2002

ORIGINAL

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO
U.S. DEPARTMENT OF ENERGY

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This document has been reviewed and approved by:

Project Manager:	[signature]	Date:	4/18/02
Health and Safety Manager:	[signature]	Date:	4-18-02
Industrial Safety Lead:	[signature]	Date:	4/18/02
Industrial Hygiene Lead:	[signature]	Date:	4/18/02

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1.0 PURPOSE

The Health and Safety Controls portion of the Remedial Design Package is designed to illustrate the planned preventative or mitigative measures to address the occupational hazards identified for the Silos Project. The Health and Safety Controls are presented consistent with the Silos Health and Safety Plan. The Silos Health and Safety Plan takes into account the specific hazards inherent to the Silos Project site and presents procedures to be followed by Fluor Fernald, its subcontractors, and all other on-site personnel to avoid and, if necessary, protect against health and/or safety hazards. Exhibit 1.0-1, an excerpt from the Silos Health and Safety Plan, illustrates the activities associated with the Silos Project and the hazards associated with the activities.

The Health and Safety Matrix (Exhibit 1.0-2) lists the occupational hazards as identified in the Silos Project Health and Safety Plan. The hazards identified in the Health and Safety Matrix are limited to those considered to be common construction and/or occupational safety hazards. These hazards are addressed by the safety programs, policies and procedures used to ensure that work is performed safely. Some of the health and safety controls used to mitigate the occupational hazards identified are listed in terms of:

- Frequency and type of monitoring required
- Personnel Protective Equipment (PPE)
- Training Requirements
- Medical Monitoring Requirements
- Administrative and Engineering Control Measures
- Permit(s)
- Decontamination and Disposal Procedures

The FEMP Emergency Plan, PL-3020 describes the emergency management program that responds to potential hazards at the site. Potential hazards identified at FEMP include severe weather, hazardous and radiological material releases, bomb threats, vehicle/transportation accidents, earthquakes and other events. The Emergency Plan identifies the responsible parties to contact in the event of an emergency and details which personnel would respond to the event. Specific elements of emergency support procedures are addressed in the Silos Project Health and Safety Plan. These elements include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

The health and safety controls will be developed further as the Operations Phase of the Silos Project is further delineated and with the development of activity specific Work Plans. Additional occupational hazards and associated mitigative measures may be identified as the project progresses.

Exhibit 1.0-1. Occupational Hazards Identified in the Silos Project Health and Safety Plan

- Motor vehicles, heavy equipment and crane operations (cranes, back hoes)
- Cutting and welding
- Overhead hazards
- Material handling (rigging, forklifts)
- Chemical and Radiological hazards
- Energy control (lockout/tagout)
- Silo integrity
- Falling hazards
- Slips and trips
- Heat and cold stress
- Electrical shock
- Lifting and straining
- Excavation and trenching
- Confined space entry

Exhibit 1.0-2. Health and Safety Controls based on the Silos Project Health and Safety Plan

ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements	Work in Silos area Work in a construction area	Thermoluminescent Dosimeter (TLD) *Fluor Fernald* Radiological Control Technician (RCT) Periodic Monitoring as required	Steel toed, leather safety boots (ANSI Z41) Hard hat (ANSI Z89.1) Safety glasses w/ rigid side shields (ANSI Z87.1) Leather palm work gloves for sharps, abrasives, hot surfaces or pinch points during use of power hand tools/equipment (The above listed PPE is to protect from dropped objects, overhead hazards, eye injury, and punctures) PPE appropriate to the specific task beyond the standard required PPE will be identified in the Work Plans	General Site Worker • Site GET Training • Site Worker Training • Rad Worker I or II • 8 hr. Supervised field experience • Construction Rules & Regulations • Orientation on the HASP including matrix, and • Orientation on Project Specific MSDSs	Medical surveillance exam: baseline, annual, and termination Report all injuries to *Fluor Fernald* Medical Department Baseline, annual, and termination urine sample	Attend a pre-work kickoff/safety meeting Daily job briefing at start of shift, after lunch, and when beginning new tasks *Fluor Fernald* to inspect all equipment prior to entering site Weekly safety meeting held on the first working day of the week Fluor Fernald approved Work Plans	Work Permit Radiological Work Permit (RWP) Site Dome Access Permit if working inside Silos 1 and 2 boundary fence	Personnel and material radiological contamination monitoring as required by Radiological Work Permit
	Work in Contamination Areas (Uranium)	General Area (GA) air sampling by *Fluor Fernald* (Uranium) Breathing Zone air sampling for at least 25% of the workers by *Fluor Fernald*	A minimum of full cloth anti-Cs for hands-on work Full-face respirator with magenta (HEPA cartridges as required by RWP) PAPR as required by RWP	Respirator training and fit-test PAPR Training if PAPRs are worn Rad Worker II 24 hr Supervised field experience	Medical approval for respirator use Initial, every 60 days, and termination urine sample Initial, annual and termination in-vivo exam	Dust suppression technologies (including use of a surfactant) as required by the Radiological Work Permit Visitors who are not Rad Worker II trained are to obtain authorization from the Radiological Control Program Team Coach Fluor Fernald	RWP	Disposal of contaminated material (anti-C, waste, etc) in supplied bags or containers Personnel and material radiological contamination monitoring required to exit Contamination Area

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Work in Contamination Areas (Radium)	(Radium) Breathing Zone air sampling for 100% of the workers by Fluor Fernald	Cloth anti-Cs with disposable outer anti-Cs for Radium Contamination Areas Air-supplied hood as required by RWP	Same as Uranium Contamination Area plus Air-supplied hood training, if air-supplied hood is worn	Same as Uranium Contamination Area plus Baseline and incident fecal sampling as required for radium/thorium contamination areas.	Same as Uranium Contamination Area	RWP	Same as Uranium Contamination Area
	Heat Stress	Physiological monitoring Ambient temperature monitoring	Cool vests or cool suits (optional)	Safety meetings concerning signs and symptoms of heat stress	Fluor Fernald Medical approval for working in hot environments	Fluor Fernald-approved heat stress program Work/rest regimen based on physiological monitoring shall be used Cool room, including water		
	Cold Stress	Ambient temperature monitoring	Clothing suitable for cold weather	Safety briefing on cold stress If temperature ≤32°F, special briefing on use of PAPRs in cold weather (if PAPRs are worn)	Fluor Fernald Medical approval for working in cold environments	Fluor Fernald-approved Cold Stress Program Identify a warm-up area(s) to be used Work/rest regimen may be used Use of PAPRs in cold weather is restricted as follows: • 0 to 15°F, Time is limited to 15 min. continuous use; and • <0°F, Use of PAPRs is prohibited except for emergency use.		
	Eye injury		Safety glasses with rigid side shields (ANSI 287.1)	Worker Awareness Training	Report all injuries to Fluor Fernald Medical Department	Attend a pre-work kickoff/safety meeting. Fluor Fernald Work Plans		
	Overhead hazards		Hardhat (ANSI 298.1)	Worker Awareness Training				
	Dropped Objects		Steel-toed, leather safety boots (ANSI 241)	Worker Awareness Training				

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements. (continued)	Elevated work (falls from elevations)		Body harness and lanyard	Training in proper use of fall protection equipment		100% fall protection required for unguarded work locations≥ 6 feet, including work assembling and disassembling scaffold and working from ladders Barricades and post signs in the area(s) below the elevated work Secure lanyard to structure capable of holding 5000 lbs. Quarterly inspection of equipment by the competent person Inspect equipment before use		
	Ladders and scaffolding		See "Elevated Work" above	Competent person for inspection of ladders and scaffolding Scaffold training for users and erectors		Ladders to be secured in place at the top when set up for use Ladders to have current inspection sticker Scaffolding to have current inspection tag		
	Use of a man lift (e.g., JLG, Grove, Scissors)		Safety harness and lanyard (except on scissors-type lifts with top rail, mid rail and toe boards)	Trained operator		All lift units are to be inspected and operated as defined within the manufacture's operation/safety manual Competent person to perform monthly inspections Operators to inspect daily or at the beginning of each shift 100% tie off when in equipment except for Scissors lifts that have top rail, mid rail, and toe boards Barricade around areas of operation Maintain ≥ 10 feet from power lines		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements. (continued)	Silo dome collapse		Safety harness and lanyard			Fluor Fernald approved Work Plans Comply with Technical Safety Requirements for Silo domes of the Preliminary Hazard Analysis Report, Chapter 5, to include: • Restrict placement on loads on domes of Silos 1, 2, or 4 so no live load greater than 700 lbs. (including up to three persons). • Evaluate modifications in dead loads applied to silos. • Equipment loads shall be distributed over the largest area practical. • No equipment loads distributed over an area smaller than 3-foot-diameter circle	Dome Access Permit	
	Hoisting/Rigging			Competent person for Hoisting and Rigging Inspection Pre-Work Rigging Orientation Briefing on lifting plan prior to the lift		Comply with DOE Hoisting and Rigging Manual requirements, Chapter 15 Lifting Plan Qualified Rigger verification form for workers Avoid load swing paths over Silo 1, 2, & 3. A Critical Lift Plan shall be required for all lifting of loads over Silos 1, 2 & 3.		
	Hand and power tools		As recommended by the manufacturer	Worker Awareness Training. Review of manufacturer's instructions for use.		Daily inspection of tools prior to use. Remove damaged tools from use and tag as "Do Not Use."		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Weather limitations for outdoor activities					Outdoor activities will be suspended if the following condition(s) occurs(s): • Lightning; • Heavy persistent rain; • Any wind velocity of 25 mph or greater will stop elevated work and crane work; and • Any weather condition whose impact is judged to be detrimental by the Fluor Fernald Health and Safety Officer		
	Handling sharp objects/ Punctures/ Pinch Points.		Leather palm gloves		Report all injuries to supervisor and Medical.	Sharp edges will be identified, eliminated, or protected. All hand and power tools will be maintained in safe condition. Guards will be kept in place on all hand/power tools. Alert workers of possible pinch points.		
	Impalement					Protective caps will be placed on the protruding ends of rebar. Sharp edges will be identified, eliminated, or protected		
	Noise	Noise monitoring and/or dosimetry may be conducted to verify compliance with regulations (as required)	Hearing protection required if noise levels ≥ 85 dBA (i.e., when using power tools or heavy equipment) Hearing protection will provide a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs will be worn as required).	Personnel exposed to an 8-hr TWA of 85 dBA or greater shall be in a Hearing Conservation Program (HCP)	Audiometric evaluation required for employees in Hearing Conservation Program.	Areas and equipment where noise ≥ 85 dBA are to be posted "Hearing Protection Required" Engineer or design out noise whenever possible Time limits or job rotation may be used in conjunction with engineering controls		Store reusable hearing protection in a sanitary manner

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Fire (open flame during welding or cutting) See also specific activities for additional requirements when cutting lead painted or contaminated materials		Flame retardant clothing or outer anti-Cs Welder's leathers (when debris contacts clothing) UV eye protection when welding	Fire watch training		Fire extinguisher available near work site Remove combustibles and cover area with fire resistant welding blankets or wet down work area as necessary Maintain a fire watch at least 30 minutes after work is completed Welding screens as needed Ventilation as needed	Open Flame/ Welding Permit Confined Space Evaluation/ Permit if cutting or welding in confined space	
	Vibration from powered hand tools.		Anti-vibration gloves shall be used during extended use of vibrating hand tools more than 2 hours on 1 day or more than 1 hour on consecutive days	Briefing for involved workers on vibration hazards		Personnel shall dress warmly when using power hand tools in cold weather Personnel shall take 10-minute breaks from vibration for each hour a vibrating hand tool is operated		
	Confined Space.	Fluor Fernald performs initial monitoring Fluor Fernald performs continuous monitoring when required	PPE required for entry into permit required, confined spaces	Confined Spaces Training required for entry into permit required confined spaces	Fluor Fernald medical approval for permit required, confined space entry	Work from outside confined space when possible Controls required for entry into permit required confined spaces	Confined Space Evaluation/ Permit	
	Back Injury (Lifting Sprain and Strains)			Must evaluate personnel if required to lift 35-50 lbs. Cannot exceed 50 lbs. without assistance Site personnel will be instructed on proper lifting techniques		Mechanical devices will be utilized to reduce manual handling of materials. Team lifting will be used in lieu of mechanical devices.		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Operation of mobile equipment (e.g., bulldozer, bobcat, forktruck, backhoe) (Property Damage)		Hearing protection required if noise levels ≥ 85 dBA. Orange Vest for nearby employees	Qualified equipment operator		Competent person to inspect equipment before use at FEMP and quarterly Evaluation prior to operation of any mobile equipment of the berms or within 10 feet of the silos. Rollover protection structures Overhead protection Daily inspection of equipment by the operator prior to use. Audible backup alarm and horn No obstructed rear views Barricade the swing radius of equipment Fire extinguisher Seat belts to be worn		
	Penetration of ground or wall penetrations - Contact with/ Hitting existing buried utilities.			Site Energy Control Training (OP-0004) for involved workers and supervisors if location of utilities cannot be determined Qualified equipment operator		Review as built drawings Daily Penetration Permit Briefing Barricade & protect as needed Flag utilities within 10 feet of penetration Lockout and tagout utilities if location of utilities cannot be determined Hand dig within 3 feet of underground utilities	Penetration Lockout/ Tagout	

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Connection to site utilities and systems			Site Energy Control Training (OP-0004) for involved workers and supervisors		Verify isolation of utilities and systems Energy isolation plan Lockout/Tagout Specific Equipment Plans	Service Interruption Permit if utilities are disrupted Also see "Ground Penetration/ Excavation/ Radiological Contamination" below	
	Electrical Shock/ Electrocution (Hazardous energy)			Site Energy Control Training (OP-0004) for involved workers and supervisors		All electrical work will be performed by trained/ qualified electricians. All lockout/tagout procedures will be followed as outlined in the HASP and OP-0004. All electrical installation shall comply with National Electrical Safety Codes (NESE), and National Electric Code (NEC). Live parts of wiring or equipment shall be guarded to protect all persons from contact. No energized work will be permitted on live lines/equipment. Electrical tie-ins to existing overhead lines on existing equipment shall require and Energy Isolation Plan and a Service Interruption Permit. Shall maintain a minimum ten (10) feet clearance from overhead lines. Approach distance for qualified employees shall be followed as listed in 10 CFR 1926.416.	Outage Permit if utilities are disrupted	

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Electrical Shock/ Electrocution (Hazardous energy) (continued)					Flexible cords shall be elevated GFCI's required Flexible cords shall be UL-listed and rated for hard usage and damp locations Flexible cords shall be protected from vehicle traffic All electric tools shall be inspected for damage prior to use and used in accordance with the manufacturer's guidelines		
	Slip/Trip/Falls		Elevated work will require fall protection (full body harness/lanyard) Steel-toed boots with substantial soles			Daily Inspections for Housekeeping. Work areas and means of access shall be maintained safely and orderly. Maintain clear travel paths. Barricade work areas. Level terrain will be utilized as unloading areas. Elevate electrical cords/welding leads when possible Tripping and poor footing hazards will be repaired as they are discovered or clearly identified. All extension cords, cables and hoses will be run overhead when possible.		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Vehicular Traffic		Orange traffic vests will be worn when working near roadways and equipment.	Qualified equipment operator Worker awareness training		Spotters will be used when backing up trucks and moving equipment in congested areas. Equipment will be equipped with backup alarms Daily vehicle inspections Equipment equipped with horns Flaggers used as needed		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Excavations (Cave in)	Any excavation four feet and deeper will be monitored for oxygen, combustible gases, and toxic atmospheres prior to entry by personnel.		The Excavation Competent Person shall have appropriate training		Daily inspections conducted by the Excavation Competent Person. Stockpiles shall be placed 3 feet or greater from the excavation Any excavation four feet and deeper will be provided with ladders to allow for means of egress in such a way as to require no more than 25 feet lateral travel. The excavated area will be barricaded to prevent field personnel from falling into the trench (when unattended). Protective systems to prevent excavation cave-in will be affected in excavations greater than five feet in depth, or if deemed necessary by a competent person. All trenching shall be in accordance with the provisions of 29 CFR 1926 Subpart P. Smoking or open flames will not be allowed near work areas, if open flames must be used, procedures outlined in the HASP for hot work will be followed. During backfilling operations, warning tape will be laid down to mark buried utilities. HASP and Work Plans	Penetration	

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Worker Struck By/ Against/ Between Equipment		Orange traffic vests will be worn when working near roadways and equipment.	Qualified equipment operator. Worker awareness training		Eye contact with operators will be made before approaching equipment. Barricade work areas Use of protective shields or guards on rotating equipment. Equipment will not be approached on blind sides. The lift and swing path will be maintained clear of obstructions. Personnel will maintain a safe distance from the swing radius of the suspended loads. Personnel will understand and review hand signals. All machines will be equipped with backup alarms. Spotters will be used when backing up trucks and moving equipment in confined areas.		
	Spills					Spill and absorbent materials will be readily available. Employees will be instructed as to proper fueling techniques. Fuel nozzle and hose will be secured in holder after use. Fuel caps will be secured after fueling operations.		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Fire/Explosion					All fuel tank/trucks shall be grounded and bonded during fueling operations. Smoking and open flames are not permitted within 50 feet of fueling/greasing areas. Safety Cans (Type II, UL approved) will be used All equipment shall be equipped with 10-lb. ABC type fire extinguishers. 10-lb. ABC type fire extinguishers shall be readily available during fuel/greasing operations.		
	Chemical Exposure	Air monitoring may be conducted to document worker exposure.	Personal Protective Equipment required by Material Safety Data Sheets (MSDSs), Work Plan, and/or FEMP Work Permit	Material Safety Data Sheets shall be reviewed with all workers prior to their starting work. Hazard Communication Training	Inclusion in the appropriate medical surveillance program if required based on exposures.	Chemical overexposures shall be reported to the supervisor and Medical (as necessary). Follow requirements on MSDS Chemical Inventory Hazard Communication	Chemical/ Hazardous Material Work Permit (as required).	Skin will be rinsed with water if contact with chemicals occurs. Portable eyewash and/or safety shower (as required).
	Overhead Utilities					Flag person as appropriate. Walk down of location to familiarize workers. All equipment will stay a minimum of ten feet from power lines of 50 kv or less. This minimum distance will be increased as the voltage of the power lines increase Insulate or de-energize lines as needed.		
1.0 General Project minimum requirements (continued)	Dust Exposure	Fugitive dust monitoring as applicable.				Water truck or other wetting device.		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
	Compressed Air			Only workers trained in the proper use, storage, and movement of compressed air cylinders shall be allowed to handle them.		Compressed air cylinders shall be appropriately secured, stored and labeled. Compressed air cylinders shall be stored with the protective caps on. Compressed air hose connections shall be secured with wire or chain to prevent whipping if they become separated.		

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Crane use			Qualified equipment operator		Mobile cranes and boom trucks shall be inspected by Fluor Fernald's crane inspector prior to entry onto and use at the site. Avoid load swing paths over Silos 1, 2, & 3 A Critical Lift Plan shall be required for all lifting of loads over Silos 1, 2, & 3 Copies of the annual inspection documentation shall be presented to Fluor Fernald 24 hours before delivery of any mobile cranes or boom trucks. Maintenance records shall be presented to Fluor Fernald prior to use of equipment. Daily and monthly inspections of cranes and hoists will be recorded on Fluor Fernald Forms: • FS-F-2965, Fluor Fernald Mobile Crane Operator Checklist, • FS-F-2423, Fluor Fernald Record of Daily Hoist Check, and • FS-F-3948, Fluor Fernald Wire Rope & Hook Condition. Only hooks with latches to bridge the throat opening shall be used. All slings shall have a certificate of proof test to 200% of vertical working load and a manufacturers tag indicating the manufacturers name, wire rope construction and the vertical work load limit. Periodic inspections of structural and mechanical below-the-hook lifting devices shall be conducted referencing Fluor Fernald Form FS-F-2478, Fluor Fernald Lifting Devices, Grabs, & Tongs Checklist	Lift and Critical Lift as applicable	

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ACTIVITY (TASKS)	HAZARD IDENTIFICATION	FREQUENCY & TYPE OF AIR AND PERSONNEL MONITORING REQUIRED	PERSONAL PROTECTIVE EQUIPMENT	TRAINING REQUIREMENTS	MEDICAL MONITORING & SURVEILLANCE REQUIREMENTS	ADMINISTRATIVE & ENGINEERING CONTROL MEASURES	PERMIT(S)	DECONTAMINATION & DISPOSAL PROCEDURES
1.0 General Project minimum requirements (continued)	Biological Hazards (insect stings, plants and snake bites)		Use insect repellent as needed. Gather pants legs and tape closed as needed. Wear a long sleeve shirt as appropriate.	Brief workers on insect, snake and plant hazards		Inspect work areas for potential biological hazards prior to start of activities.		Wash any areas of skin exposed to poisonous plants.
	Concrete Splash		Neoprene or Nitrate gloves for hand protection Rubber pullover boots Long sleeve shirts Splash goggles or face shield and safety glasses	Worker awareness training with review of MSDSs.				Wash any area of body that comes in contact with the wet concrete Follow recommendations of Manufactures MSDS for eye contact. Eyewash stations.
	Metal Fumes (Welding/Torch Work)	Personal Exposure Monitoring based on type of metal being welded, welding rods used, and duration of task.	Respiratory Protection may be required in enclosed or confined spaces.	Worker awareness training with review of MSDSs.	Medical approval for respirators if one is used. Fit Test for respirator	Welding and torch work to be performed in open, well-ventilated areas when possible		Wash hands and face prior to eating and drinking and at end of shift

000414

4267

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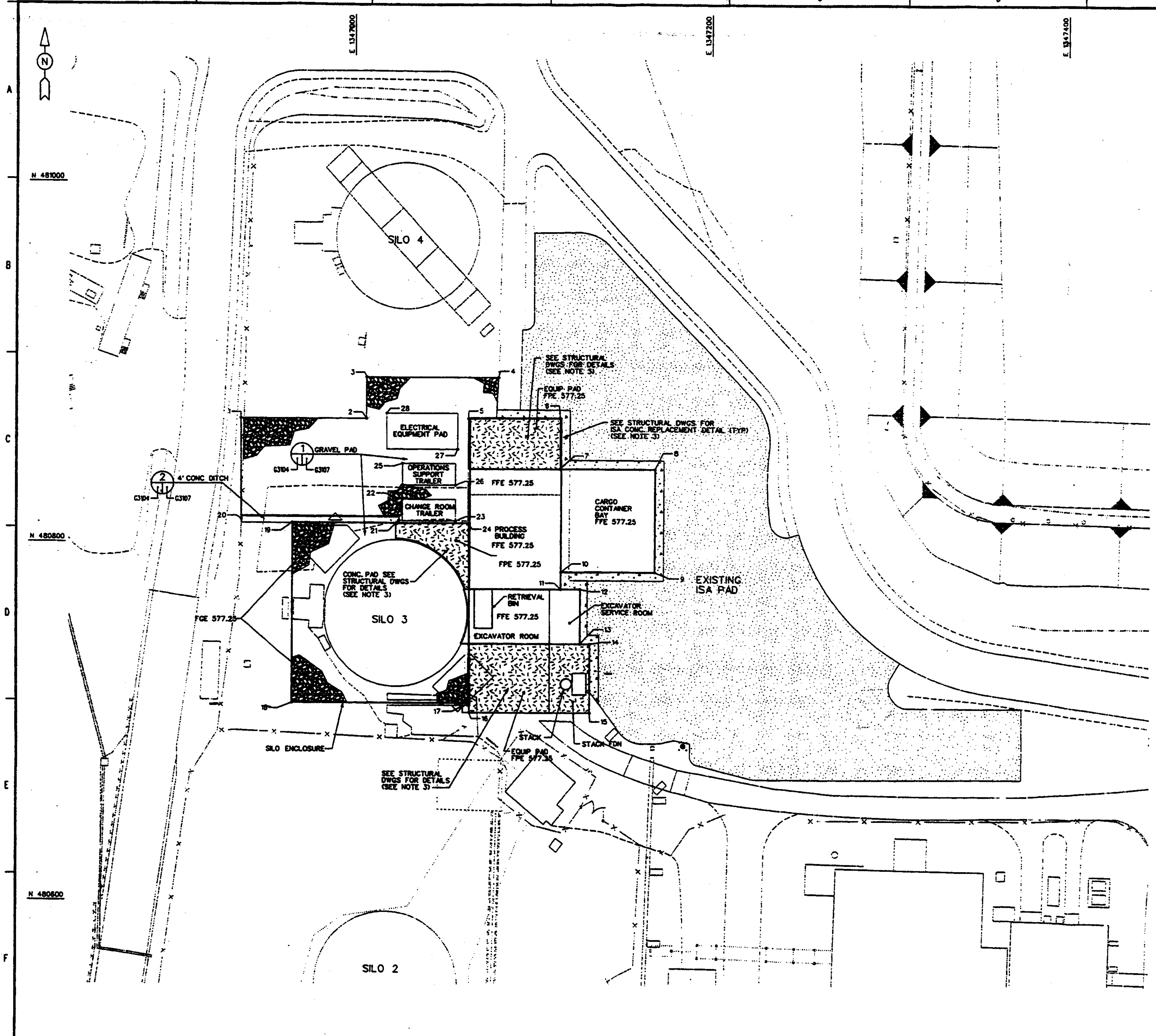


NOTES:

1. FOR GENERAL NOTES AND LEGEND SEE SHEET G3102.
2. FOR GENERAL ARRANGEMENT SEE DRAWING 94X-3900-M-01461.
3. STRUCTURAL FOUNDATIONS AND BUILDINGS TO BE PLACED PER FUTURE CONSTRUCTION PACKAGE.

COORDINATE CHART

POINT NO.	NORTHING	EASTING
1	480868.98	1346935.17
2	480868.98	1347006.90
3	480892.19	1347006.88
4	480891.98	1347081.21
5	480869.03	1347084.57
6	480866.97	1347116.03
7	480841.01	1347116.03
8	480840.96	1347189.63
9	480783.63	1347189.63
10	480783.64	1347116.80
11	480773.96	1347116.80
12	480773.96	1347127.63
13	480743.46	1347127.63
14	480743.46	1347133.23
15	480704.90	1347133.23
16	480704.86	1347065.36
17	480710.17	1347065.26
18	480710.17	1346984.72
19	480810.59	1346984.13
20	480812.60	1346935.51
21	480812.34	1347025.37
22	480824.16	1347026.65
23	480811.99	1347057.36
24	480810.52	1347064.57
25	480843.99	1347027.36
26	480831.99	1347057.36
27	480851.99	1347058.46
28	480871.99	1347018.46

REF DWG NO.	DRAWING TITLE
94X-3900-M-01461	MECHANICAL/GENERAL ARRANGEMENT PLOT PLAN

SCALE: 1" = 20'

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
0	ISSUED FOR CONSTRUCTION	04/15/02		

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

JACOBS

PROJECT NAME: SILO 3

DRAWING TITLE: CIVIL SITE PLAN

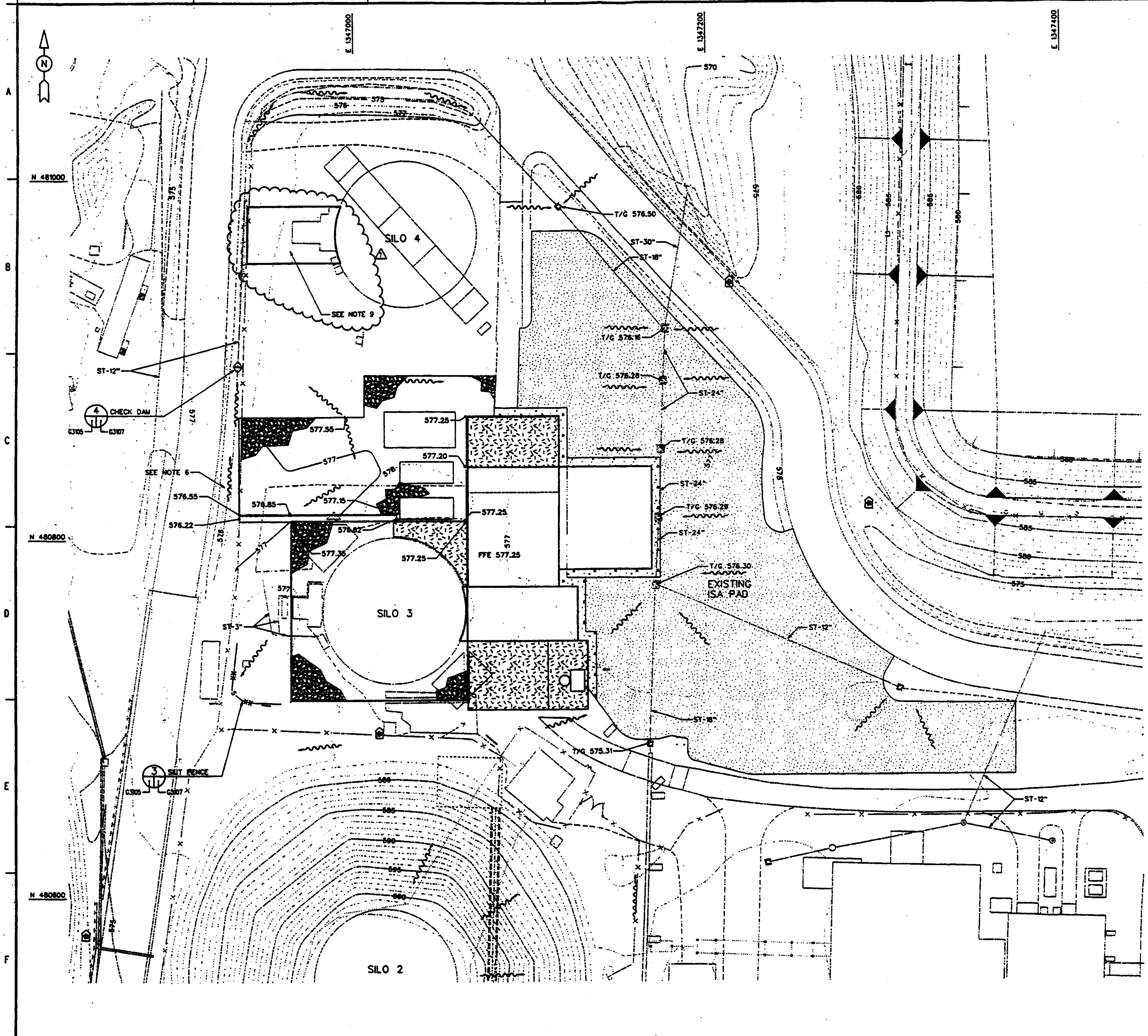
000415

SCALE: 1"=20'

PROJECT NO. 40430

94X-3900-G-01297 | G3104 | 0

4267



NOTES:

1. ALL DRAINAGE SHALL BE DIRECTED TOWARD ONE OF THE EXISTING ISA PAD DRAINAGE STRUCTURES WHERE POSSIBLE.
2. ALL SEDIMENT AND EROSION CONTROL FEATURES SHALL BE INSTALLED AS REQUIRED AND OPERATIONAL PRIOR TO EARTH DISTURBANCE ACTIVITIES.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL OF STORMWATER COLLECTED IN AREAS EXCAVATED BELOW GRADE. ANY DISCHARGE WATER RESULTING FROM PUMPING OF GROUND OR RUNOFF WATER FROM TRENCHES OR OTHER AREAS MUST BE ROUTED THROUGH SEDIMENTATION CONTROL STRUCTURES AND NOT DISCHARGED DIRECTLY INTO RECEIVING CHANNELS. RUNOFF SHALL BE MANAGED IN ACCORDANCE WITH FEMP STORMWATER POLLUTION PREVENTION PLAN AND TRANSPORTED TO AN ON-SITE LOCATION DETERMINED BY THE OWNER.
4. ROOF DRAINS FROM ALL BUILDINGS SHALL DRAIN TO THE EAST TOWARD THE ISA PAD WHERE POSSIBLE.
5. SILT FENCE LOCATIONS SHOWN ARE APPROXIMATE. ADD ADDITIONAL SILT FENCE AND/OR ADJUST LOCATION AS NECESSARY TO MEET FIELD CONDITIONS.
6. GRADE DITCH TO FLOW TO THE NORTH.
7. CONTRACTOR SHALL PROTECT EXISTING CATCH BASINS AND OTHER STORMWATER CONTROLS DURING CONSTRUCTION.
8. FOR GENERAL NOTES AND LEGEND AND UTILITY DESIGNATORS SEE SHEET G3102.
9. EXCAVATION, GRADING AND BACKFILLING WILL BE PERFORMED FOR THE SILO REINFORCEMENT DEMONSTRATION IN THE SILO 4 AREA.

REF DWG NO.	DRAWING TITLE

SCALE: 1" = 20'

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
1	REVISED PER DCN 40430-JEG-001	04/30/02		
0	ISSUED FOR CONSTRUCTION	04/15/02	WDB III	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3

000416

DRAWING TITLE: CIVIL

GRADING, DRAINAGE AND EROSION CONTROL PLAN

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
W.MARVIN	04/11/02	F.PARTON, JR.	04/11/02	W.D.BARTON III	04/11/02

SCALE	1"=20'
CLASS	U
T.O. NUMBER	N/A
PROJECT NO.	40430
JEG PROJECT NO.	35H19605
FILENAME	94XG1298.DGN
DRAWING INDEX CODE NO.	94X-3900-G-01298
SHEET NO.	G3105
REV. NO.	1

4267

SILO 3 - MATERIAL BALANCE TABLE

STREAM NUMBER	1A	1B	1C	2	3	4A	4A	4B	4B	5	6	7	8	9	9	10
STREAM DESCRIPTION	PNEUMATIC RETRIEVAL OF SILO 3 MATERIAL	MECHANICAL RETRIEVAL OF SILO 3 MATERIAL	MATERIAL DISCHARGED FROM PNEUMATIC RETRIEVAL COLLECTOR	AIR DISCHARGED FROM PNEUMATIC RETRIEVAL COLLECTOR	AIR DISCHARGED FROM CARTRIDGE FILTER	MATERIAL TO PACKAGING STATION A		MATERIAL TO PACKAGING STATION B		SUPPLY AIR TO SILO 3	AIR FLOW FROM SILO 3 VENT	TOTAL AIR FLOW FROM SILO 3	AIR FLOW FROM RETRIEVAL BIN	AIR FLOW FROM INCLINED CONVEYOR (TOP)		AIR FLOW FROM INCLINED CONVEYOR (BOTTOM)
	PHASE 1	PHASE 2	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 2	PHASE 1	PHASE 2	PHASE 1	PHASE 2	PHASE 2	PHASE 2	PHASE 1	PHASE 2	
SOLID AND LIQUID PHASES																
SILO 3 MATERIAL (LB/HR)	11,082	11,082	11,071	11.0	.0011	11,071	10,982	11,071	10,982		22	22	64		6.6	6.6
WATER (LB/HR)	366	366	366	0.4	.00004	366	363	366	363		1	1	2		0.2	0.2
TOTAL (LB/HR)	11,448	11,448	11,437	11.4	.00114	11,437	11,345	11,437	11,345		23	23	66		6.9	6.9
DENSITY (LB/FT^3)	42.4	42.4	42.4			42.4	42.4	42.4	42.4		42.4	42.4	42.4		42.4	42.4
INSTANTANEOUS FLOW RATE (YD^3/HR)	10	10	10			10	10	10	10							
DESIGN FLOW (GPM)																
GAS PHASE																
AIR (LB/HR)	5,259	5,186		5,259	5,259					5,259	4,383	4,383	12,710	—	1,315	1,315
WATER IN AIR (LB/HR)	83.2	96		83	83					83	69.3	69.3	201	—	20.8	20.8
TOTAL (LB/HR)	5,343	5,283		5,343	5,343					5,343	4,452	4,452	12,911	—	1,336	1,336
AIR (SCFM)	1,200	1,200		1,200	1,200					1,200	1,000	1,000	2,900	—	300	300
RADON (pCi/L)	180		180	180	180					0	213	213	213	—	213	213
RADON (Ci/HR)	.00037	0.0008	.00037	.00037	.00037					0	0.0004	0.0004	.0011	—	0.0001	0.0001
TEMPERATURE (F)	70	70	70	70	70	70	70	70	70	70	70	70	70	—	70	70
											NOTE 1 & 2				NOTE 6	

STREAM NUMBER	11	11	12	12	13A	13B	14	15	16	17	18	19	20	21	21	22	22
STREAM DESCRIPTION	TOTAL AIR FLOW FROM INCLINED CONVEYOR		TOTAL AIR FLOW FROM SILO 3, RETRIEVAL BIN & CONVEYOR		EXHAUST FROM PNEUMATIC RETRIEVAL SYSTEM	EXHAUST FROM AUXILIARY VACUUM BLOWER	TOTAL EXHAUST FROM EXCAVATOR ROOM DURING PNEUMATIC RETRIEVAL	SUPPLY AIR TO FINES COLLECTION BINS AND PACKAGING SYSTEMS	SUPPLY VENT AIR TO FINES COLLECTION BINS	SUPPLY VENT AIR TO PACKAGING SYSTEMS	VACUUM EXHAUST FROM FINES COLLECTION BINS	VACUUM EXHAUST FROM PACKAGING SYSTEMS	PROCESS EXHAUST FROM PACKAGING SYSTEMS	TOTAL FLOW TO PROCES VENT DUST COLLECTORS		TOTAL FLOW TO PROCESS HEPA FILTERS	
	PHASE 1	PHASE 2	PHASE 1	PHASE 2	PHASE 1		PHASE 1							PHASE 1	PHASE 2	PHASE 1	PHASE 2
SOLID AND LIQUID PHASES																	
SILO 3 MATERIAL (LB/HR)		13.3		99.6											99.6		0.1
WATER (LB/HR)		0.4		3.3											3.3		0.0
TOTAL (LB/HR)		13.7		102.9	0.0024 GR/HR										102.9		0.1
DENSITY (LB/FT^3)		42.4		42.4											42.4		42.4
INSTANTANEOUS FLOW RATE (YD^3/HR)																	
DESIGN FLOW (GPM)																	
GAS PHASE																	
AIR (LB/HR)	1,315	2,630	19,723	19,723	5,259	1,096	18,408	1,096	1,096	1,096	1,096	1,096	4,383	24,106	24,106	24,106	24,106
WATER IN AIR (LB/HR)	20.8	41.6	311.9	311.9	83	17.4	291.1	17.4	17.4	17.4	17.4	17.4	69.3	381.2	381.2	381	381
TOTAL (LB/HR)	1,336	2,671	20,035	20,035	5,343	1113	18,699	1113	1113	1113	1113	1113	4,452	24,487	24,487	24,487	24,487
AIR (SCFM)	300	600	4,500	4,500	1,200	250	4,200	250	250	250	250	250	1000	5,500	5,500	5,500	5,500
RADON (pCi/L)	213	213	213	213	180	180	0	0	0	0	213	213	213	33	213	33	213
RADON (Ci/HR)	0.0001	.0002	0.0001	0.0016	0.00037	0.00037	0	0	0	0	.0001	.0001	.0004	.0004	0.0020	.0004	0.0020
TEMPERATURE (F)	70	70	70	70	200	100	70	70	70	70	70		70	70	70	70	70
							NOTE 5					NOTE 3 & 4	NOTE 3				

STREAM NUMBER	23	24	25	26	26	27	28	29	30
STREAM DESCRIPTION	TOTAL FLOW TO PROCESS EXHAUST FANS	TOTAL FLOW FROM PROCESS EXHAUST FANS	PROCESS BUILDING EXHAUST	TOTAL EXHAUST FROM STACK		DISCHARGE OF EXCAVATOR ROOM AND EXCAVATOR SERVICE ROOM SUMP PUMPS	DISCHARGE OF WASTEWATER PUMPS	FINES FROM PROCESS DUST COLLECTORS TO FINES COLLECTION BINS A&B	DISCHARGE OF CONTAMINATED SUMP PUMPS
				PHASE 1	PHASE 2				
SOLID AND LIQUID PHASES									
SILO 3 MATERIAL (LB/HR)								99.5	
WATER (LB/HR)								3.3	
TOTAL (LB/HR)	0.216 GR/HR	0.216 GR/HR	0.550 GR/HR	.768 GR/HR	.766 GR/HR		625	102.8	2500
DENSITY (LB/FT^3)								42.4	
INSTANTANEOUS FLOW RATE (FT^3/HR)						20	25		100
DESIGN FLOW (GPM)									
GAS PHASE									
AIR (LB/HR)	24,106	24,106	18,408	47,773	42,513				
WATER IN AIR (LB/HR)	381	381	291.1	755.9	672.3				
TOTAL (LB/HR)	24,487	24,487	18,699	48,528	43,186				
AIR (SCFM)	5,500	5,500	4,200	10,900	9700				
RADON (pCi/L)	.00009	.00009	0	20	213				
RADON (Ci/HR)	844pCi/HR	844pCi/HR	0	0.00037	0.0035				
TEMPERATURE (F)	70	100	100	140	100	70	70	70	70
						NOTE 7	NOTE 7	NOTE 7	NOTE 7

NOTES:

1. DURING PHASE 2, AIR WILL BE REMOVED USING STREAM 6.
2. DURING PHASE 1, AIR CAN BE REMOVED USING STREAM 6 DURING SPOOL PIECE ADDITION TO PNEUMATIC VACUUM WAND ASSEMBLY.
3. STREAMS 19 AND 20 ARE OPERATED INDIVIDUALLY AND INTERMITTENTLY AS NEEDED.
4. STREAMS 17 AND 19 ARE OPERATED TO RECOVER MATERIAL IN THE EVENT OF AN OVERFILLED BULK BAG.
5. STREAM 14 WILL BE IN OPERATION DURING PHASE 1 AND SILO 3 INTRUSION ACTIVITIES (CUTTING OF THE CONCRETE WALL).
6. STREAM 9 OPERATES DURING PHASE 1 TO PROVIDE A SLIGHT VACUUM ON FEED CONVEYOR (FDR-10-5102).
7. BASED ON 5% BY WEIGHT OF SILO 3 MATERIAL IN THE WASTEWATER STREAM.

GENERAL NOTES:

1. THIS MATERIAL BALANCE REFLECTS NO "TREATMENT" OF SILO 3 MATERIAL.
2. PHASE 1 APPLIES TO PNEUMATIC REMOVAL OF SILO 3 MATERIAL. PHASE 2 APPLIES TO EXCAVATION OF SILO 3 MATERIAL.
3. MINOR DISCREPANCIES IN MASS BALANCE ARE THE RESULT OF EITHER ROUNDOFF OR TRUNCATION.
4. TOTAL QUANTITY OF SILO 3 MATERIAL TO BE REMOVED IS ESTIMATED TO BE 5088 YD^3.
5. A PHASE DESIGNATION INDICATES USAGE QUANTITY DURING THE INDICATED PHASE ONLY. NO PHASE DESIGNATION INDICATES USAGE QUANTITY IS THE SAME DURING BOTH PHASES OF OPERATION.
6. DENSITY OF 42.4 LB/FT^3 WAS USED FOR SILO 3 MATERIAL FROM HISTORICAL DATA AND CHARACTERIZATION, TREATABILITY AND COMPACTION STUDY.
7. SILO 3 MATERIAL IS 3.2% WATER BY WEIGHT FROM STABILIZATION WORK PLAN 40430-WP-0002. (RMRS)

REF DWG NO.	DRAWING TITLE
F0002	PFD-MATERIAL RETRIEVAL AND FEED SYSTEMS
F0003	PFD-PROCESS VENT AND PACKAGING SYSTEMS
F0004	PFD-WATER AND WASTEWATER SYSTEMS
H0004	HEATING AND VENTILATION AIR FLOW DIAGRAM

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02		
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3

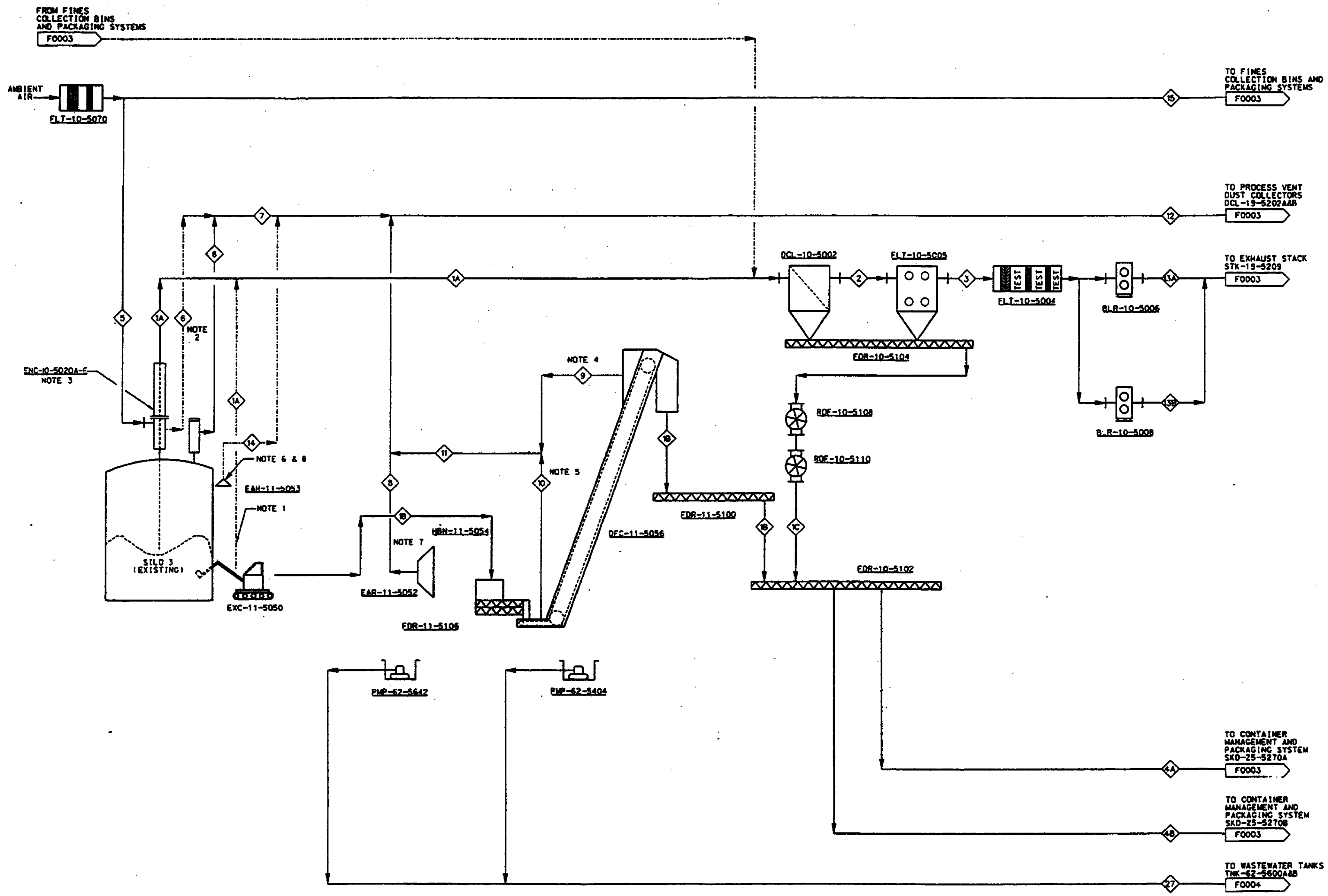
000417

DRAWING TITLE: FLOW DIAGRAMS PROCESS FLOW DIAGRAM MATERIAL BALANCE TABLE

DRAWN BY: J.ROSENBAUM DATE: 03/12/02 — TECHNICAL LEAD: KENNETH RICKETT DATE: 03/12/02 — CHECKED BY: RICHARD L. HICKS DATE: 03/12/02
SCALE: NONE — CLASS: U
PROJECT NO. 40430 — T.A. NUMBER: N/A — JEG PROJECT NO. 35N19805 — FILENAME: 94XF1428.DGN
94X-3900-F-01428 — SHEET NO. F0001 — REV. NO. B

PRELIMINARY
NOT FOR CONSTRUCTION

4267



FLT-10-5070 SUPPLY HEPA FILTER
ENC-10-5020A-E VACUUM WAND MANAGEMENT SYSTEMS A-E (NOTE 3)
EXC-11-5050 EXCAVATOR
EAR-11-5053 EXCAVATOR ROOM HOOD
HBN-11-5054 RETRIEVAL BIN
EAR-11-5052 RETRIEVAL BIN HOOD
FDR-11-5106 RETRIEVAL BIN DISCHARGE FEEDER
PMP-62-5642 EXCAVATOR ROOM SUMP PUMP
PMP-62-5404 EXCAVATOR SERVICE ROOM SUMP PUMP
DFC-11-5056 INCLINED CONVEYOR
FDR-11-5100 TRANSFER CONVEYOR
DCL-10-5002 PNEUMATIC RETRIEVAL COLLECTOR
FLT-10-5005 CARTRIDGE FILTER
FDR-10-5104 PNEUMATIC RETRIEVAL COLLECTOR DISCHARGE FEEDER
FLT-10-5004 HEPA FILTER
ROF-10-5108 PRIMARY ROTARY FEEDER
ROF-10-5110 SECONDARY ROTARY FEEDER
BLR-10-5006 PNEUMATIC RETRIEVAL BLOWER
BLR-10-5008 AUXILIARY VACUUM BLOWER
FDR-10-5102 FEED CONVEYOR

NOTES:

1. PHANTOM LINES (- - - - - -) INDICATE ALTERNATE OPERATION.
2. STREAM 6A IS USED ONLY FOR VACUUM RETRIEVAL WAND ASSEMBLY MANIPULATIONS AND MOVEMENT, AND SPOOLPIECE ADDITION. WHEN IN USE. STREAM 6A WILL HAVE THE SAME FLOW RATE AS SHOWN FOR STREAM 6. PHASE 2.
3. ENC-10-5020 IS TYPICAL OF FIVE SILO-DOME LOCATIONS.
4. STREAM 9 IS IN SERVICE DURING BOTH PHASE 1 AND PHASE 2.
5. STREAM 10 IS IN SERVICE ONLY DURING PHASE 2.
6. AIR SUPPLIED BY HVAC (4200 SCFM). REF DWG. No. 94X-3900-H-01304 (H0003).
7. AIR SUPPLIED BY HVAC (2900 SCFM). REF DWG. No. 94X-3900-H-01304 (H0003).
8. HOOD USED TO EXHAUST EXCAVATOR ROOM DURING PNEUMATIC RETRIEVAL AND DURING SILO 3 WALL CUTTING.

GENERAL NOTES:

1. ALL SYMBOLOGY (E.G., VALVES, SPECIALTY ITEMS, EQUIPMENT); ABBREVIATIONS; SYSTEM NAMES AND NUMBERS; AND EQUIPMENT DESCRIPTIONS AND DESIGNATORS, ARE PROVIDED ON PIPING AND INSTRUMENTATION DIAGRAMS N0001 AND N0003.

REF DWG NO.	DRAWING TITLE
F0001	PFD-MATERIAL BALANCE TABLE
F0003	PFD-WATER AND WASTEWATER SYSTEMS
F0004	PFD-PROCESS VENT AND PACKAGING SYSTEMS
H0003	HVAC AIR FLOW DIAGRAM
N0001	P&ID-PIPING, VALVES AND MISCELLANEOUS
N0003	P&ID-EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY JACOBS

PROJECT NAME: SILO 3

000418

DRAWING TITLE: FLOW DIAGRAMS PROCESS FLOW DIAGRAM MATERIAL RETRIEVAL AND FEED SYSTEMS

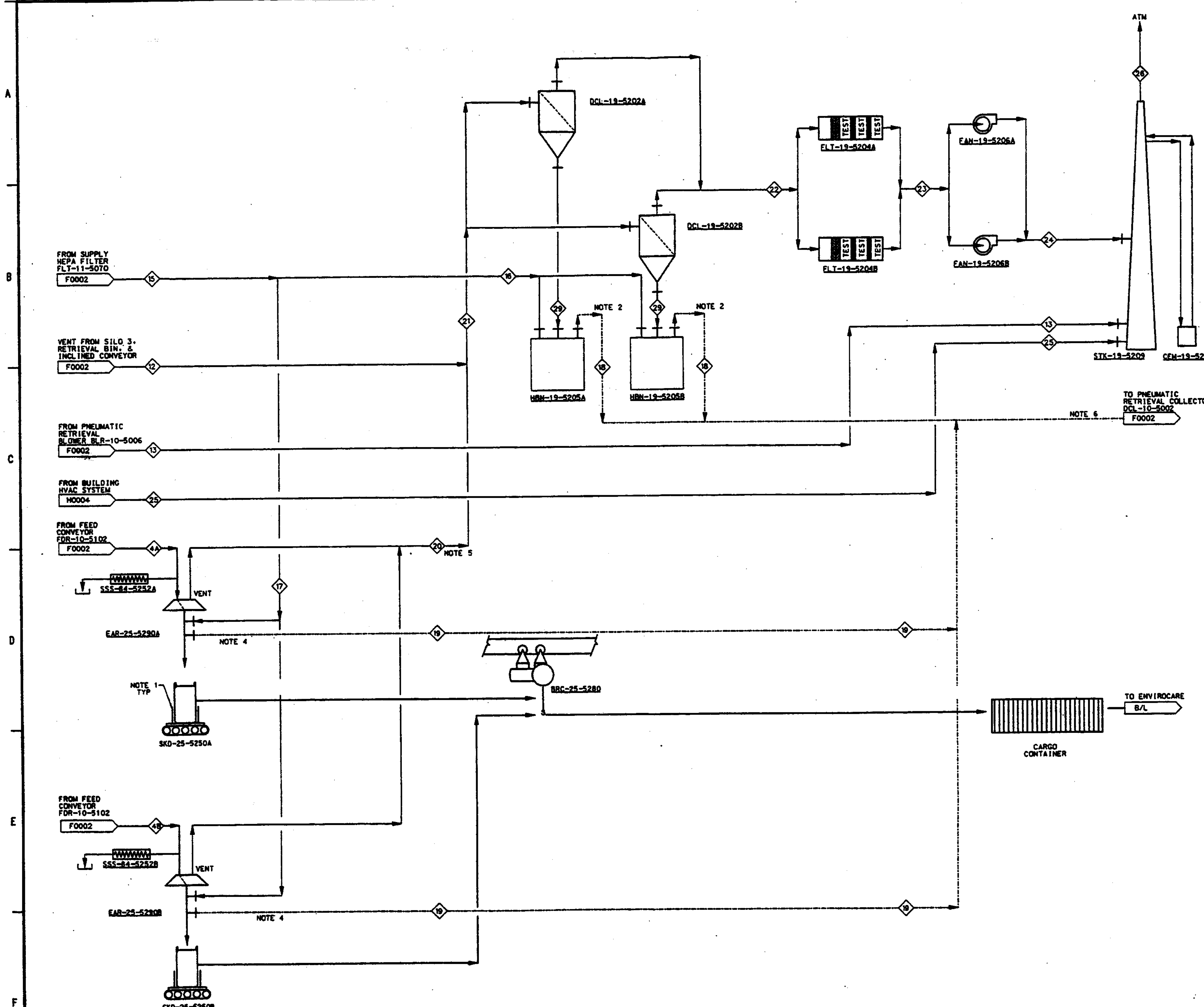
DESIGN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	JAMES T. NELSON	03/12/02	RICHARD L. HICKS	03/12/02

SCALE: NONE — CLASS: U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-F-01429	F0002	C

JEG PROJECT NO. 35H19605 — FILENAME 94XF1429.DGN

PRELIMINARY
NOT FOR CONSTRUCTION



SSS-84-5252A PACKAGING SAMPLER A

EAR-25-5290A PACKAGING STATION A EXHAUST HOOD

SKD-25-5250A CONTAINER MANAGEMENT AND PACKAGING SYSTEM A

SSS-84-5252B PACKAGING SAMPLER B

EAR-25-5290B PACKAGING STATION B EXHAUST HOOD

SKD-25-5250B CONTAINER MANAGEMENT AND PACKAGING SYSTEM B

BRC-25-5280 BRIDGE CRANE

DCL-19-5202A PROCESS VENT DUST COLLECTOR A

DCL-19-5202B PROCESS VENT DUST COLLECTOR B

HBN-19-5205A FINES COLLECTION BIN A

HBN-19-5205B FINES COLLECTION BIN B

FLT-19-5204A PROCESS HEPA FILTER A

FLT-19-5204B PROCESS HEPA FILTER B

FAN-19-5206A PROCESS EXHAUST FAN A

FAN-19-5206B PROCESS EXHAUST FAN B

STK-19-5209 EXHAUST STACK

CEM-19-5208 ISOKINETIC STACK MONITOR

NOTES:

4267

1. LOADING FRAME TO SUPPORT BAGS.
2. FINES FROM PROCESS VENT DUST COLLECTORS WILL BE COLLECTED IN FINES COLLECTION BINS. AFTER BIN IS FILLED, FINES ARE TRANSPORTED VIA PNEUMATIC CONVEYING SYSTEM BACK TO THE PNEUMATIC RETRIEVAL COLLECTOR. ONLY ONE BIN IS EMPTIED AT A TIME
3. PHANTOM LINES (————) INDICATE ALTERNATE OPERATION.
4. PNEUMATIC CONVEYING CONNECTIONS ARE PROVIDED AT THE LOADING SPOUTS FOR VACUUM ATTACHMENTS. THESE ATTACHMENTS ARE USED TO RECOVER IN THE EVENT OF AN OVERFILLED BAG.
5. STREAM 20 IS EQUALLY SPLIT BETWEEN PACKAGING STATION EXHAUST HOODS A&B.
6. MATERIAL WILL BE TRANSFERRED FROM ONLY ONE SOURCE AT A TIME I.E., EITHER ONE PACKAGING STATION OR ONE FINES COLLECTION BIN.

GENERAL NOTES:

1. ALL SYMBOLOGY (E.G., VALVES, SPECIALTY ITEMS, EQUIPMENT): ABBREVIATIONS: SYSTEM NAMES AND NUMBERS: AND EQUIPMENT DESCRIPTIONS AND DESIGNATORS, ARE PROVIDED ON PIPING AND INSTRUMENTATION DIAGRAMS N0001 AND N0003.

REF DWG NO.	DRAWING TITLE
F0001	PFD-MATERIAL BALANCE TABLE
F0002	PFD-MATERIAL RETRIEVAL AND FEED SYSTEMS
H0002	HEATING AND VENTILATION AIR FLOW DIAGRAM
H0003	HVAC AIR FLOW DIAGRAM
N0001	P&ID-PIPING, VALVES AND MISCELLANEOUS
N0003	P&ID-EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APR.
C	ISSUED FOR EPA REVIEW	04/30/02	[illegible]	[illegible]
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
C	ISSUED FOR REVIEW	03/15/02	RLH	RGL

PRELIMINARY
NOT FOR CONSTRUCTION

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3

000419

DRAWING TITLE:
FLOW DIAGRAMS
PROCESS FLOW DIAGRAM
PROCESS VENT AND PACKAGING SYSTEMS

DRAWN BY: J.ROSENBAUM DATE: 03/12/02 TECHNICAL LEAD: KENNETH RICKETT DATE: 03/12/02 CHECKED BY: RICHARD HICKS DATE: 03/12/02

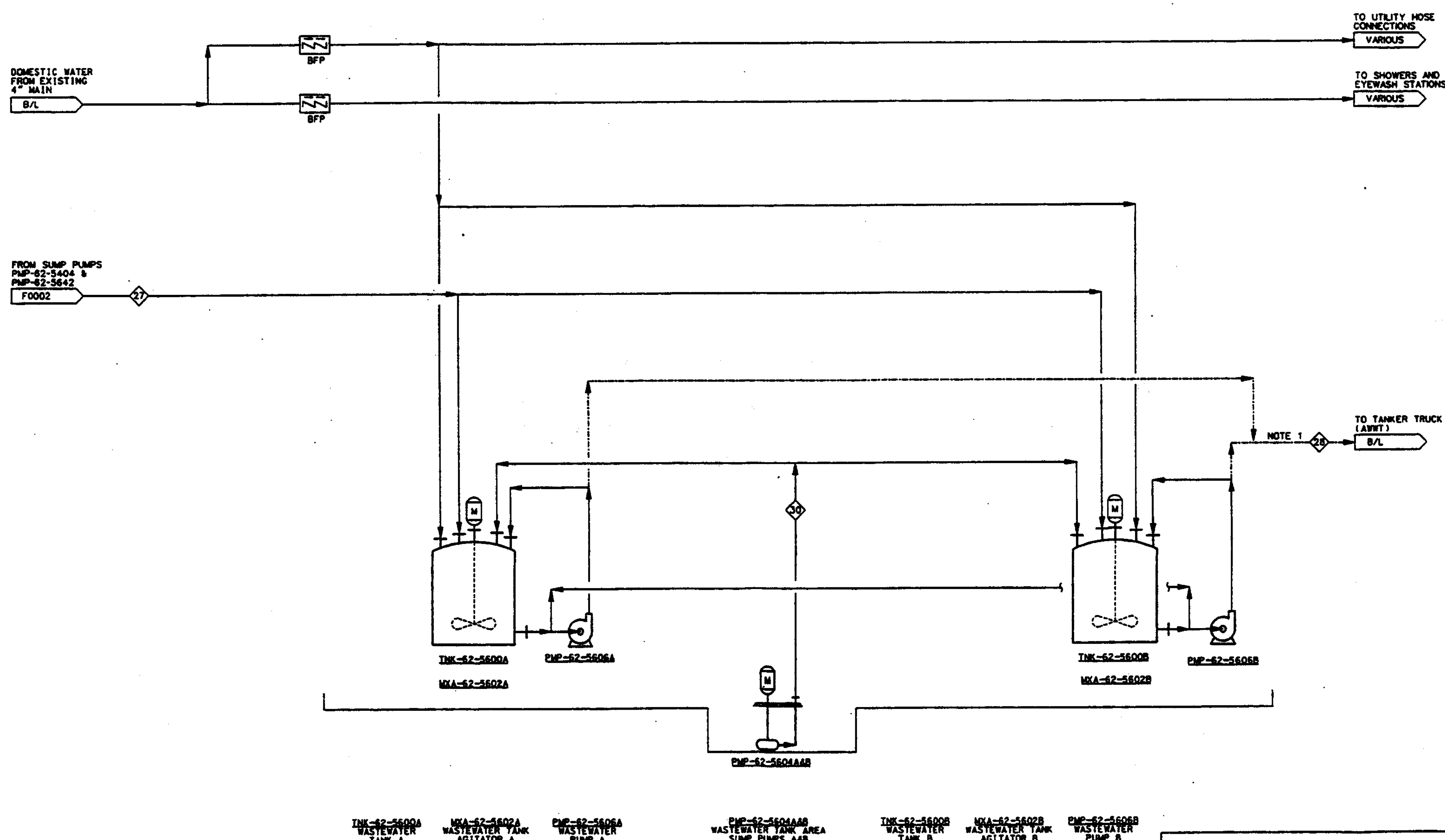
SCALE: NONE CLASS: U

PROJECT NO. 40430

94X-3900-F-01431 F0003 C

DATE: 06/03/02 TIME: 10:06:47 AM USER: PriceTG

4267



NOTES:

1. PHANTOM LINES (------) INDICATE ALTERNATE OPERATION.

GENERAL NOTES:

1. ALL SYMBOLOGY (E.G., VALVES, SPECIALTY ITEMS, EQUIPMENT): ABBREVIATIONS: SYSTEM NAMES AND NUMBERS: AND EQUIPMENT DESCRIPTIONS AND DESIGNATORS, ARE PROVIDED ON PIPING AND INSTRUMENTATION DIAGRAMS N0001 AND N0003.

REF DWG NO.	DRAWING TITLE
F0001	PFD-MATERIAL BALANCE TABLE
F0002	PFD-MATERIAL RETRIEVAL AND FEED SYSTEMS
H0003	HVAC AIR FLOW DIAGRAM
N0001	P&ID-PIPING, VALVES, AND MISCELLANEOUS
N0003	P&ID-EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
C	ISSUED FOR REVIEW	03/18/02	RLH	RGL

PRELIMINARY
NOT FOR CONSTRUCTION

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

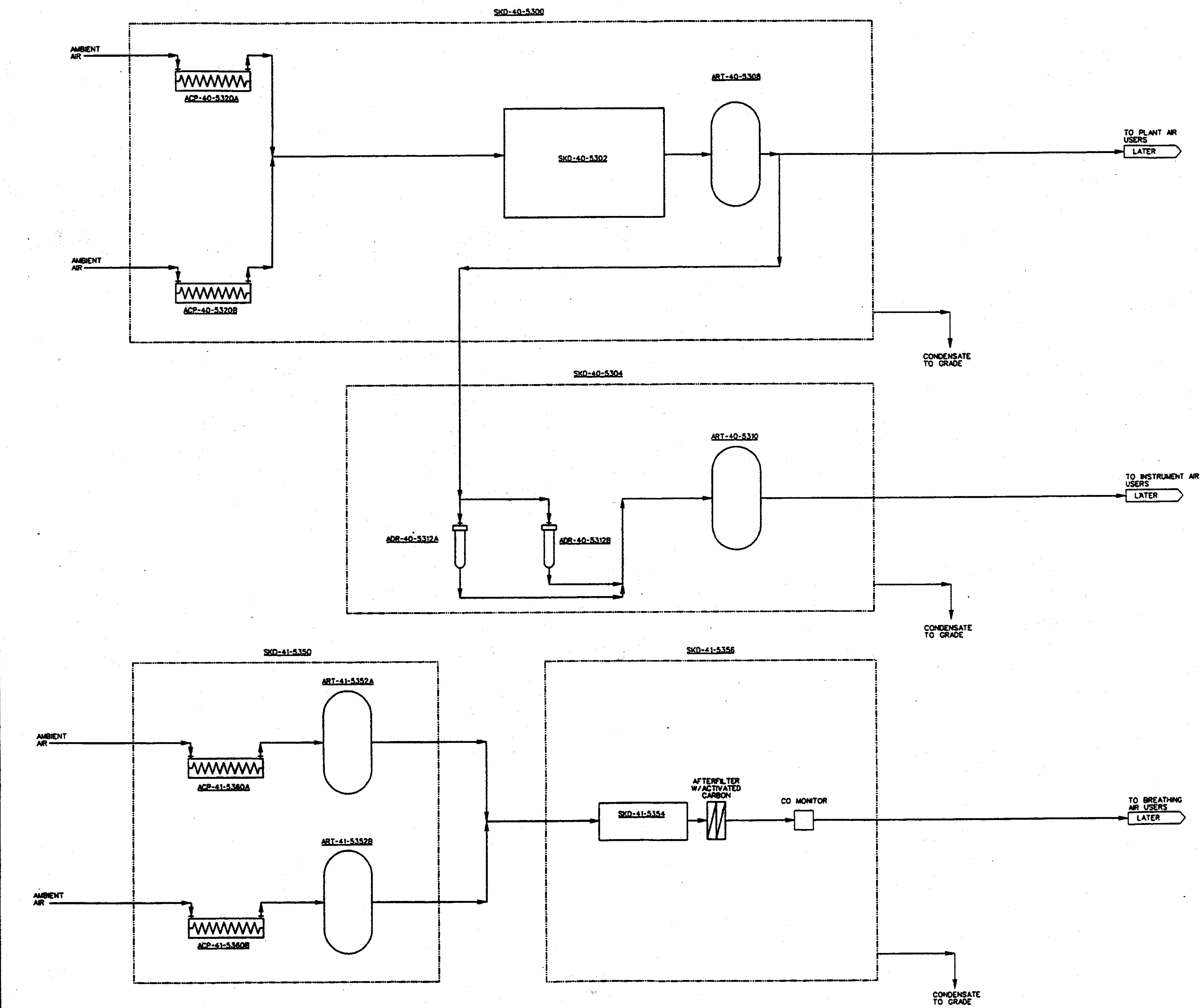
THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3 000420

DRAWING TITLE:
FLOW DIAGRAMS
PROCESS FLOW DIAGRAM
WATER AND WASTEWATER SYSTEMS

DRAWN BY: J.ROSENBAUM DATE: 03/12/02 | TECHNICAL LEAD: JAMES T. NELSON DATE: 03/12/02 | CHECKED BY: RICHARD L. HICKS DATE: 03/12/02
SCALE: NONE CLASS: U
T.A. NUMBER: N/A | PROJECT NO. 40430 | JE PROJECT NO. 35H19605 | FILENAME: 94XF1430.DGN
DRAWING INDEX CODE NO. 94X-3900-F-01430 | SHEET NO. F0004 | REV. NO. C

4267



SKD-40-5300 PLANT/INSTRUMENT AIR COMPRESSOR SKID

SKD-41-5350 BREATHING AIR COMPRESSOR SKID

SKD-41-5356 BREATHING AIR CONDITIONING SKID

ACP-40-5320A AIR COMPRESSOR A

ACP-40-5320B AIR COMPRESSOR B

ACP-41-5360A BREATHING AIR COMPRESSOR A

ACP-41-5360B BREATHING AIR COMPRESSOR B

SKD-40-5302 REFRIGERATION DRYER SKID

ART-41-5352A BREATHING AIR RECEIVER TANK A

ART-41-5352B BREATHING AIR RECEIVER TANK B

ART-40-5308 PLANT AIR RECEIVER TANK

SKD-40-5304 INSTRUMENT AIR DRYER SKID

ADR-40-5312A DESICCANT VESSEL A

ADR-40-5312B DESICCANT VESSEL B

SKD-41-5354 REFRIGERATION DRYER SKID

ART-40-5310 INSTRUMENT AIR RECEIVER TANK

GENERAL NOTES:

1. ALL SYMBOLOGY (E.G., VALVES, SPECIALTY ITEMS, EQUIPMENT); ABBREVIATIONS; SYSTEM NAMES AND NUMBERS; AND EQUIPMENT DESCRIPTIONS AND DESIGNATORS, ARE PROVIDED ON PIPING AND INSTRUMENTATION DIAGRAMS N0001 AND N0003.

REF DWG NO.	DRAWING TITLE
F0001	PFD-MATERIAL BALANCE TABLE
F0003	PFD-WATER AND WASTEWATER SYSTEMS
F0004	PFD-PROCESS VENT AND PACKAGING SYSTEMS
N0001	P&ID-PIPING, VALVES AND MISCELLANEOUS
N0003	P&ID-EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPL.
B	ISSUED FOR EPA REVIEW	04/30/02	JJR	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY JACOBS

PROJECT NAME: SILO 3

000421

DRAWING TITLE: FLOW DIAGRAMS
PROCESS FLOW DIAGRAM
PLANT, INSTRUMENT, AND BREATHING AIR SYSTEMS

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD HICKS	03/12/02

SCALE: NONE CLASS: U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-F-01432	F0005	B

JOB PROJECT NO. 35H19805 FILENAME 94XF1432.DGN

PRELIMINARY
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DATE: 04/30/02 TIME: 05:09:30 PM USER: JRosenba DESIGN FILE: h:\Proc\Mechanical\Drawings\94XF1432.dgn

4267

ABBREVIATIONS

AG	ABOVE GROUND
ATM	ATMOSPHERE
BL	BATTERY LIMIT
BTL	BOTTOM TANGENT LINE
BYP	BYPASS
CC	CHEMICAL CLEANOUT
CL	CENTERLINE
CO	CLEANOUT
CONN	CONNECTION
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
CTR	CENTER
DCS	DISTRIBUTED CONTROL SYSTEM
DES	DESIGN
DIA	DIAMETER
DP	DESIGN PRESSURE
D/P	DIFFERENTIAL PRESSURE
DRN	DRAIN
DT	DESIGN TEMPERATURE
DWG	DRAWING
(E)	EXISTING
EA	EXHAUST AIR
EL	ELEVATION
ESD	EMERGENCY SHUTDOWN
FOF	FACE OF FLANGE
(F)	FURNISHED
FI	FAIL INDETERMINATE
FLG	FLANGE
FP	FULL PORT
FRP	FIBERGLASS REINFORCED PLASTIC
FV	FULL VACUUM
GO	GEAR OPERATED
GPM	GALLONS PER MINUTE
GR	GRADE
HC	HOSE CONNECTION
HDR	HEADER
HEPA	HIGH EFFICIENCY PARTICULATE AIR
HH	HAND HOLE
HOA	HAND/OFF/AUTOMATIC
HP	HORSE POWER
HZ	HERTZ
HPT	HIGH POINT
IAS	INSTRUMENT AIR SUPPLY
ISBL	INSIDE BATTERY LIMITS
LP	LOW PRESSURE
LPT	LOW POINT
MAX	MAXIMUM
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MTL	MATERIAL
MW	MANWAY
NNF	NORMALLY NO FLOW
NOZ	NOZZLE
O/C	OPEN/CLOSE
O/O	ON/OFF
OP	OUTPUT
OSBL	OUTSIDE BATTERY LIMITS
OVHD	OVERHEAD
PH	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLCS.	PLACES
PRESS	PRESSURE
PSIG	POUNDS PER SQUARE INCH, GAUGE
PV	PROCESS VARIABLE
(R)	RELOCATED
REQD	REQUIRED
RTD	RESISTANCE TEMP. DETECTOR
SA	SUPPLY AIR
SC	SAMPLE CONNECTION
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SD	SHUTDOWN
SG	SPECIFIC GRAVITY
SIS	SAFETY INSTRUMENTED SYSTEM
SO	STEAM OUT
SP	SET POINT
SS	STAINLESS STEEL
S/S	START/STOP
STD	STANDARD
TA	TRANSFER AIR
T/C	THERMOCOUPLE
TDH	TOTAL DIFFERENTIAL HEAD
TEMP	TEMPERATURE
THRD	THREADED
TL	TANGENT LINE
TSO	TIGHT SHUT OFF
T/T	TANGENT-TO-TANGENT
TYP	TYPICAL
UG	UNDERGROUND
ULPA	ULTRA LOW PENETRATING AIR
V	VOLT
VAC	VACUUM
VB	VORTEX BREAKER
VNT	VENT
W/	WITH
W/O	WITHOUT

VALVE SYMBOLS

OPEN		CLOSED
	GATE	
	GLOBE	
	NEEDLE	
	PLUG	
	BALL	
	PINCH	
	BUTTERFLY	
	ANGLE	
	3-WAY	
	4-WAY	
	CHECK	
	DOUBLE CHECK	
	MANUAL CHECK	
	KNIFE (ORIFICE GATE)	

NORMAL POSITIONS ALL VALVES

NO-INDICATES NORMALLY OPEN
NC-INDICATES NORMALLY CLOSED

LOCKED POSITIONS ALL VALVES

LO-INDICATES LOCKED OPEN
LC-INDICATES LOCKED CLOSED

FAIL POSITIONS ALL VALVES

FO-INDICATES FAIL OPEN
FC-INDICATES FAIL CLOSED
FL-INDICATES FAIL LAST POSITION

VALVE ACTUATORS

- CYLINDER
- ROTARY MOTOR (SHOWN TYPICALLY WITH ELECTRIC SIGNAL)
- DIGITAL
- PRESSURE DIAPHRAGM
- SOLENOID
- DIAPHRAGM
- HANDWHEEL

PIPING FITTINGS

- FLANGE
- SCREWED CAP
- WELDED CAP
- UNION JOINT
- CONCENTRIC (OR GENERIC) REDUCER
- ECCENTRIC REDUCER
- HOSE CONNECTION (FEMALE)
- HOSE CONNECTION (MALE)

PIPING LINE SYMBOLS

- PRIMARY (AG & UG)
- SECONDARY / UTILITY (AG & UG)
- FUTURE & EXISTING ON NEW P&IDs
- JACKETED OR DOUBLE CONTAINMENT

PIPING SPECIALTY ITEMS

- Y-TYPE STRAINER
- CONE STRAINER
- DUPLEX STRAINER
- BASKET STRAINER
- EXPANSION JOINT
- FLEXIBLE CONNECTOR
- ATMOSPHERIC VENT
- F FILTER
- T TRAP
- PULSATION DAMPENER
- S IN-LINE SILENCER
- S VENT SILENCER
- RS REMOVABLE SPOOL
- FLEXIBLE HOSE
- BREATHER
- VENT COVER
- IN-LINE MIXER
- ROTARY VALVE
- BACK DRAFT DAMPER
- SAFETY SHOWER
- BFP BACK FLOW PREVENTER

LINE IDENTIFICATION

II-JJZZZZ-M-NNN-OO-TT

- TT — HEAT TRACE TYPE (USE ONLY IF REQUIRED)
- OO — INSULATION TYPE (USE ONLY IF REQUIRED)
- NNN — MATERIAL SPECIFICATION
- M — PIPE SIZE (INCHES)
- ZZZZ — LINE SEQUENCE NUMBER
- JJ — SYSTEM NUMBER
- II — LINE SERVICE (SEE BELOW)

LINE SERVICE CODES (II)

CA	--	AIR, COMPRESSED
DW	--	DOMESTIC WATER
DW3	--	POTABLE WATER
IA	--	INSTRUMENT AIR
LPW	--	LIQUID PROCESS WASTE
MRS	--	MECHANICAL RETRIEVAL SYSTEM
PA	--	AIR, PLANT
PRS	--	PNEUMATIC RETRIEVAL SYSTEM
PVS	--	PROCESS VENT SYSTEM
SA	--	AIR, BREATHING
TW	--	PROCESS WATER
VA	--	VENTILATION AIR

INSULATION TYPE CODES (OO)

AS -- ANTI-SWEAT
CC -- COLD SERVICE INSULATION
HC -- HEAT CONSERVATION INSULATION
PP -- PERSONNEL PROTECTION INSULATION

TRACE TYPE CODES (TT)

ET -- ELECTRIC TRACED

MISCELLANEOUS

- POINT OF CHANGE IN LINE CLASS OR INSULATION REQUIREMENT
- PACKAGED EQUIPMENT LIMITS
- SUPPLY OR TRANSFER AIR FLOW DIRECTION
- EXHAUST OR TRANSFER AIR FLOW DIRECTION
- RETURN AIR FLOW DIRECTION
- PAGE CONNECTOR
- PAGE CONNECTOR
- PAGE CONNECTOR BIDIRECTIONAL FLOW
- B/L BATTERY LIMITS

NOZZLE IDENTIFICATION

A - 10"

- 10" — NOZZLE SIZE (INCHES)
- A — NOZZLE IDENTIFIER (FROM VESSEL DATA SHEET)

VALVE IDENTIFICATION (AAA)

AAA-JJ-KKKK

- KKKK — VALVE NUMBER
- JJ — SYSTEM NUMBER
- AAA — VALVE CODE

AIR OPERATED VALVE	--	AOV
BACK FLOW PREVENTER	--	BFP
CHECK VALVE	--	CKV
DOUBLE CHECK VALVE	--	DCV
DAMPER (BUTTERFLY)	--	DMP
HAND OPERATED VALVE	--	HOV
MOTOR OPERATED VALVE	--	MOV
PRESSURE REDUCING VALVE	--	PRV
SOLENOID OPERATED VALVE	--	SOV

SYSTEM NUMBERING (JJ)

	FACILITIES
00	NOT USED
01	NOT USED
02	WASTE RETRIEVAL FACILITIES
03	NOT USED
04	NOT USED
05	MISCELLANEOUS FACILITIES-SITE
06	NOT USED
07	NOT USED
08	NOT USED
09	NOT USED
	RETRIEVAL
10	PNEUMATIC RETRIEVAL SYSTEM
11	MECHANICAL RETRIEVAL SYSTEM
12	NOT USED
13	NOT USED
14	NOT USED
	PROCESSING
15	NOT USED
16	NOT USED
17	NOT USED
18	NOT USED
19	PROCESS VENT (DUST COLLECTION) SYSTEM
20	NOT USED
21	NOT USED
22	NOT USED
	PRODUCT HANDLING
23	NOT USED
24	NOT USED
25	PRODUCT PACKAGING AND CONTAINER
26	MANAGEMENT SYSTEM
27	NOT USED
28	NOT USED
29	NOT USED
	ELECTRICAL
30	HIGH VOLTAGE SYSTEM
31	480 VOLT DISTRIBUTION SYSTEM
32	STANDBY ELECTRICAL SYSTEM
33	UNINTERRUPTIBLE POWER SYSTEM
34	LIGHTING SYSTEM
35	GROUNDING SYSTEM
36	NOT USED
37	NOT USED
38	NOT USED
39	MISCELLANEOUS ELECTRICAL
	UTILITIES AND CHEMICALS
40	PLANT AND INSTRUMENT AIR SYSTEM
41	BREATHING AIR SYSTEM
42	NOT USED
43	NOT USED
44	NOT USED
45	NOT USED
46	NOT USED
47	NOT USED
48	NOT USED
49	NOT USED
	WATER SYSTEMS
50	PROCESS WATER SYSTEM
51	POTABLE WATER SYSTEM
52	NOT USED
53	NOT USED
54	NOT USED
55	NOT USED
56	NOT USED
57	NOT USED
58	NOT USED
59	NOT USED
	WASTE SYSTEMS
60	NOT USED
61	NOT USED
62	WASTEWATER SYSTEM
63	NOT USED
64	NOT USED
65	NOT USED
66	NOT USED
67	NOT USED
68	NOT USED
69	NOT USED
	HVAC SYSTEMS
70	SUPPLY AIR SYSTEM
71	EXHAUST AIR SYSTEM
72	NOT USED
73	NOT USED
74	NOT USED
75	NOT USED
76	NOT USED
77	NOT USED
78	NOT USED
79	NOT USED
	MECHANICAL AND ANALYTICAL SYSTEMS
80	NOT USED
81	NOT USED
82	NOT USED
83	NOT USED
84	SAMPLING SYSTEM
85	NOT USED
86	NOT USED
87	NOT USED
88	NOT USED
89	NOT USED
	INFORMATION AND CONTROL SYSTEMS
90	CONTROL SYSTEM
91	NOT USED
92	FIRE DETECTION AND ALARM SYSTEM
93	NOT USED
94	NOT USED
95	NOT USED
96	NOT USED
97	NOT USED
98	NOT USED
99	NOT USED

REF DWG NO.	DRAWING TITLE
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JTN	RGL
B	ISSUED FOR REVIEW	03/15/02	JTN	RGL
A	ISSUED FOR REVIEW	01/11/02	JTN	RGL

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000422

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
PIPING, VALVES, AND MISCELLANEOUS

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBALM	1/7/02	RICHARD HICKS	1/7/02	J.T.NELSON	1/7/02
PLANT/BLDG. NO.		FLOOR		SCALE NONE	CLASS U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-N-01381	N0001	C
JEC PROJECT NO. 35H19605	FILENAME 94XN1381.DCN			

PRELIMINARY
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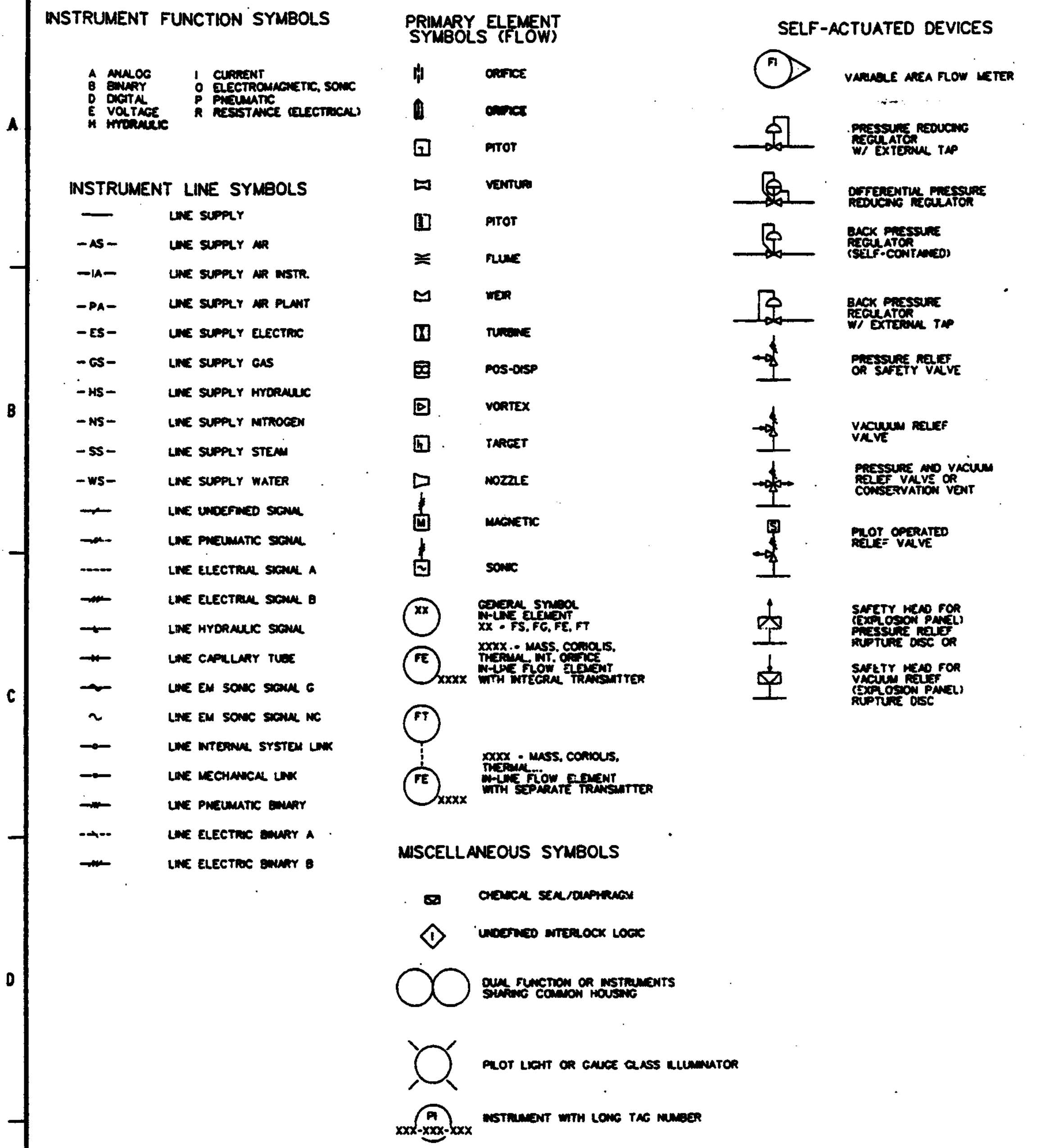
DATE: 05/02/02 TIME: 03:46:43 PM



GENERAL INSTRUMENT SYMBOLS

LOCATION/ACCESSIBILITY	DISCRETE INSTRUMENTS	SHARED DISPLAY AND CONTROL (DCS)	PLC	DISCRETE HARDWARE INTERLOCK
FIELD MOUNTED 1. FIELD OR LOCALLY MOUNTED. 2. ACCESSIBLE TO AN OPERATOR AT DEVICE				
PRIMARY LOCATION NORMALLY ACCESSIBLE TO AN OPERATOR 1. CENTRAL OR MAIN CONTROL ROOM. 2. FRONT OF MAIN PANEL OR CONSOLE MOUNTED 3. VISIBLE ON VIDEO DISPLAY. 4. ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.				
PRIMARY LOCATION NORMALLY INACCESSIBLE TO AN OPERATOR 1. CENTRAL OR MAIN CONTROL ROOM. 2. REAR OF PANEL OR CABINET MOUNTED. 3. NOT VISIBLE ON VIDEO DISPLAY. 4. NOT NORMALLY ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.				
AUXILIARY LOCATION NORMALLY ACCESSIBLE TO AN OPERATOR 1. SECONDARY OR LOCAL CONTROL ROOM. 2. FIELD OR LOCAL CONTROL PANEL. 3. FRONT OF SECONDARY OR LOCAL PANEL MOUNTED. 4. VISIBLE ON VIDEO DISPLAY. 5. ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.				
AUXILIARY LOCATION NORMALLY INACCESSIBLE TO AN OPERATOR 1. SECONDARY OR LOCAL CONTROL ROOM. 2. FIELD OR LOCAL CONTROL PANEL. 3. REAR OF SECONDARY OR LOCAL PANEL OR CABINET MOUNTED. 4. NOT VISIBLE ON VIDEO DISPLAY. 5. NOT NORMALLY ACCESSIBLE TO AN OPERATOR AT DEVICE OR CONSOLE.				

INSTRUMENT IDENTIFICATION LETTERS

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, FLAME, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE (TYPICALLY CONDUCTIVITY - ELECTRICAL)		CONTROL		CLOSED
D	USER'S CHOICE (TYPICALLY DENSITY OR SPECIFIC GRAVITY)	DIFFERENTIAL			DIVERT
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE OR GAUGING (DIMENSIONAL)		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE (TYPICALLY MOISTURE OR HUMIDITY)	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY OR HEAT DUTY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	THROUGH
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JTN	RGL
B	ISSUED FOR REVIEW	03/15/02	JTN	RGL
A	ISSUED FOR REVIEW	[illegible]	JTN	RGL

PRELIMINARY
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UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

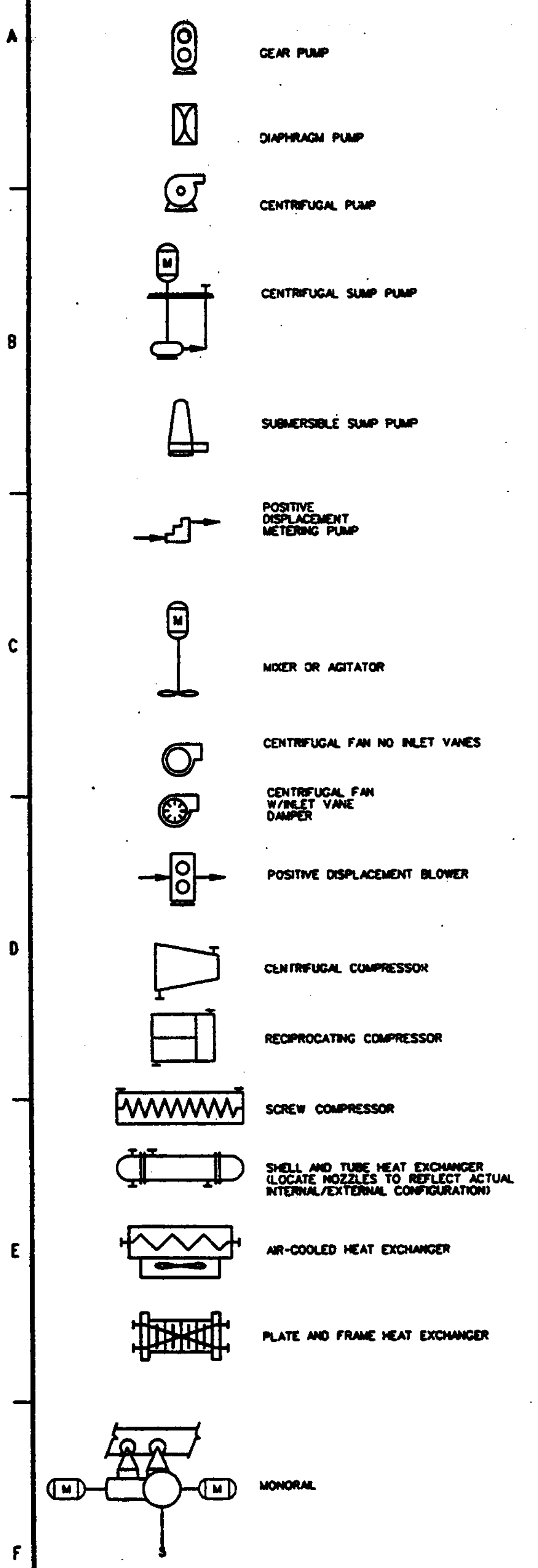
THIS DRAWING PREPARED BY
JE JACOBS

PROJECT NAME
SILO 3 000423

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
INSTRUMENTATION

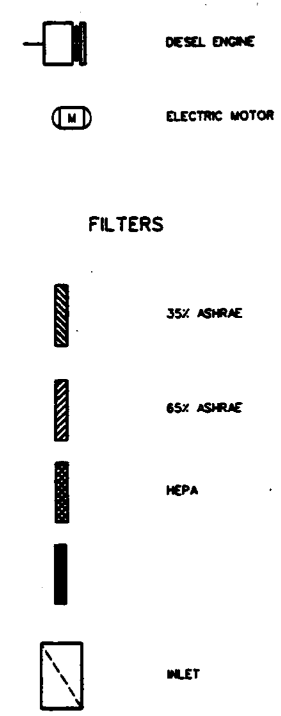
DRAWN BY J.ROSENBAUM DATE 1/7/02 | TECHNICAL LEAD RICHARD HICKS DATE 1/7/02 | CHECKED BY J.T.NELSON DATE 1/7/02
SCALE NONE | CLASS U
TECH LEAD | DATE
T.O. NUMBER N/A | PROJECT NO. 40430 | JEG PROJECT NO. 35H19605 | FILENAME 94X01382.DGN
DRAWING INDEX CODE NO. 94X-3900-N-01382 | SHEET NO. N0002 | REV. NO. C

EQUIPMENT SYMBOLS



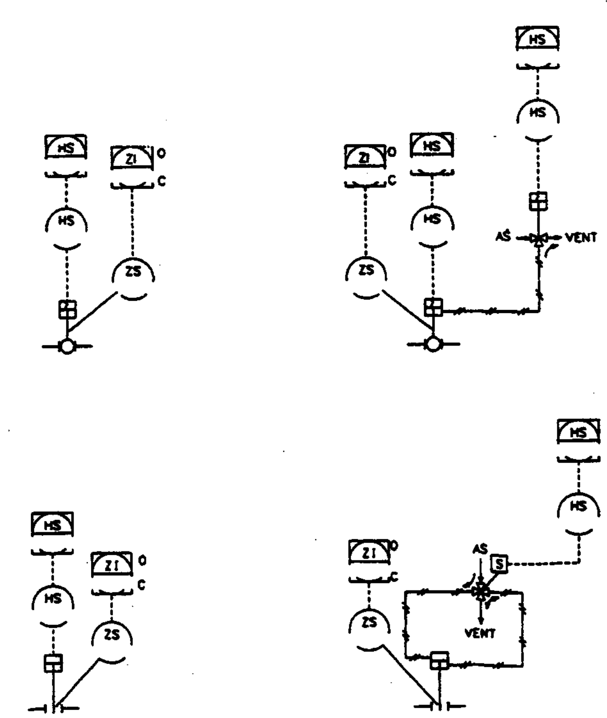
DRIVERS

FILTERS



REPRESENTATIVE SYMBOLOGY

THIS REPRESENTS THIS



EQUIPMENT DESCRIPTION	EQUIPMENT DESIGNATOR (XXX)
ACCUMULATOR	ACC
AIR COMPRESSOR	ACP
AIR DRYER	ADR
AIR HANDLING UNIT	AHU
AIR PREHEATER	APH
AIR RECEIVER TANK	ART
AUTO TRANSFER SWITCH	ATS
BACK DRAFT DAMPER	BKD
BAGHOUSE	BGH
BELT CONVEYOR	BCV
BIN (BULK STORAGE)	BIN
BIN ACTIVATOR	BIA
BLOWER	BLR
BREATHING AIR STATION	BAS
BRIDGE CRANE	BRC
BUCKET ELEVATOR	BEV
CABLE OR HOSE REEL	CBR
CARBON FILTER BED	CFB
CARTRIDGE FILTER	CTF
CHILLER	CHR
CONDENSER	CND
CONTAINER	CON
CONTINOUS EMISSION MONITORING	CEM
CONTROLLER	CNT
COOLING TOWER	CTW
CRANE/HOIST	CRH
CYCLONE SEPARATOR	CYS
DAMPER (NON-BUTTERFLY)	DPR
DELUMPER	DLM
DESICCANT DRYER SYSTEM	DDS
DIESEL GENERATOR	DGN
DIESEL GENERATOR CONTROL PANEL	DGP
DOUBLE DUMP VALVE	DDV
DRAG FLIGHT CONVEYOR	DFC
DRUM DUMPER	DDP
DRYER	DRY
DRYER (ROTARY)	DRO
DUCT HEATER	DHT
DUST COLLECTOR	DCL
EDUCTOR	EDR
EJECTOR	EJE
ENCLOSURE	ENC
EVAPORATOR	EVP
EXCAVATOR	EXC
EXHAUST AIR REGISTER	EAR
EXPANSION JOINT	EXP
FAN	FAN
FEEDER	FDR
FILTER	FLT
FILTER PRESS	FLP
FLEXIBLE CONNECTION	FLX
FORK LIFT	FKL
GRAVITY DAMPER	GDM
HEAT EXCHANGER	HTX
HEATER	HTR
HOPPER/BIN	HBN
HYDRAULIC ACTUATOR	HYD
HYDRAULIC SYSTEM SKID	HSS
LIFT TABLE	LFT
LIVE ROLLER CONVEYOR	LRC
LOADING SPOUT	LSR
LOUVER	LVR
MIXER / AGITATOR	MXA
MIXER / BLENDER	MXB
MOTOR	MTR
ORIFICE PLATE	ORF
PACKAGE UNIT	PKU
PANEL (CONTROL)	PNL
PANELBOARD	PNB
PERSONNEL CONTAMINATION MONITOR	PCM
PHASE SEPARATOR	PHS
PRESSURE SAFETY ELEMENT	PSE
PRODUCT WEIGH BIN	PWB
PUMP	PMP

EQUIPMENT DESCRIPTION	EQUIPMENT DESIGNATOR (XXX)
REACTOR	REA
RECEIVER	RVR
ROLLER CONVEYOR	RCV
ROLL UP DOOR	RDR
ROTARY FEEDER	ROF
SAMPLING SYSTEM (GASES)	SSG
SAMPLING SYSTEM (LIQUIDS)	SSL
SAMPLING SYSTEM (SOLIDS)	SSS
SCALE	SCL
SCREW CONVEYOR (METERING)	SCM
SCREW CONVEYOR (TRANSFER)	SCT
SCRUBBER	SCR
SKID	SKD
SLIDE GATE	SRS
STACK	STK
STATIC MIXER	STM
STRAINER	STR
SUMP	SMP
TANK	TNK
TRAP	TRP
UNINTERRUPTIBLE POWER SUPPLY	UPS
UPS BATTERY RACK	UBR
VACUUM BREAKER	VBK
VAPORIZER	VPR
VIBRATOR	VIB
WATER METER PIT	WMP
WATER TREATMENT PLANT	WTP

EQUIPMENT NUMBER IDENTIFICATION

XXX-JJ-ZZZZ

- EQUIPMENT SEQUENCE NUMBER
- SYSTEM NUMBER (SEE N0001)
- EQUIPMENT DESIGNATOR

NOTES:

1. ALL MOTORS ARE 3 PHASE, 60 HERTZ, 230/460 V AND 1750 RPM UNLESS OTHERWISE NOTED.

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEPIPING, VALVES
N0002	INSTRUMENTATION

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JCN	RQL
B	ISSUED FOR REVIEW	03/15/02	JTN	RQL
A	ISSUED FOR REVIEW	01/11/02	JTN	RQL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

JE JACOBS

PROJECT NAME: SILO 3 000424

DRAWING TITLE: INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
EQUIPMENT AND MISCELLANEOUS

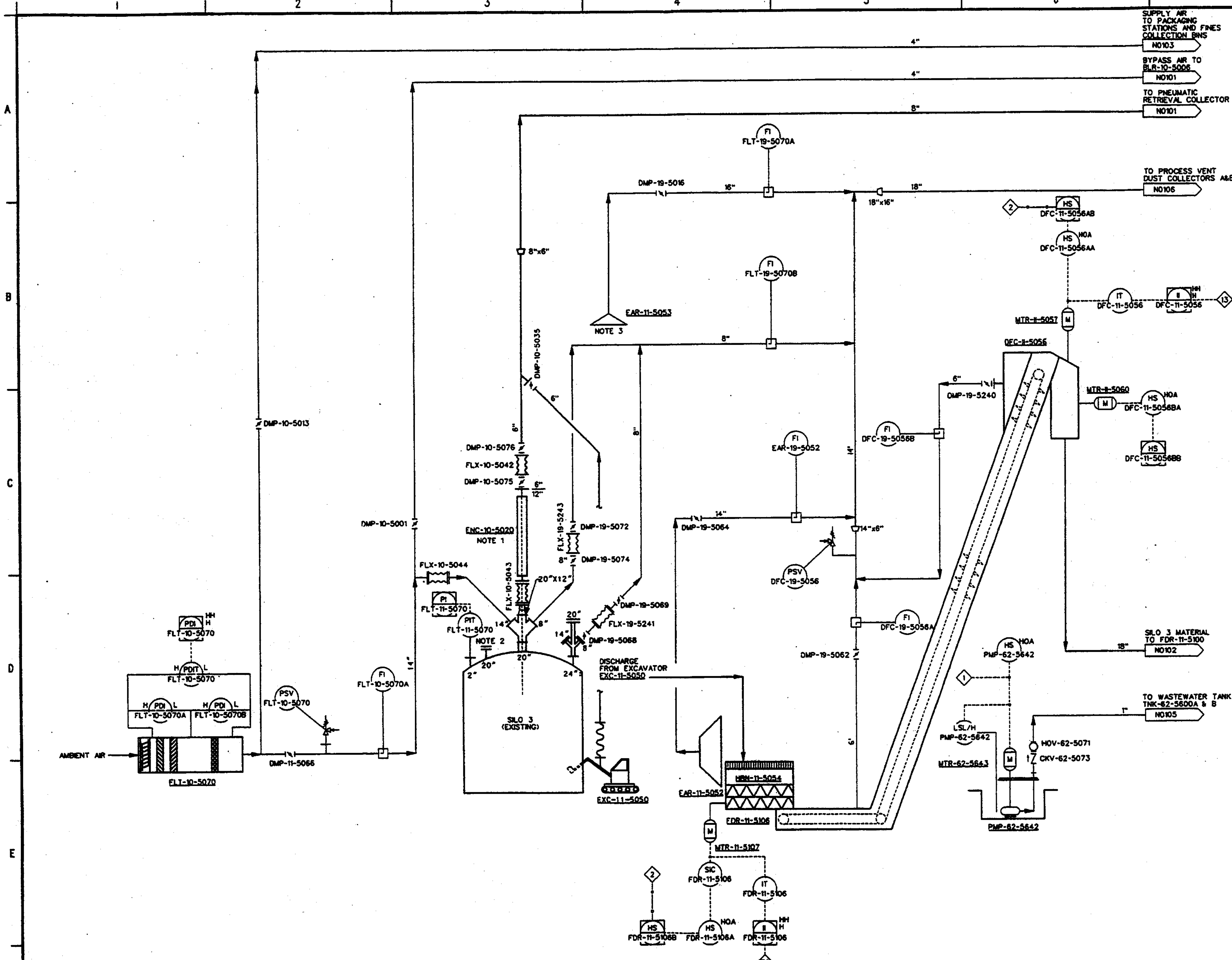
DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	1/7/02	RICHARD HICKS	1/7/02	J.T.NELSON	1/7/02

SCALE: NONE CLASS: U

TECH LEAD ________ DATE ________

T.A. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-N-01383	N0003	C
JE PROJECT NO. 35H19605	FILENAME 94XN01383.DGN			

PRELIMINARY
NOT FOR CONSTRUCTION



NOTES:

4267

1. TYPICAL OF SPOOL PIECES TO BE ATTACHED TO 5 NOZZLES ON SILO 3, TO ALLOW PNEUMATIC RETRIEVAL, SILO VENTILATION, OR SILO EXHAUST.
2. CAMERA PORT.
3. WHEN NOT MECHANICALLY RETRIEVING, AIR IS PULLED INTO THIS HOOD TO MAINTAIN NEGATIVE PRESSURE IN EXCAVATION ROOM. THIS CONNECTION WILL ALSO BE USED TO PICK-UP DEBRIS DURING THE SILO ENTRY (CUTTING) PROCESS.

INTERLOCKS:

1. SUMP PUMP (PMP-62-5642) TO SHUT DOWN ON HIGH HIGH LEVEL IN WASTE WATER TANKS (TNK-62-5600A & B).
2. SHUTDOWN INCLINED CONVEYOR (DFC-11-5056) AND RETRIEVAL BIN DISCHARGE FEEDER (FDR-11-5106) IF FEEDER (FDR-11-5100) IS NOT RUNNING.
13. INCLINED CONVEYOR TO SHUTDOWN ON HIGH HIGH CURRENT.
39. SHUTDOWN RETRIEVAL BIN DISCHARGE FEEDER ON HIGH - HIGH CURRENT.

FLT-10-5070
SUPPLY HEPA FILTER
3000 ACFM
BAG-IN/BAG-OUT
SS

ENC-10-5020
VACUUM WAND MANAGEMENT SYSTEM

EXC-11-5050
EXCAVATOR
75 HP

EAR-11-5053
EXCAVATOR ROOM HOOD

EAR-11-5052
RETRIEVAL BIN HOOD

FDR-11-5106
RETRIEVAL BIN DISCHARGE FEEDER

MTR-11-5107
10 HP

HBN-11-5054
RETRIEVAL BIN
8'L X 4'W X 4'H

DFC-11-5056
INCLINED CONVEYOR

MTR-11-5057
10 HP

MTR-11-5060
2 HP
BEATER BELT MOTOR

PMP-62-5642
EXCAVATOR ROOM SUMP PUMP
20 GPM @ 41 FT TDH
4X4X10/8

MTR-62-5643
2 HP

PRELIMINARY
NOT FOR CONSTRUCTION

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3 **000425**

DRAWING TITLE: INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
ACCESS AND RETRIEVAL SYSTEM

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD L. HICKS	03/12/02

SCALE: NONE
CLASS: U

T.A. NUMBER: N/A
PROJECT NO. 40430
PROJECT NO. 35H19605
FILENAME: 94X01433.DGN
DRAWING INDEX CODE NO.: 94X-3900-N-01433
SHEET NO.: N0100
REV. NO.: C

4267

ABBREVIATIONS

AC	ABOVE GROUND
ATM	ATMOSPHERE
BL	BATTERY LIMIT
BTL	BOTTOM TANGENT LINE
BYP	BYPASS
CC	CHEMICAL CLEANOUT
CL	CENTERLINE
CO	CLEANOUT
CONN	CONNECTION
CSC	CAR SEAL CLOSED
CSO	CAR SEAL OPEN
CTR	CENTER
DCS	DISTRIBUTED CONTROL SYSTEM
DES	DESIGN
DIA	DIAMETER
DP	DESIGN PRESSURE
D/P	DIFFERENTIAL PRESSURE
DRN	DRAIN
DT	DESIGN TEMPERATURE
DWG	DRAWING
(E)	EXISTING
EA	EXHAUST AIR
EL	ELEVATION
ESD	EMERGENCY SHUTDOWN
FOF	FACE OF FLANGE
(F)	FURNISHED
FI	FAIL INDETERMINATE
FLG	FLANGE
FP	FULL PORT
FRP	FIBERGLASS REINFORCED PLASTIC
FV	FULL VACUUM
GO	GEAR OPERATED
GPM	GALLONS PER MINUTE
GR	GRADE
HC	HOSE CONNECTION
HDR	HEADER
HEPA	HIGH EFFICIENCY PARTICULATE AIR
HH	HAND HOLE
HOA	HAND/OFF/AUTOMATIC
HP	HORSE POWER
HZ	HERTZ
HPT	HIGH POINT
IAS	INSTRUMENT AIR SUPPLY
ISBL	INSIDE BATTERY LIMITS
LP	LOW PRESSURE
LPT	LOW POINT
MAX	MAXIMUM
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MTL	MATERIAL
MW	MANWAY
NNF	NORMALLY NO FLOW
NOZ	NOZZLE
C/C	OPEN/CLOSE
O/O	ON/OFF
OP	OUTPUT
OSBL	OUTSIDE BATTERY LIMITS
OVHD	OVERHEAD
PH	PHASE
PLC	PROGRAMMABLE LOGIC CONTROLLER
PLCS.	PLACES
PRESS	PRESSURE
PSIG	POUNDS PER SQUARE INCH, GAUGE
PV	PROCESS VARIABLE
(R)	RELOCATED
REQD	REQUIRED
RTD	RESISTANCE TEMP. DETECTOR
SA	SUPPLY AIR
SC	SAMPLE CONNECTION
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SD	SHUTDOWN
SG	SPECIFIC GRAVITY
SIS	SAFETY INSTRUMENTED SYSTEM
SO	STEAM OUT
SP	SET POINT
SS	STAINLESS STEEL
S/S	START/STOP
STD	STANDARD
TA	TRANSFER AIR
T/C	THERMOCOUPLE
TDH	TOTAL DIFFERENTIAL HEAD
TEMP	TEMPERATURE
THRD	THREADED
TL	TANGENT LINE
TSO	TIGHT SHUT OFF
T/T	TANGENT-TO-TANGENT
TYP	TYPICAL
UG	UNDERGROUND
ULPA	ULTRA LOW PENETRATING AIR
V	VOLT
VAC	VACUUM
VB	VORTEX BREAKER
VNT	VENT
W/	WITH
W/O	WITHOUT

VALVE SYMBOLS

OPEN CLOSED

GATE
GLOBE
NEEDLE
PLUG
BALL
PINCH
BUTTERFLY
ANGLE
3-WAY
4-WAY
CHECK
DOUBLE CHECK
MANUAL CHECK
KNIFE (ORIFICE GATE)

NORMAL POSITIONS ALL VALVES

NO-INDICATES NORMALLY OPEN
NC-INDICATES NORMALLY CLOSED

LOCKED POSITIONS ALL VALVES

LO-INDICATES LOCKED OPEN
LC-INDICATES LOCKED CLOSED

FAIL POSITIONS ALL VALVES

FO-INDICATES FAIL OPEN
FC-INDICATES FAIL CLOSED
FL-INDICATES FAIL LAST POSITION

VALVE ACTUATORS

CYLINDER
ROTARY MOTOR (SHOWN TYPICALLY WITH ELECTRIC SIGNAL)
DIGITAL
PRESSURE DIAPHRAGM
SOLENOID
DIAPHRAGM
HANDWHEEL

PIPING FITTINGS

FLANGE
SCREWED CAP
WELDED CAP
UNION JOINT
CONCENTRIC (OR GENERIC) REDUCER
ECCENTRIC REDUCER
HOSE CONNECTION (FEMALE)
HOSE CONNECTION (MALE)

PIPING LINE SYMBOLS

PRIMARY (AC & UC)
SECONDARY / UTILITY (AG & UG)
FUTURE & EXISTING ON NEW P&IDs
JACKETED OR DOUBLE CONTAINMENT

PIPING SPECIALTY ITEMS

Y-TYPE STRAINER
CONE STRAINER
DUPLEX STRAINER
BASKET STRAINER
EXPANSION JOINT
FLEXIBLE CONNECTOR
ATMOSPHERIC VENT
FILTER
TRAP
PULSATION DAMPENER
IN-LINE SILENCER
VENT SILENCER
RS REMOVABLE SPOOL
FLEXIBLE HOSE
BREATHER
VENT COVER
IN-LINE MIXER
ROTARY VALVE
BACK DRAFT DAMPER
SAFETY SHOWER
BFP BACK FLOW PREVENTER

LINE IDENTIFICATION

II-JJZZZZ-M-NNN-OO-TT

- TT — HEAT TRACE TYPE (USE ONLY IF REQUIRED)
- OO — INSULATION TYPE (USE ONLY IF REQUIRED)
- NNN — MATERIAL SPECIFICATION
- M — PIPE SIZE (INCHES)
- ZZZZ — LINE SEQUENCE NUMBER
- JJ — SYSTEM NUMBER
- II — LINE SERVICE (SEE BELOW)

LINE SERVICE CODES (II)

CA -- AIR, COMPRESSED
DW -- DOMESTIC WATER
DW3 -- POTABLE WATER
IA -- INSTRUMENT AIR
LPW -- LIQUID PROCESS WASTE
MRS -- MECHANICAL RETRIEVAL SYSTEM
PA -- AIR, PLANT
PRS -- PNEUMATIC RETRIEVAL SYSTEM
PVS -- PROCESS VENT SYSTEM
SA -- AIR, BREATHING
TW -- PROCESS WATER
VA -- VENTILATION AIR

INSULATION TYPE CODES (OO)

AS -- ANTI-SWEAT
CC -- COLD SERVICE INSULATION
HC -- HEAT CONSERVATION INSULATION
PP -- PERSONNEL PROTECTION INSULATION

TRACE TYPE CODES (TT)

ET -- ELECTRIC TRACED

MISCELLANEOUS

POINT OF CHANGE IN LINE CLASS OR INSULATION REQUIREMENT
PACKAGED EQUIPMENT LIMITS
SUPPLY OR TRANSFER AIR FLOW DIRECTION
EXHAUST OR TRANSFER AIR FLOW DIRECTION
RETURN AIR FLOW DIRECTION
PAGE CONNECTOR
PAGE CONNECTOR
PAGE CONNECTOR BIDIRECTIONAL FLOW
B/L BATTERY LIMITS

NOZZLE IDENTIFICATION

A - 10"

- 10" — NOZZLE SIZE (INCHES)
- A — NOZZLE IDENTIFIER (FROM VESSEL DATA SHEET)

VALVE IDENTIFICATION (AAA)

AAA-JJ-KKKK

- KKKK — VALVE NUMBER
- JJ — SYSTEM NUMBER
- AAA — VALVE CODE

AIR OPERATED VALVE -- AOV
BACK FLOW PREVENTER -- BFP
CHECK VALVE -- CKV
DOUBLE CHECK VALVE -- DCV
DAMPER (BUTTERFLY) -- DMP
HAND OPERATED VALVE -- HOV
MOTOR OPERATED VALVE -- MOV
PRESSURE REDUCING VALVE -- PRV
SOLENOID OPERATED VALVE -- SOV

SYSTEM NUMBERING (JJ)

FACILITIES
00 NOT USED
01 NOT USED
02 WASTE RETRIEVAL FACILITIES
03 NOT USED
04 NOT USED
05 MISCELLANEOUS FACILITIES-SITE
06 NOT USED
07 NOT USED
08 NOT USED
09 NOT USED

RETRIEVAL
10 PNEUMATIC RETRIEVAL SYSTEM
11 MECHANICAL RETRIEVAL SYSTEM
12 NOT USED
13 NOT USED
14 NOT USED

PROCESSING
15 NOT USED
16 NOT USED
17 NOT USED
18 NOT USED
19 PROCESS VENT (DUST COLLECTION) SYSTEM
20 NOT USED
21 NOT USED
22 NOT USED

PRODUCT HANDLING
23 NOT USED
24 NOT USED
25 PRODUCT PACKAGING AND CONTAINER
26 MANAGEMENT SYSTEM
27 NOT USED
28 NOT USED
29 NOT USED

ELECTRICAL
30 HIGH VOLTAGE SYSTEM
31 480 VOLT DISTRIBUTION SYSTEM
32 STANDBY ELECTRICAL SYSTEM
33 UNINTERRUPTIBLE POWER SYSTEM
34 LIGHTING SYSTEM
35 GROUNDING SYSTEM
36 NOT USED
37 NOT USED
38 NOT USED
39 MISCELLANEOUS ELECTRICAL

UTILITIES AND CHEMICALS
40 PLANT AND INSTRUMENT AIR SYSTEM
41 BREATHING AIR SYSTEM
42 NOT USED
43 NOT USED
44 NOT USED
45 NOT USED
46 NOT USED
47 NOT USED
48 NOT USED
49 NOT USED

WATER SYSTEMS
50 PROCESS WATER SYSTEM
51 POTABLE WATER SYSTEM
52 NOT USED
53 NOT USED
54 NOT USED
55 NOT USED
56 NOT USED
57 NOT USED
58 NOT USED
59 NOT USED

WASTE SYSTEMS
60 NOT USED
61 NOT USED
62 WASTEWATER SYSTEM
63 NOT USED
64 NOT USED
65 NOT USED
66 NOT USED
67 NOT USED
68 NOT USED
69 NOT USED

HVAC SYSTEMS
70 SUPPLY AIR SYSTEM
71 EXHAUST AIR SYSTEM
72 NOT USED
73 NOT USED
74 NOT USED
75 NOT USED
76 NOT USED
77 NOT USED
78 NOT USED
79 NOT USED

MECHANICAL AND ANALYTICAL SYSTEMS
80 NOT USED
81 NOT USED
82 NOT USED
83 NOT USED
84 SAMPLING SYSTEM
85 NOT USED
86 NOT USED
87 NOT USED
88 NOT USED
89 NOT USED

INFORMATION AND CONTROL SYSTEMS
90 CONTROL SYSTEM
91 NOT USED
92 FIRE DETECTION AND ALARM SYSTEM
93 NOT USED
94 NOT USED
95 NOT USED
96 NOT USED
97 NOT USED
98 NOT USED
99 NOT USED

REF DWG NO.	DRAWING TITLE
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JTN	RGL
B	ISSUED FOR REVIEW	03/15/02	JTN	RGL
A	ISSUED FOR REVIEW	01/10/02	JTN	RGL

PRELIMINARY
NOT FOR CONSTRUCTION

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000422

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
PIPING, VALVES, AND MISCELLANEOUS

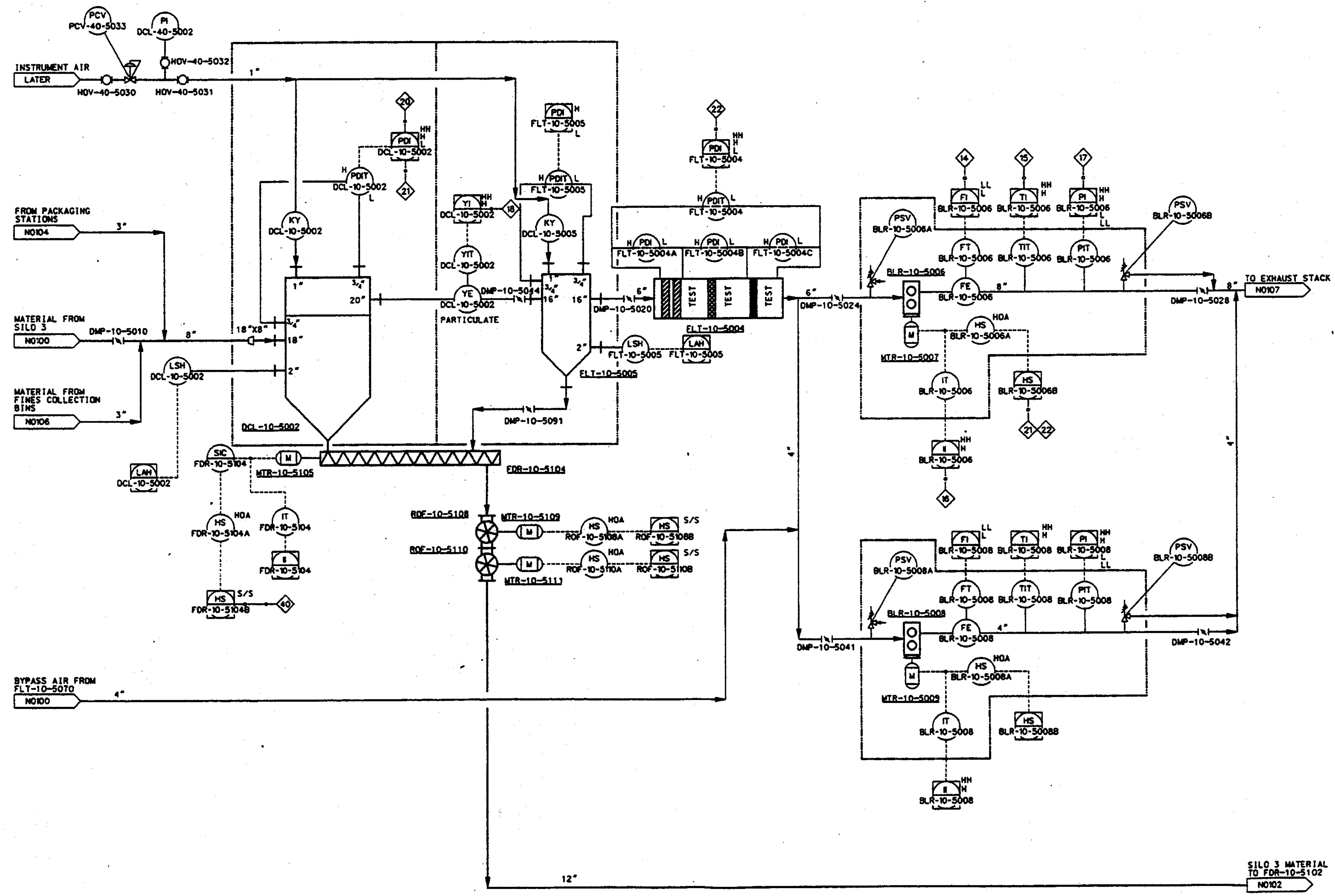
DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBALM	1/7/02	RICHARD HICKS	1/7/02	J.T.NELSON	1/7/02

SCALE: NONE
CLASS: U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-N-01381	N0001	C

JEG PROJECT NO. 35H19605
FILENAME 94X01381.DGN

4267



FDR-10-5104
PNEUMATIC RETRIEVAL COLLECTOR DISCHARGE FEEDER
TWIN SCREW, VARIABLE FLIGHT
SS

MTR-10-5105
5 HP

ROF-10-5108
PRIMARY ROTARY FEEDER
SS

MTR-10-5109
2 HP

DCL-10-5002
PNEUMATIC RETRIEVAL COLLECTOR
1200 SCFM

ROF-10-5110
SECONDARY ROTARY FEEDER
SS

MTR-10-5111
2 HP

FLT-10-5004
HEPA FILTER
3000 SCFM
BAG-IN/BAG-OUT
SS

FLT-10-5005
CARTRIDGE FILTER

BLR-10-5006
PNEUMATIC RETRIEVAL BLOWER
1200 SCFM
CS

MTR-10-5007
100 HP

BLR-10-5008
AUXILIARY VACUUM BLOWER
250 SCFM
CS

MTR-10-5009
20 HP

PRELIMINARY
NOT FOR CONSTRUCTION

NOTES:

1. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED, OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.

INTERLOCKS:

14 SHUTDOWN BLOWER BLR-10-5006 ON LOW LOW FLOW.

15 SHUTDOWN BLOWER BLR-10-5006 ON HIGH HIGH TEMPERATURE.

16 SHUTDOWN BLOWER BLR-10-5006 ON HIGH HIGH CURRENT.

17 SHUTDOWN BLOWER BLR-10-5006 ON HIGH HIGH PRESSURE.

18 SHUTDOWN BLOWER BLR-10-5006 ON HIGH HIGH PARTICULATE LEVELS FROM PNEUMATIC RETRIEVAL COLLECTOR DCL-10-5002.

20 AUTOMATICALLY PULSE BAGS ON HIGH PDAH ON PNEUMATIC RETRIEVAL COLLECTOR DCL-10-5002.

21 SHUTDOWN BLOWER BLR-10-5006 ON PDAHH ON PNEUMATIC RETRIEVAL COLLECTOR DCL-10-5002.

22 SHUTDOWN BLOWER BLR-10-5006 ON PDAHH ON HEPA FILTER FLT-10-5004.

40 STOP PNEUMATIC RETRIEVAL DISCHARGE FEEDER ON HIGH - HIGH CURRENT. AND ALARM AT TOP OF SILO 3.

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JM	RGL
B	ISSUED FOR REVIEW	04/9/02	JM	RGL
A	ISSUED FOR REVIEW	03/15/02	RLM	RGL

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000426

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
PNEUMATIC CONVEYING SYSTEM

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD L. HICKS	03/12/02

SCALE: NONE
CLASS: U
T.O. NUMBER: N/A
PROJECT NO.: 40430
JEG PROJECT NO.: 35H18605
FILENAME: 94XN1434.DGN
DRAWING INDEX CODE NO.: 94X-3900-N-01434
SHEET NO.: N0101
REV. NO.: C

DATE: 05/02/02
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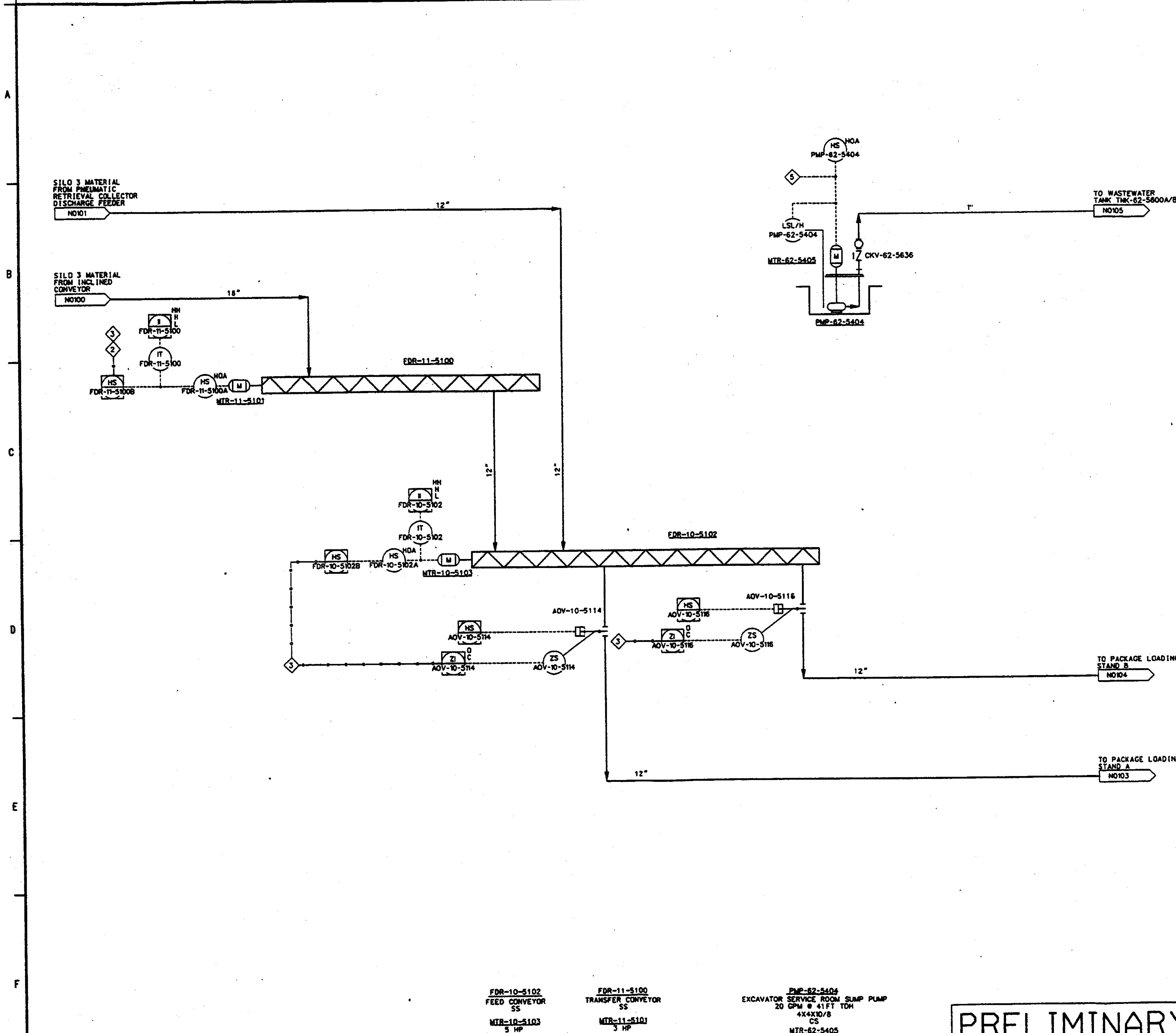
USER: DavisBJ



PRELIMINARY
NOT FOR CONSTRUCTION

INTERLOCKS: **4267**

2. SHUTDOWN INCLINED CONVEYOR (DFC-11-5056) IF TRANSFER CONVEYOR (FDR-11-5100) IS NOT RUNNING.
3. INTERLOCK WILL ALLOW FEEDERS (FDR-11-5100 AND FDR-10-5102) TO RUN ONLY IF ONE OF THE TWO DISCHARGE VALVES (AOV-10-5114 OR AOV-10-5116) IS OPEN.
4. SHUTDOWN TRANSFER CONVEYOR (FDR-11-5100) AND PNEUMATIC RETRIEVAL COLLECTOR DISCHARGE FEEDER (FDR-10-5104) IF FEED CONVEYOR (FDR-10-5102) IS NOT RUNNING. ALSO ALARM TO OPERATOR AT SILO 3.
5. SUMP PUMP (PMP-62-5404) TO SHUT DOWN ON HIGH - HIGH LEVEL IN TANKS TNK-62-5600A/B.

NOTES:

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JM	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	JTN	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY JACOBS

PROJECT NAME: SILO 3 **000427**

DRAWING TITLE: INSTRUMENTATION PIPING AND INSTRUMENT DIAGRAM FEED SYSTEM

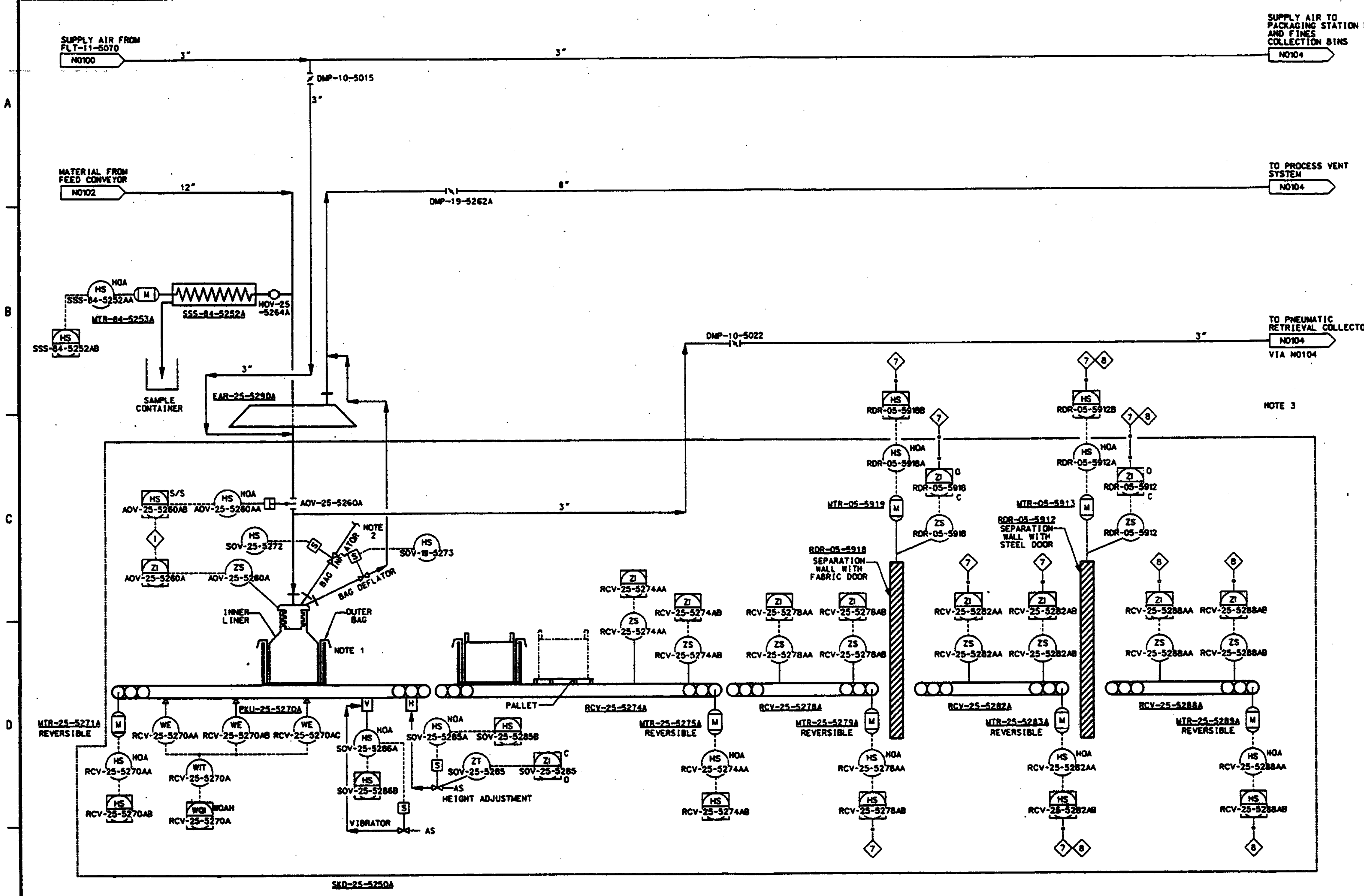
DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	RICHARD L. HICKS	03/12/02	JAMES T. NELSON	03/12/02

SCALE: NONE CLASS: U

T.A. NUMBER: N/A PROJECT NO.: 40430
PROJECT NO.: 35H19605 FILENAME: 94XN1435.DGN
DRAWING INDEX CODE NO.: 94X-3900-N-01435 SHEET NO.: N0102 REV. NO.: C

DATE: 05/02/02 TIME: 10:46:07 AM USER: PrinceTC

4267



SKD-25-5250A
CONTAINER MANAGEMENT AND PACKAGING SYSTEM A

PKU-25-5270A
PACKAGE LOADING STAND A
SS
MTR-25-5271A
3 HP. REV.

EAR-25-5290A
PACKAGING STATION EXHAUST HOOD A
CS

SSS-84-5252A
PACKAGING SAMPLER A
SS
MTR-84-5253A
1/6 HP. 1 PH. 115 V

RCV-25-5274A
INTERMEDIATE PACKAGING CONVEYOR A
CS
MTR-25-5275A
3 HP. REV.

RCV-25-5278A
PACKAGE STAGING CONVEYOR A
CS
MTR-25-5279A
3 HP. REV.

RCV-25-5282A
AIRLOCK CONVEYOR A
CS
MTR-25-5283A
3 HP. REV.

RCV-25-5288A
OFF-LOADING CONVEYOR A
CS
MTR-25-5289A
3 HP. REV.

RDR-05-5918
ROLL-UP DOOR 013E
FABRIC
MTR-05-5919
1 HP. REV.

RDR-05-5912
ROLL-UP DOOR 013B
CS
MTR-05-5913
1.5 HP. REV.

NOTES:

1. SUPPLY PROXIMITY OR PRESSURE SWITCH ON FLEXIBLE CORD TO BE ATTACHED TO THE BULK BAG FRAME. THIS SWITCH SHALL ALARM ON HIGH LEVEL IN THE BAG AND CLOSE THE FILL VALVE ON HIGH - HIGH LEVEL IN THE BAG.
2. "INFLATOR" AIR WILL BE PROVIDED VIA A SMALL BLOWER INTEGRAL WITH THE PACKAGE LOADING STAND.
3. A BRIDGE CRANE (BRC-25-5280) IS SUPPLIED FOR OFF LOADING CONVEYOR RCV-25-5288A. FOR DETAILS SEE SHEET N0104.
4. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED. OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.

INTERLOCKS:

7 TO INDEX A BULK BAG FROM THE PACKAGE STAGING CONVEYOR TO THE AIRLOCK CONVEYOR. THE FOLLOWING HAPPENS:

- THE STEEL ROLL-UP DOOR (RDR-05-5912) MUST BE CLOSED.
- THE FABRIC ROLL-UP DOOR (RDR-05-5918) OPENS.
- THE PACKAGE STAGING CONVEYOR STARTS.
- THE AIRLOCK CONVEYOR STARTS.

WHEN LIMIT SWITCH ZI-RCV-25-5282AB IS ACTIVATED:

- STOP PACKAGE STAGING CONVEYOR.
- STOP AIRLOCK CONVEYOR.
- CLOSE FABRIC DOOR (RDR-05-5918).

8 TO INDEX A BULK BAG FROM THE AIRLOCK CONVEYOR TO THE OFF-LOADING CONVEYOR. THE FOLLOWING HAPPENS:

- THE FABRIC ROLL-UP DOOR (RDR-05-5918) MUST BE CLOSED.
- THE STEEL ROLL-UP DOOR (RDR-05-5912) OPENS.
- THE AIRLOCK CONVEYOR STARTS.
- THE OFF-LOADING CONVEYOR STARTS.

WHEN LIMIT SWITCH ZI-RCV-25-5288AB IS ACTIVATED:

- STOP AIRLOCK CONVEYOR.
- STOP OFF-LOADING CONVEYOR.
- CLOSE STEEL DOOR (RDR-05-5912).

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

JACOBS

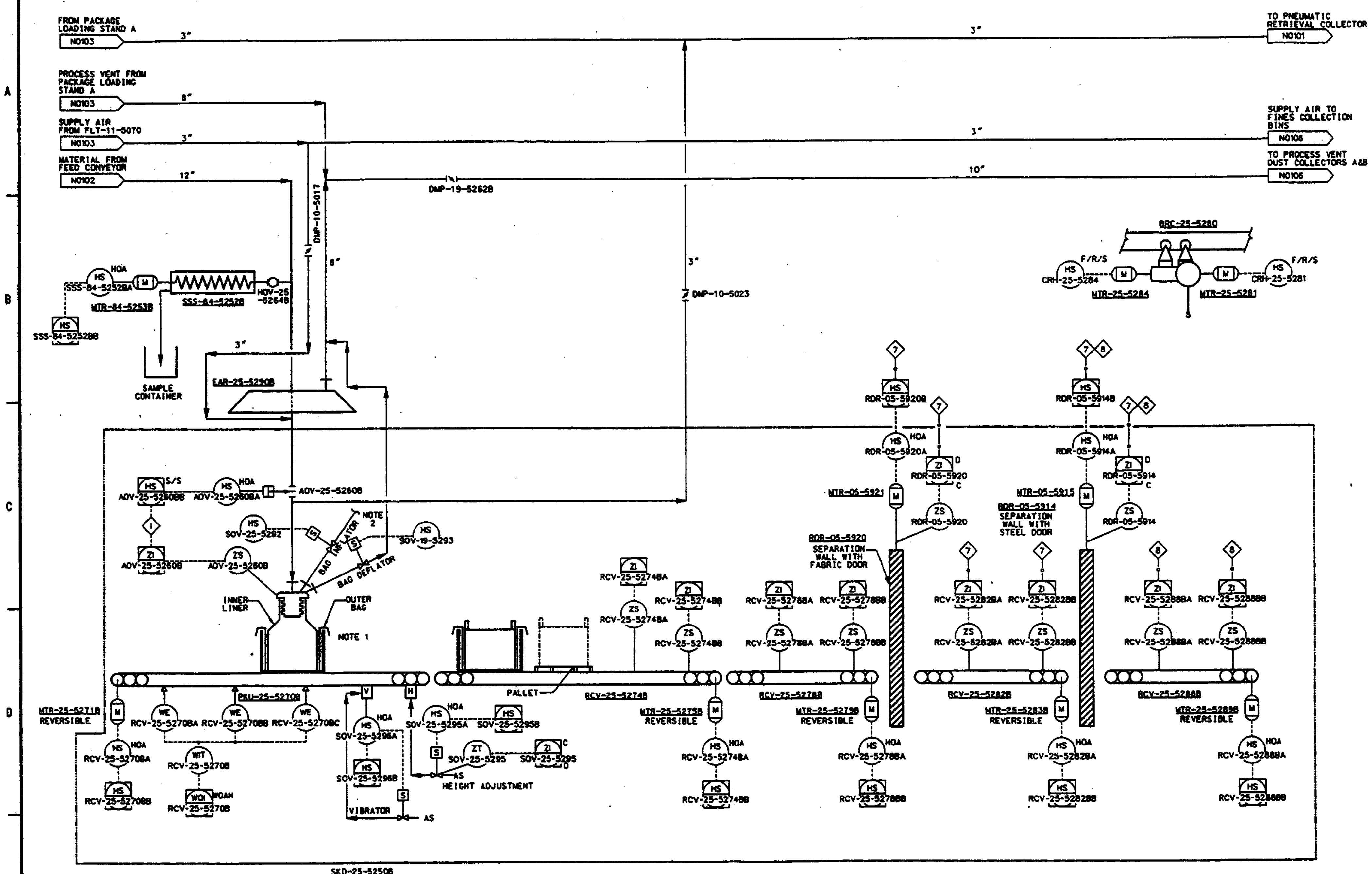
PROJECT NAME: SILO 3 000428

DRAWING TITLE:
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
BULK BAG PACKAGING LINE A

DRAWN BY: J.ROSENBAUM DATE: 03/12/02
TECHNICAL LEAD: KENNETH RICKETT
CHECKED BY: RICHARD L. HICKS
SCALE: NONE
CLASS: U
PROJECT NO. 40430
T.O. NUMBER: N/A
JEG PROJECT NO. 35H18605
DRAWING SHEET CODE NO. 94X-3900-N-01436
SHEET NO. N0103
REV. NO. C

PRELIMINARY
NOT FOR CONSTRUCTION

4267



NOTES:

1. SUPPLY PROXIMITY OR PRESSURE SWITCH ON FLEXIBLE CORD TO BE ATTACHED TO THE BULK BAG FRAME. THIS SWITCH SHALL ALARM ON HIGH LEVEL IN THE BAG AND CLOSE THE FILL VALVE ON HIGH - HIGH LEVEL IN THE BAG.
2. "INFLATOR" AIR WILL BE PROVIDED VIA A SMALL BLOWER INTEGRAL WITH THE PACKAGE LOADING STAND.
3. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED, OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.

INTERLOCKS:

7 TO INDEX A BULK BAG FROM THE PACKAGE STAGING CONVEYOR TO THE AIRLOCK CONVEYOR, THE FOLLOWING HAPPENS:

- THE STEEL ROLL-UP DOOR (RDR-05-5914) MUST BE CLOSED.
- THE FABRIC ROLL-UP DOOR (RDR-05-5920) OPENS.
- THE PACKAGE STAGING CONVEYOR STARTS.
- THE AIRLOCK CONVEYOR STARTS.

WHEN LIMIT SWITCH ZI-RCV-25-5282BA IS ACTIVATED:

- STOP PACKAGE STAGING CONVEYOR.
- STOP AIRLOCK CONVEYOR.
- CLOSE FABRIC DOOR (RDR-05-5920).

8 TO INDEX A BULK BAG FROM THE AIRLOCK CONVEYOR TO THE OFF-LOADING CONVEYOR, THE FOLLOWING HAPPENS:

- THE FABRIC ROLL-UP DOOR (RDR-05-5920) MUST BE CLOSED.
- THE STEEL ROLL-UP DOOR (RDR-05-5914) OPENS.
- THE AIRLOCK CONVEYOR STARTS.
- THE OFF-LOADING CONVEYOR STARTS.

WHEN LIMIT SWITCH ZI-RCV-25-5288BA IS ACTIVATED:

- STOP AIRLOCK CONVEYOR.
- STOP OFF-LOADING CONVEYOR.
- CLOSE STEEL DOOR (RDR-05-5914).

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
C	ISSUED FOR REVIEW	03/15/02	RLH	RGL

SKD-25-5250B
CONTAINER MANAGEMENT AND PACKAGING SYSTEM B

PKU-25-5270B
PACKAGE LOADING STAND B
SS
MTR-25-5271B
3 HP. REV.

EAR-25-5290B
PACKAGING STATION EXHAUST HOOD B
CS

SSS-84-5252B
PACKAGING SAMPLER B
SS
MTR-84-5253B
1/6 HP. 1 PH. 115 V

RCV-25-5274B
INTERMEDIATE PACKAGING CONVEYOR B
CS
MTR-25-5275B
3 HP. REV.

RCV-25-5278B
PACKAGE STAGING CONVEYOR B
CS
MTR-25-5279B
3 HP. REV.

BRC-25-5280
BRIDGE CRANE
CS
MTR-25-5281
3 HP. REV.
MTR-25-5284
2 HP. REV.

RCV-25-5282B
AIRLOCK CONVEYOR B
CS
MTR-25-5283B
3 HP. REV.

RCV-25-5288B
OFF LOADING CONVEYOR B
CS
MTR-25-5289B
3 HP. REV.

RDR-05-5914
ROLL-UP DOOR 013C
CS
MTR-05-5915
1.5 HP. REV.

RDR-05-5920
ROLL-UP DOOR 013F
FABRIC
MTR-05-5921
1 HP. REV.

PRELIMINARY
NOT FOR CONSTRUCTION

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

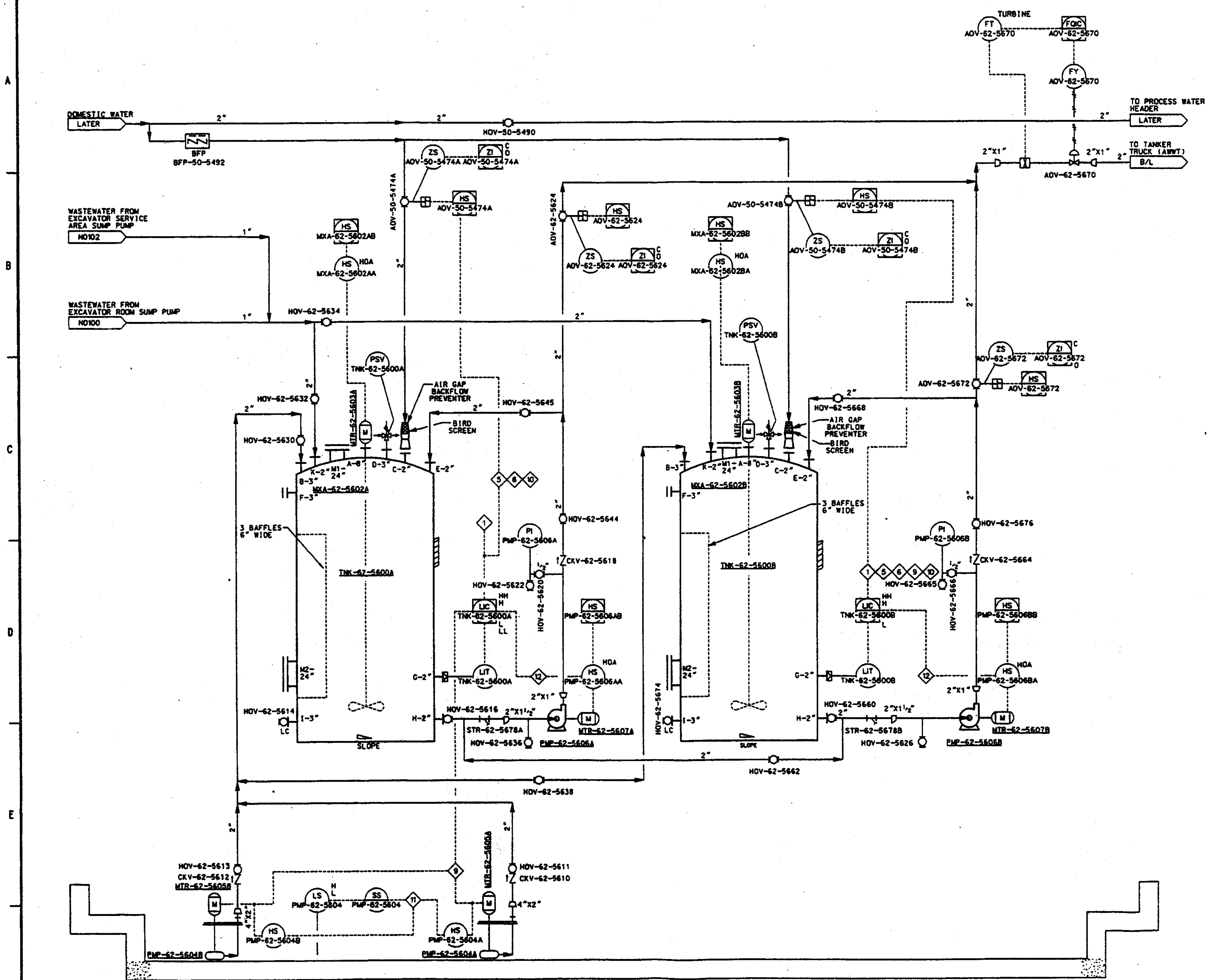
THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3 000429

DRAWING TITLE:
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
BULK BAG PACKAGING LINE B

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD L. HICKS	03/13/02

SCALE: NONE
CLASS: U
T.A. NUMBER: N/A
PROJECT NO. 40430
JES PROJECT NO. 35H19605
FILENAME: 94X0N437.DGN
DRAWING INDEX CODE NO. 94X-3900-N-01437
SHEET NO. N0104
REV. NO. C



PMP-62-5604 A/B
WASTEWATER TANK AREA SUMP PUMPS
50 GPM @ 41' TDH
3X3X8 (7)
MTR-62-5605 A/B
$7\frac{1}{2}$ HP

TNK-62-5600 A/B
WASTEWATER TANK A/B
1700 GALLONS
6' DIA X 8' STRAIGHT SIDE
FRP

MXA-62-5602A/B
WASTEWATER TANK A/B
AGITATOR
MTR-62-5603 A/B
1 HP

PMP-62-5606 A/B
WASTEWATER PUMP A/B
25 GPM @ 47' TDH
$1\frac{1}{2}$ X 1 X 6 (3.5)
MTR-62-5607 A/B
2 HP

PRELIMINARY
NOT FOR CONSTRUCTION

4267

NOTES:

1. ALL PIPING AND EQUIPMENT ON THIS DRAWING ARE INSULATED AND ELECTRIC TRACED.

INTERLOCKS:

1. SUMP PUMP (PMP-62-5642) TO SHUT DOWN ON HIGH HIGH LEVEL IN EITHER WASTE WATER TANK (TNK-62-5600A & B).
6. CLOSE FRESH WATER INLET TO WASTEWATER TANK A OR B. WHEN THEY ARE FULL (HIGH LEVEL).
9. SUMP PUMPS (PMP-62-5604 A/B) TO SHUT DOWN ON HIGH-HIGH LEVEL IN WASTEWATER TANK (TNK-62-5600A OR B).
10. SHUT DOWN AGITATORS ON LOW LEVEL IN WASTEWATER TANKS
11. SUMP PUMPS (PMP-62-5604 A/B) TO SHUT DOWN ON LOW LEVEL IN SUMP.
12. WASTEWATER PUMP (PMP-62-5606A/B) TO SHUTDOWN ON LOW-LOW LEVEL IN WASTEWATER TANK (TNK-62-5600A OR B).

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JTN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	JTN	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000430

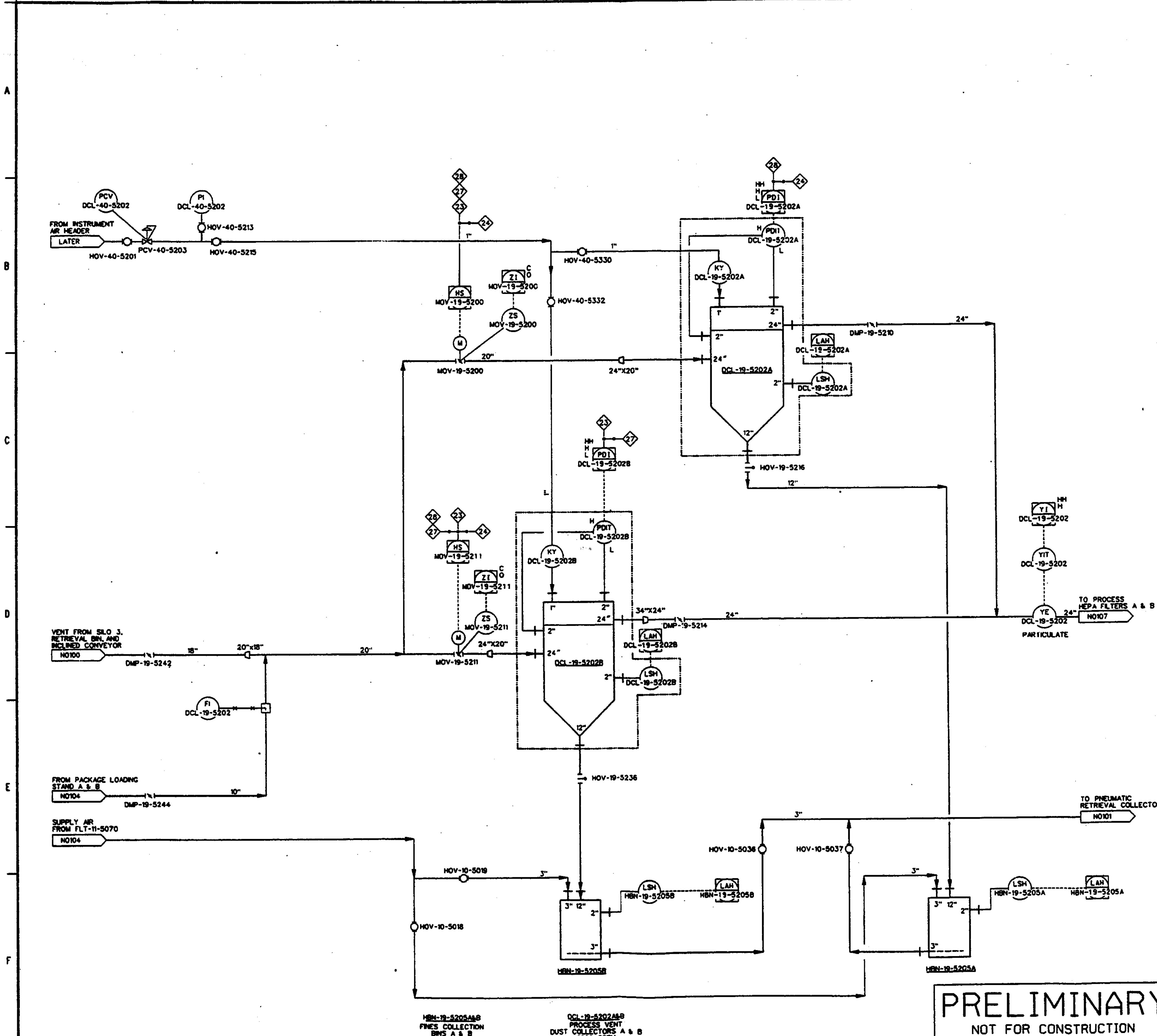
DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
WASTEWATER SYSTEM

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	RICHARD L. HICKS	03/12/02	JAMES T. NELSON	03/12/02

SCALE: NONE CLASS: U

T.A. NUMBER: N/A | PROJECT NO. 40430 | JOB PROJECT NO. 35H19605 | FILENAME 94X0N1438.DGN | DRAWING INDEX CODE NO. 94X-3900-N-01438 | SHEET NO. N0105 | REV. NO. C

4267



PRELIMINARY
NOT FOR CONSTRUCTION

NOTES:

1. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED. OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.

INTERLOCKS:

23 OPEN MOV-19-5200 AND CLOSE MOV-19-5211 ON PDAH IN DCL-19-5202 B.

24 OPEN MOV-19-5211 AND CLOSE MOV-'9-5200 ON PDAH ON DCL-19-5202A.

27 OPEN MOV-19-5200 AND CLOSE MOV-19-5211 ON HIGH HIGH PARTICULATE ON DCL-19-5202B.

28 OPEN MOV-19-5211 AND CLOSE MOV-19-5200 ON HIGH HIGH PARTICULATE ON DCL-19-5202A.

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVIEW PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	[illegible]	[illegible]
B	ISSUED FOR REVIEW	04/10/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000431

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
PROCESS VENT AND FINES ADDITION SYSTEMS

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD L. HICKS	03/12/02

SCALE: NONE CLASS: U

PROJECT NO. 40430 T.E. NUMBER N/A

94X-3900-N-01439 | SHEET NO. N0106 | REV. NO. C

4267

NOTES:

1. HEAT TRACE AND INSULATE PROCESS LINES TO CEM-19-5208.

INTERLOCKS:

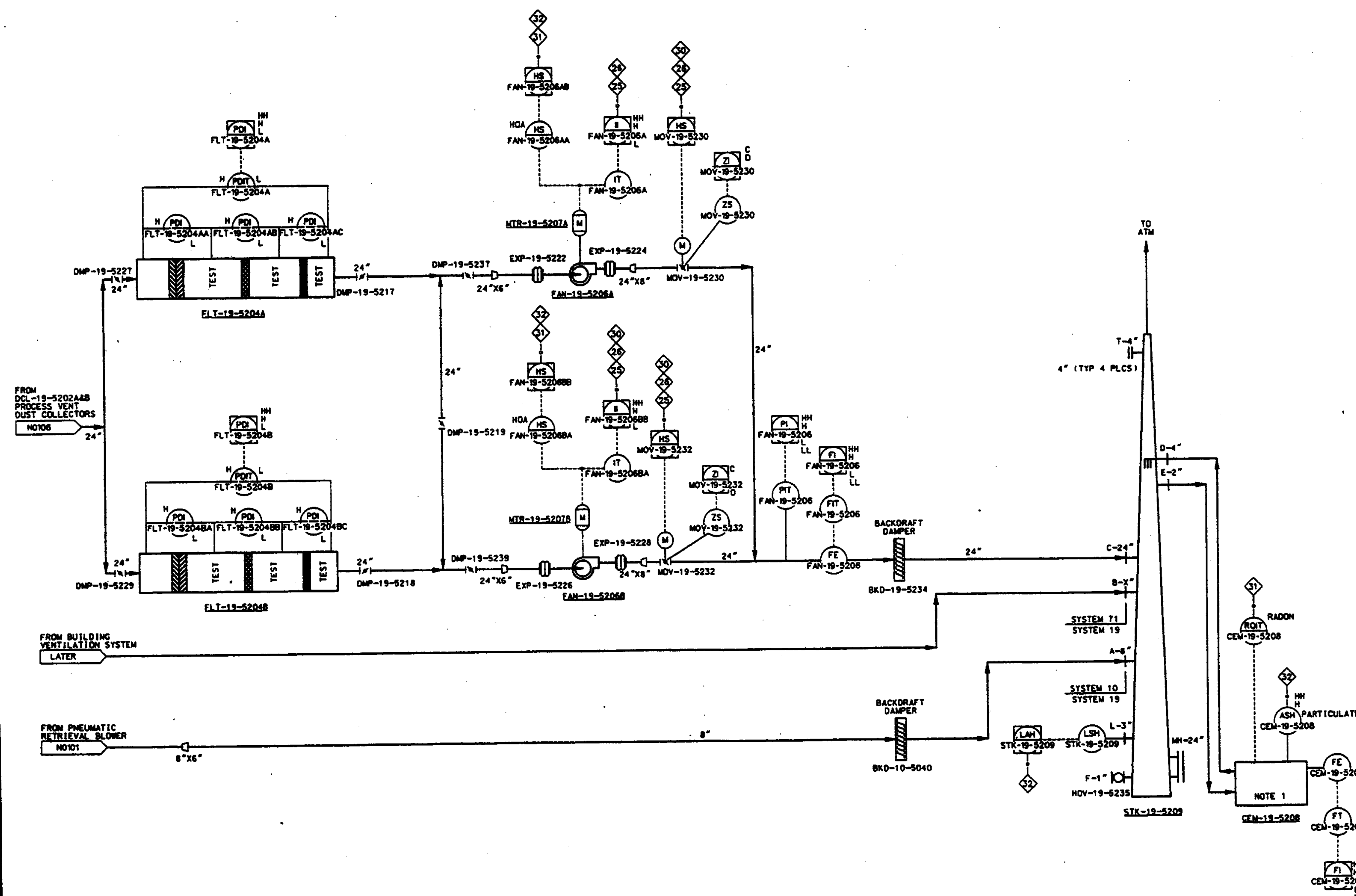
25 SHUTDOWN FAN-19-5206A ON LOW CURRENT AND OPEN MOV-19-5232 AND START FAN-19-5206B AND CLOSE MOV-19-5230.

26 SHUTDOWN FAN-19-5206B ON LOW CURRENT AND OPEN MOV-19-5230. THEN START FAN-19-5206A AND CLOSE MOV-19-5230.

30 OPEN MOV-19-5230 AND CLOSE MOV-19-5232 ON HIGH HIGH CURRENT ON FAN-19-5206B. AND SHUTDOWN FAN-19-5206B.

31 SHUTDOWN FAN-19-5206A OR FAN-19-5206B ON HIGH HIGH RADON LEVEL IN EXHAUST STACK.

32 ALARM FAN-19-5206A OR FAN-19-5206B ON HIGH HIGH WATER OR RADIOLOGICAL PARTICULATE LEVELS IN EXHAUST STACK.



FLT-19-5204A & B
PROCESS HEPA FILTERS A & B
6000 SCFM
BAG-IN/BAG-OUT TYPE
SS

FAN-19-5206A & B
PROCESS EXHAUST FANS A & B
6000 SCFM @ 27" S.P.

MTR-19-5207A & B
30 HP

STK-19-5209
EXHAUST STACK
3'-0" DIA x 125' HIGH
TAPERED
CS

CEM-19-5208
ISOKINETIC
SAMPLING SYSTEM

PRELIMINARY
NOT FOR CONSTRUCTION

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APR.
C	ISSUED FOR EPA REVIEW	04/30/02		
B	ISSUED FOR REVIEW	[illegible]	JN	RGL
A	ISSUED FOR REVIEW	[illegible]	RLH	RGL

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

JACOBS

SILO 3 000432

INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
PROCESS VENT SYSTEM

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD L. HICKS	03/12/02

SCALE: NONE
CLASS: U

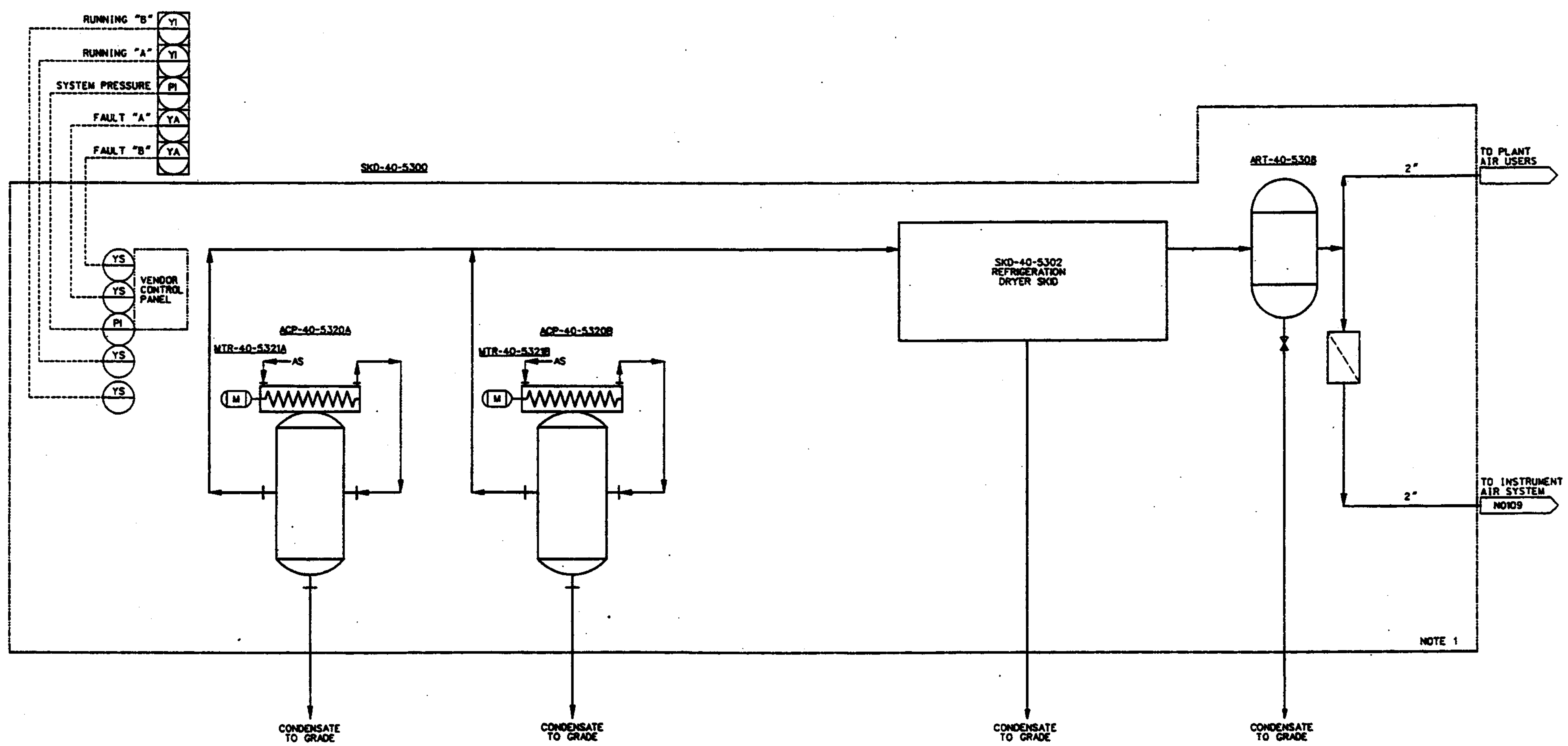
T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-N-01440	N0107	C
35H19605	94X01440.DGN			

NOTES:

4267

1. VENDOR TO PROVIDE ALL INSTRUMENTATION WITHIN PACKAGE BOUNDRIES.

2. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED. OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.



SKD-40-5300
PLANT/INSTRUMENT AIR COMPRESSOR SKID

ACP-40-5320A & B
AIR COMPRESSORS A & B
125 SCFM @ 110 PSIG

MTR-40-5321A & B
60 HP

SKD-40-5302
REFRIGERATION DRYER SKID
125 SCFM @ 110 PSIG

ART-40-5308
PLANT AIR
RECEIVER TANK

REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/18/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

PRELIMINARY
NOT FOR CONSTRUCTION

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000433

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
PLANT AIR SYSTEM

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
J.ROSENBAUM	03/12/02	KENNETH RICKETT	03/12/02	RICHARD L. HICKS	03/12/02

SCALE: NONE
CLASS: U

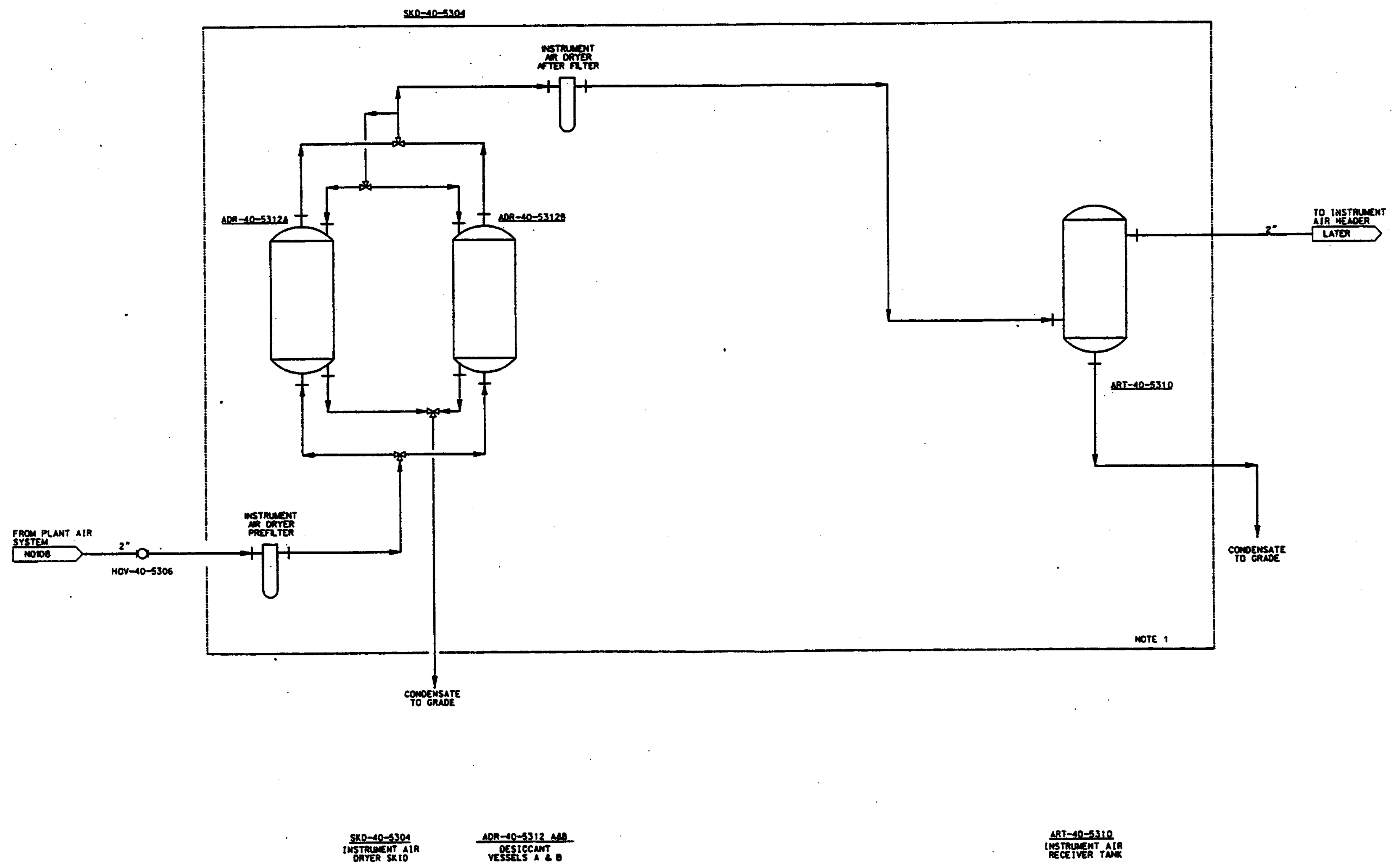
T.O. NUMBER: N/A
PROJECT NO.: 40430
JACOBS PROJECT NO.: 35H10605
FILENAME: 94XN01441.DGN

DRAWING NUMBER	SHEET NO.	REV. NO.
94X-3900-N-01441	N0108	C

4267

NOTES:

1. VENDOR TO PROVIDE ALL INSTRUMENTATION WITHIN PACKAGE BOUNDRIES.
2. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED. OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.



REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JM	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/12/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JE JACOBS

PROJECT NAME
SILO 3 000434

DRAWING TITLE
INSTRUMENTATION
PIPING AND INSTRUMENT DIAGRAM
INSTRUMENT AIR SYSTEM

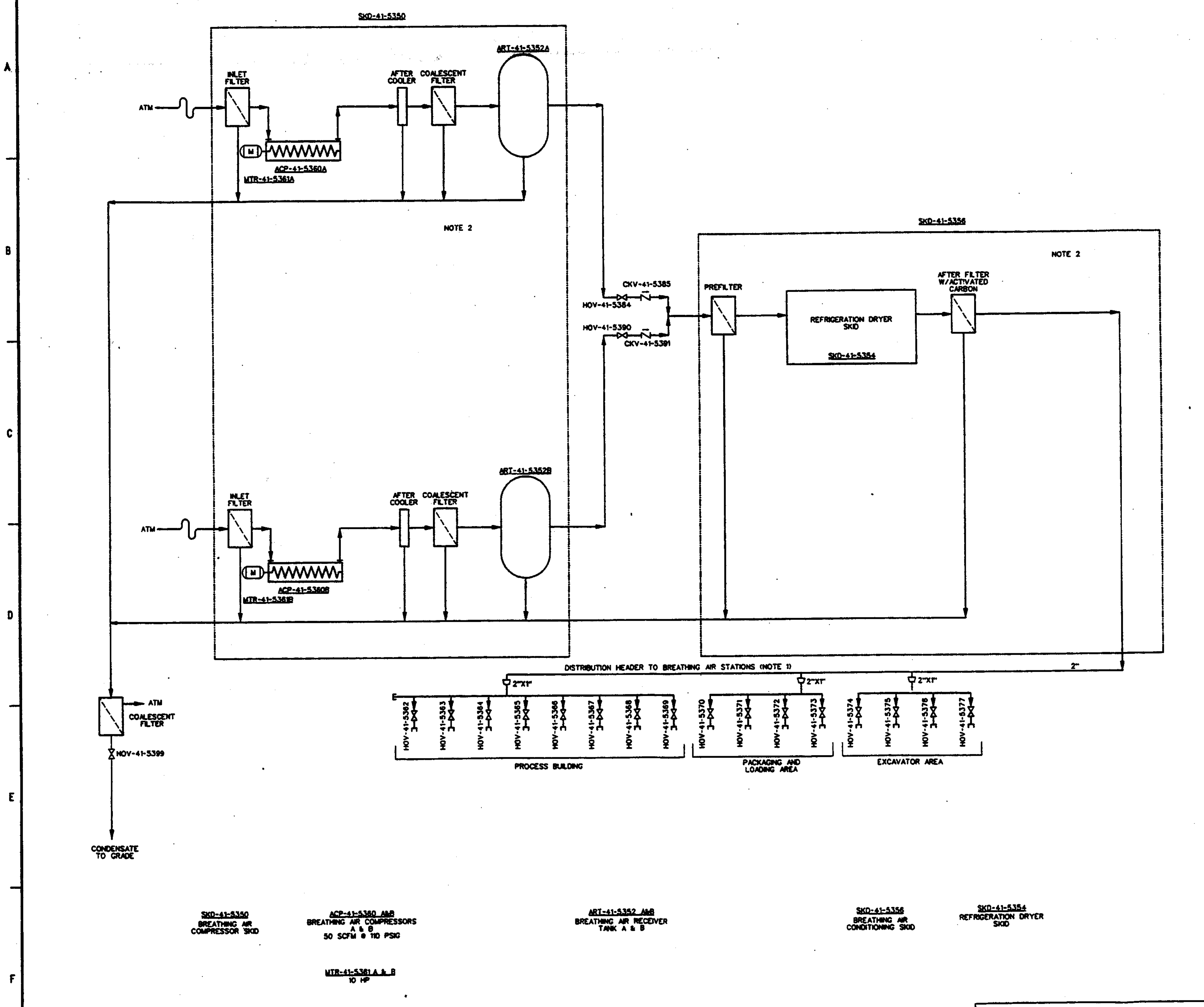
DRAWN BY J.ROSENBAUM DATE 03/12/02 | TECHNICAL LEAD KENNETH RICKETT DATE 03/12/02 | CHECKED BY RICHARD L. HICKS DATE 03/12/02
SCALE NONE | CLASS U
PROJECT NO. 40430 | T.E. NUMBER N/A
94X-3900-N-01442 | SHEET NO. N0109 | REV. NO. C

PRELIMINARY
NOT FOR CONSTRUCTION

4267

NOTES:

1. BREATHING AIR CONNECTIONS FOR SUPPLIED AIR AREAS WILL BE LOCATED OUTSIDE AREA IN UTILITY BOXES FOR CONTAMINATION CONTROL.
2. VENDOR TO PROVIDE ALL INSTRUMENTATION WITHIN PACKAGE BOUNDRIES.
3. ALL PACKAGED UNITS WILL HAVE INSTRUMENTATION THAT MAY NOT BE SHOWN. DETAILS WILL BE ADDED AFTER THE EQUIPMENT IS PURCHASED. OR A REFERENCE TO THE APPROPRIATE VENDOR DOCUMENTATION WILL BE ADDED.



REF DWG NO.	DRAWING TITLE
N0001	PIPING, VALVES AND MISCELLANEOUS
N0002	INSTRUMENTATION
N0003	EQUIPMENT AND MISCELLANEOUS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	JN	RGL
B	ISSUED FOR REVIEW	04/11/02	JN	RGL
A	ISSUED FOR REVIEW	03/15/02	RLH	RGL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3 000435

DRAWING TITLE: INSTRUMENTATION PIPING AND INSTRUMENT DIAGRAM BREATHING AIR SYSTEM

DRAWN BY: J.ROSENBAUM DATE: 03/12/02 TECHNICAL LEAD: KENNETH RICKETT DATE: 03/12/02 CHECKED BY: RICHARD L. HICKS DATE: 03/12/02
SCALE: NONE CLASS: U
T.A. NUMBER: N/A PROJECT NO.: 40430
DRAWING NO.: 94X-3900-N-01443 SHEET NO.: N0110 REV. NO.: C

PRELIMINARY
NOT FOR CONSTRUCTION

EQUIPMENT DESCRIPTION	EQUIPMENT DESIGNATOR (XXX)
AIR CONDITIONING UNIT	ACU
AIR HANDLING UNIT	AHU
CONDENSER	CND
DAMPER (BUTTERFLY)	DMP
DAMPER (NON-BUTTERFLY)	DPR
DUCT HEATER	DHT
ENCLOSURE	ENC
EXHAUST AIR REGISTER	EAR
EXPANSION JOINT	EXP
FAN	FAN
FILTER	FLT
FLEXIBLE CONNECTION	FLX
GRAVITY DAMPER	GDM
HEATER	HTR
HUMIDIFER	HUM
JUNCTION BOX	JBX
LOUVER	LVR
MAIN CIRCUIT BREAKER	MCB
MOTOR	MTR
MOTOR CONTROL CENTER	MCC
MOTOR STARTER PANEL	MSP
PACKAGE UNIT	PKU
PANEL (CONTROL)	PNL
PANELBOARD	PNB
POWER DISTRIBUTION PANEL	PDP
POWER PANEL	PPN
POWER PANEL (INSTRUMENTATION)	PWP
RETURN AIR REGISTER	RAR
STACK	STK
SUPPLY AIR DIFFUSER	SAD
UNINTERRUPTABLE POWER SUPPLY	UPS
UPS DISTRIBUTION PANEL	UDP
VACUUM BREAKER	VBK

SYSTEM NUMBERING

(YY)	
	FACILITIES
00	NOT USED
01	NOT USED
02	WASTE RETRIEVAL FACILITIES
03	NOT USED
04	NOT USED
05	MISCELLANEOUS FACILITES
06	NOT USED
07	NOT USED
08	NOT USED
09	NOT USED
	RETRIEVAL
10	PNEUMATIC RETRIEVAL SYSTEM
11	MECHANICAL RETRIVEAL SYSTEM
12	NOT USED
13	NOT USED
14	NOT USED
	PROCESSING
15	NOT USED
16	NOT USED
17	NOT USED
18	NOT USED
19	PROCESS VENT (DUST COLLECTION) SYSTEM
20	NOT USED
21	NOT USED
22	NOT USED
	PRODUCT HANDLING
23	NOT USED
24	NOT USED
25	CONTAINER MANAGEMENT SYSTEM
26	NOT USED
27	NOT USED
28	NOT USED
29	NOT USED
	ELECTRICAL
30	HIGH VOLTAGE SYSTEM
31	480 VOLT DISTRIBUTION SYSTEM
32	STANDBY ELECTRICAL SYSTEM
33	UNINTERRUPTIBLE POWER SYSTEM
34	LIGHTING SYSTEM
35	GROUNDING SYSTEM
36	NOT USED
37	NOT USED
38	NOT USED
39	MISCELLANEOUS ELECTRICAL
	UTILITIES AND CHEMICALS
40	PLANT AND INSTRUMENT AIR SYSTEM
41	BREATHING AIR SYSTEM
42	NOT USED
43	NOT USED
44	ADDITIVE SYSTEM
45	NOT USED
46	NOT USED
47	NOT USED
48	NOT USED
49	NOT USED
	WATER SYSTEMS
50	PROCESS WATER SYSTEM
51	NOT USED
52	NOT USED
53	NOT USED
54	NOT USED
55	NOT USED
56	NOT USED
57	NOT USED
58	NOT USED
59	NOT USED
	WASTE SYSTEMS
60	NOT USED
61	NOT USED
62	WATER SYSTEM
63	NOT USED
64	NOT USED
65	NOT USED
66	NOT USED
67	NOT USED
68	NOT USED
69	NOT USED
	HVAC SYSTEMS
70	SUPPLY AIR SYSTEM
71	EXHAUST AIR SYSTEM
72	NOT USED
73	NOT USED
74	NOT USED
75	NOT USED
76	NOT USED
77	HVAC MISCELLANEOUS
78	NOT USED
79	NOT USED
	MECHANICAL AND ANALYTICAL SYSTEMS
80	NOT USED
81	NOT USED
82	NOT USED
83	NOT USED
84	SAMPLING SYSTEM
85	NOT USED
86	NOT USED
87	NOT USED
88	NOT USED
89	NOT USED
	INFORMATION AND CONTROL SYSTEMS
90	CONTROL SYSTEM
91	NOT USED
92	FIRE DETECTION AND ALARM SYSTEM
93	NOT USED
94	NOT USED
95	NOT USED
96	NOT USED
97	NOT USED
98	NOT USED
99	NOT USED

EQUIPMENT NUMBER IDENTIFICATION

XXX-YY-ZZZZ

- ZZZZ — EQUIPMENT SEQUENCE NUMBER
- YY — SYSTEM NUMBER
- XXX — EQUIPMENT CODE DESIGNATOR

GENERAL NOTES:

1. ALL NOTED DUCT DIMENSIONS ARE INSIDE DIMENSIONS UNLESS OTHERWISE NOTED.
2. ALL DUCTWORK SHALL BE GALVANIZED STEEL AS INDICATED IN SPECIFICATION SECTION: (SPECIFICATION NUMBER TO BE FURNISHED LATER) IN AIR-SUPPLY AND DISTRIBUTION SYSTEM UNLESS OTHERWISE NOTED.
3. ALL DUCTWORK ELEVATIONS ARE BOTTOM OF SHEET METAL. UNLESS OTHERWISE NOTED.
4. ROOM PRESSURES INDICATED ON DRAWINGS ARE DIFFERENTIAL PRESSURES (IN INCHES WC) WITH RESPECT TO ATMOSPHERIC PRESSURE.
5. AIRFLOW RATES SHOWN IN CUBIC FEET PER MINUTE (CFM) ARE ACTUAL FLOWS (ACFM) AT THE SITE ELEVATION ABOVE SEA LEVEL.
6. ALL EQUIPMENT SUPPORTS, FOUNDATIONS, PADS, WALL OPENINGS AND PENETRATIONS SHALL BE VERIFIED WITH THE ACTUAL EQUIPMENT FOR SIZE AND FIT. THE EQUIPMENT SIZES INDICATED ON THE DRAWINGS HAVE BEEN SELECTED FOR ENGINEERING DESIGN AND SPACE ALLOCATION PURPOSES. THE ACTUAL SIZES MAY VARY DEPENDING ON EQUIPMENT MANUFACTURER.
7. FOR EXPLANATION OF ADDITIONAL ABBREVIATIONS USED SEE ASHRAE HANDBOOK OF FUNDAMENTALS.
8. ALL MOTORS ARE 3 PHASE, 60 HERTZ, 230/460 VOLTS UNLESS OTHERWISE NOTED.
9. FOR LEGEND, SYMBOLS AND ABBREVIATIONS SEE H0002.

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02		
A	ISSUED FOR REVIEW	03/15/02	BOC	BL

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000436

DRAWING TITLE
HVAC
GENERAL NOTES
SYSTEMS AND EQUIPMENT DESIGNATORS

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
B.SLABBEKORN	03/12/02	CRAIG SMITH	03/12/02	B.O. CINGILLI	03/12/02

PLANT/BLDG NO.: NA | FLOOR: NA | SCALE: NONE | CLASS: U

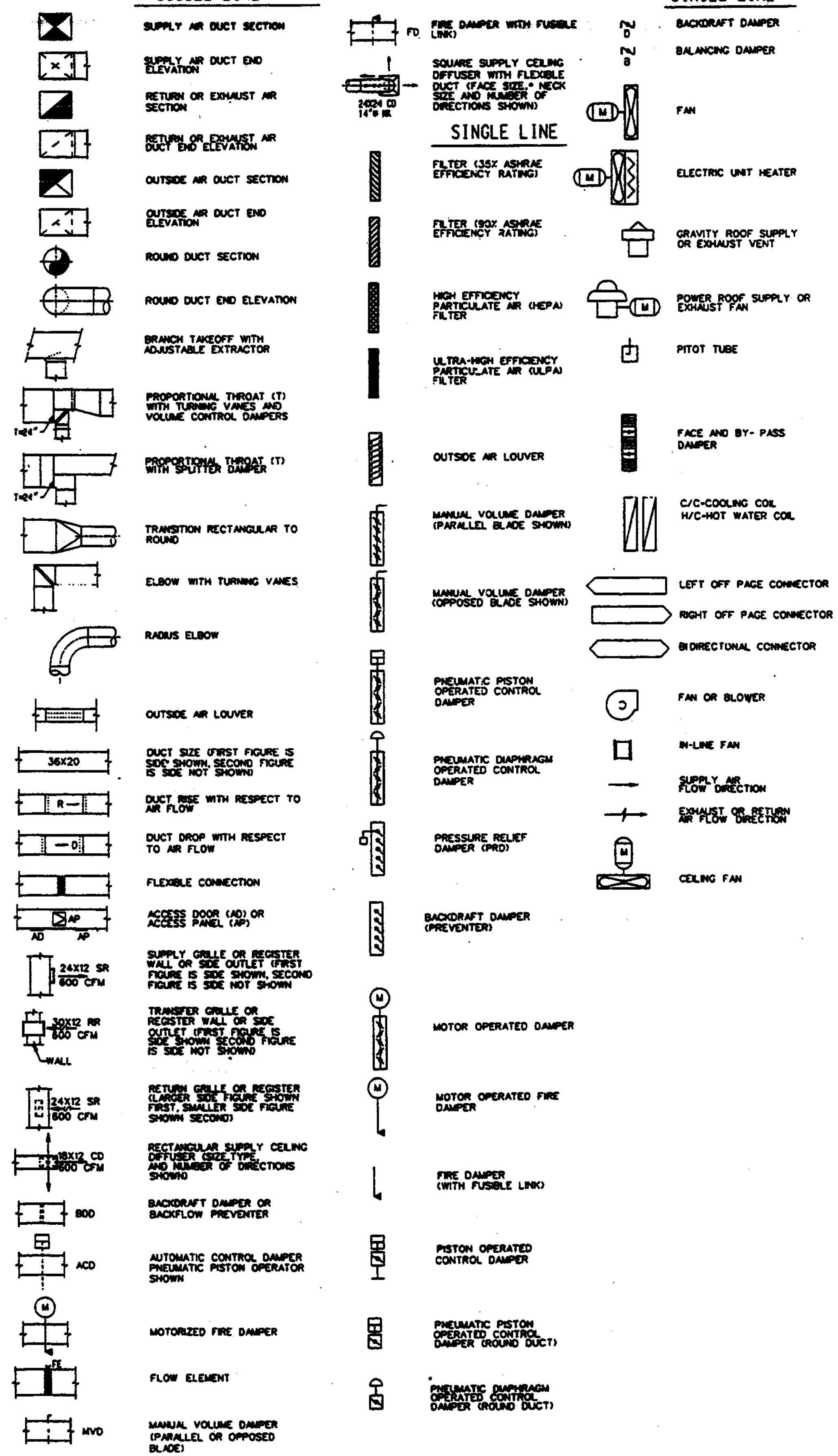
SUBMITTED FOR 30% ISSUE — TECH LEAD ______ DATE ______
SUBMITTED FOR 60% ISSUE — TECH LEAD ______ DATE ______
SUBMITTED FOR 90% ISSUE — TECH LEAD ______ DATE ______

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-H-01302	H0001	B

JEG PROJECT NO.: 35H19605 | FILENAME: 94xH13020GN

PRELIMINARY
NOT FOR CONSTRUCTION

HEATING, VENTILATION AND AIR CONDITIONING LEGEND, SYMBOLS AND ABBREVIATIONS



ABBREVIATIONS

ABBREV.	WORD OR TERM
ABV	ABOVE
ACFM	ACTUAL CUBIC FEET PER MINUTE
AC	AIR CONDITIONING
ACU	AIR CONDITIONING UNIT
APPROX	APPROXIMATELY
ATM	ATMOSPHERE
AUTO	AUTOMATIC
BEL	BELOW
BHP	BRAKE HORSEPOWER
BOG	BOTTOM OF GRILLE
BOD	BOTTOM OF DUCT
BOL	BOTTOM OF LOUVER
BOP	BOTTOM OF PIPE
BOU	BOTTOM OF UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
BYP	BYPASS
CNTFGL	CENTRIFUGAL
C	COMMON
CAP	CAPACITY
CCW	COUNTERCLOCKWISE
CD	CEILING DIFFUSER
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CG	CEILING GRILLE
CL	CENTERLINE
CLG	COOLING
CONC	CONCRETE
COND	CONDENSATE
CONN	CONNECTION
CR	CEILING REGISTER
CS	CARBON STEEL
CTR	CENTER
CV	CHECK VALVE
CW	CLOCKWISE
CCW	COUNTER-CLOCKWISE
DES	DESIGN
DIA	DIAMETER
DISCH	DISCHARGE
DN	DOWN
D/P	DIFFERENTIAL PRESSURE
DRN	DRAIN
DT	DESIGN TEMPERATURE
DWG	DRAWING
(E)	EXISTING
EA	EXHAUST AIR
EFF	EFFICIENCY
EG	EXHAUST GRILLE
ELB	ELBOW
EL	ELEVATION
ENT	ENTERING
EQUIP	EQUIPMENT
EP	EXPLOSION PROOF
ER	EXHAUST REGISTER
ESD	EMERGENCY SHUTDOWN
EVAC	EVACUATION
EXFIL	EXFILTRATION
EXH	EXHAUST
(F)	FURNISHED
°F	DEGREES FAHRENHEIT
°F DB	DEGREES FAHRENHEIT DRY BULB
°F WB	DEGREES FAHRENHEIT WET BULB
FD	FIRE DAMPER
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FLTR	FILTER
FP	FIRE PROTECTION
FPI	FINS PER INCH
FPM	FEET PER MINUTE
FT	FEET
FURN	FURNISHED
FT^2	SQUARE FEET
FT^3	CUBIC FEET
FC	FAIL CLOSED
FO	FAIL OPEN
FL	FAIL LOCKED
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FWD CRV	FORWARD CURVED
GAL	GALLON
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
GR	GRADE
H	HIGH
HTG	HEATING
HEPA	HIGH EFFICIENCY PARTICULATE AIR FILTER
HVAC	HEATING, VENTILATION AND AIR CONDITIONING
HD	HEAD
HDR	HEADER
HP	HORSEPOWER
HGT	HEIGHT
HOA	HAND/OFF/AUTOMATIC
HPT	HIGH POINT
HR	HOUR
HZ	HERTZ
IAS	INSTRUMENT AIR SUPPLY
INSUL	INSULATION
I.E.	THAT IS
IN	INCH
INFIL	INFILTRATION
INSTR	INSTRUMENT
IN WC	INCHES WATER COLUMN
IN WG	INCHES WATER GAUGE
KW	KILOWATT
L	LONG
LG	LEVEL GAUGE
LGTH	LENGTH
LP	LOW PRESSURE
LPT	LOW POINT
MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MW	MANWAY
MIN	MINIMUM
MOV	MOTOR OPERATED VALVE
MTD	MOUNTED
MTG	MOUNTING
MTL	MATERIAL
MFR	MANUFACTURER
NC	NORMALLY CLOSED
NEG	NEGATIVE
NIC	NOT IN CONTRACT
NK	NECK
NO	NORMALLY OPEN
NTS	NOT TO SCALE

ABBREV.	WORD OR TERM
OA	OUTSIDE AIR
OBD	OPPOSED BLADE DAMPER
OC	ON CENTER
OD	OUTSIDE DIAMETER
OVHD	OVERHEAD
OP	OUTPUT
OPER	OPERATING / OPERATOR
OPNG	OPENING
PD	PRESSURE DROP
PENET	PENETRATION
PF	PREFILTER
PH	PHASE
PL	PLATE
PLCS	PLACES
PNL	PANEL
PNEU	PNEUMATIC
POC	POINT OF CONNECTION
POS	POSITIVE
PRESS	PRESSURE
PDAH	PRESSURE DIFFERENTIAL ALARM HIGH
PDAL	PRESSURE DIFFERENTIAL ALARM LOW
PDI	PRESSURE DIFFERENTIAL INDICATOR
PDIC	PRESSURE DIFFERENTIAL INDICATING CONTROLLER
PDIT	PRESSURE DIFFERENTIAL INDICATING TRANSMITTER
ΔP	PRESSURE DIFFERENTIAL
PSIG	POUNDS PER SQUARE INCH (GAUGE)
QTY	QUANTITY
R	ROWS
RA	RETURN AIR
RD	REFRIGERANT DISCHARGE
REF	REFERENCE
REG	REGISTER
REQD	REQUIRED
RG	RETURN GRILLE
RFGT	REFRIGERANT
RH	RELATIVE HUMIDITY
RL	REFRIGERANT LIQUID
RPM	REVOLUTIONS PER MINUTE
RR	RETURN REGISTER
RS	REFRIGERANT SUCTION
SA	SUPPLY AIR
SC	SAMPLE CONNECTION
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SD	SHUTDOWN
SEC	SECONDARY
SG	SUPPLY GRILLE
SIS	SAFETY INSTRUMENTED SYSTEM
SL	SOUND LINING
SPD	SPEED
SP	STATIC PRESSURE
SR	SUPPLY REGISTER
SS	STAINLESS STEEL
STD	STANDARD
SV	SOLENOID VALVE
SW	SWITCH
TA	TRANSFER AIR
TEFC	TOTALLY ENCLOSED FAN COOLED
TEMP	TEMPERATURE
TG	TRANSFER GRILLE
TOC	TOP OF CONCRETE
TOD	TOP OF DUCT
TOS	TOP OF STEEL
TR	TRANSFER REGISTER
TRANSF	TRANSFER
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UC	UNDERCUT DOOR
UG	UNDERGROUND
VAC	VACUUM
VEL	VELOCITY
VNT	VENT
W	WIDE
W/	WITH
WC	WATER COLUMN
WG	WATER GAUGE
W/O	WITHOUT
WR	COOLING WATER RETURN
WS	COOLING WATER SUPPLY
WT	WEIGHT
WTR	WATER

NOTE:
1. FOR EQUIPMENT NUMBERING, DESIGNATORS AND SYSTEM NUMBERS SEE H0001.

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02	BOC	BL
A	ISSUED FOR REVIEW	03/15/02	BOC	BL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY JACOBS

PROJECT NAME: SILO 3 000437

DRAWING TITLE: HVAC LEGEND, SYMBOLS & ABBREVIATIONS

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
B. SLABBEKORN	03/12/02	CRAIG SMITH	03/12/02	B.O. CINGILLI	03/12/02

PLANT/BLDG NO.: NA — FLOOR: NA — SCALE: NONE — CLASS: U

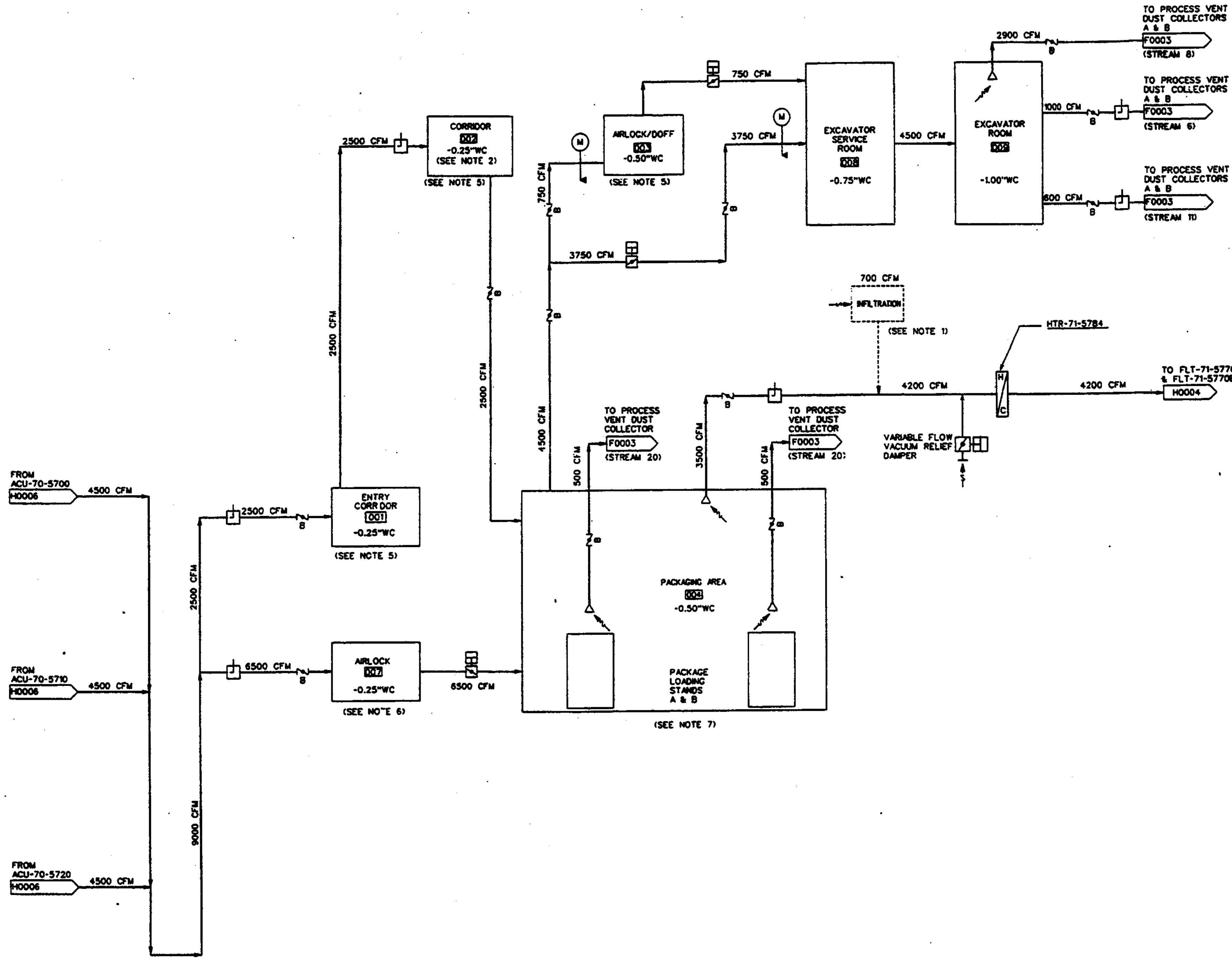
T.O. NUMBER: N/A — PROJECT NO.: 40430 — PROJECT NO.: 35H19605 — FILENAME: 94xh01303DGN

DRAWING INDEX CODE NO.: 94X-3900-H-01303 — SHEET NO.: H0002 — REV. NO.: B

PRELIMINARY
NOT FOR CONSTRUCTION

USER: BSlabbekorn
DESIGN FILE: I:\hvac\DRAWINGS\EPA ISSUE\X0394XH01303.dgn

4267



NOTES:

1. THE ROOM EXHAUST AIR FLOW RATES DO NOT INCLUDE THE INFILTRATION FLOW QUANTITIES: ADJUST THE ROOM EXHAUST FLOW RATES DURING THE AIR SYSTEM BALANCING IN ORDER TO OFFSET THE ACTUAL INFILTRATION FLOW QUANTITIES TO OBTAIN THE REQUIRED ROOM NEGATIVE PRESSURES. THE EXHAUST AIR FILTRATION UNITS ARE SIZED TO HANDLE THE BUILDING INFILTRATION QUANTITY.
2. THE INDICATED ROOM DIFFERENTIAL PRESSURES ARE THE REQUIRED MINIMUM DIFFERENTIALS (TYPICAL EACH ROOM).
3. ALL BALANCING DAMPERS SHALL BE PROVIDED WITH A QUADRANT OPERATOR CAPABLE OF LOCKING THE DAMPER BLADE IN ANY POSITION.
4. ALL AIRFLOW ISOLATION AND FIRE DAMPERS SHALL BE CONNECTED TO THE UNINTERRUPTABLE POWER SUPPLY (UPS) SYSTEM IN ORDER TO PREVENT THE DAMPERS FROM CLOSING SIMULTANEOUSLY WHENEVER A TOTAL COMMERCIAL POWER OUTAGE OCCURS.
5. ROOM HAS (1) 2 KW ELECTRIC RADIANT HEATER.
6. ROOM HAS (2) 2 KW ELECTRIC RADIANT HEATERS.
7. ROOM HAS (4) 15 KW ELECTRIC RADIANT HEATERS.

REF DWG NO.	DRAWING TITLE
H0001	HVAC SYSTEMS AND EQUIPMENT DESIGNATORS
H0002	HVAC LEGEND, SYMBOLS & ABBREVIATIONS
F0003	PROCESS VENT AND PACKAGING SYSTEMS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02		
B	ISSUED FOR REVIEW	03/15/02	BOC	BL
A	ISSUED FOR REVIEW	01/11/02	CCS	BL

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000438

DRAWING TITLE
HVAC
AIR FLOW DIAGRAM

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
B. D. COLLINS	01/07/02	B. O. CINGILLI	01/07/02	C. SMITH	01/07/02

PLANT/BLDG NO.: NA — PLAN: NA — SCALE: NONE — CLASS: U

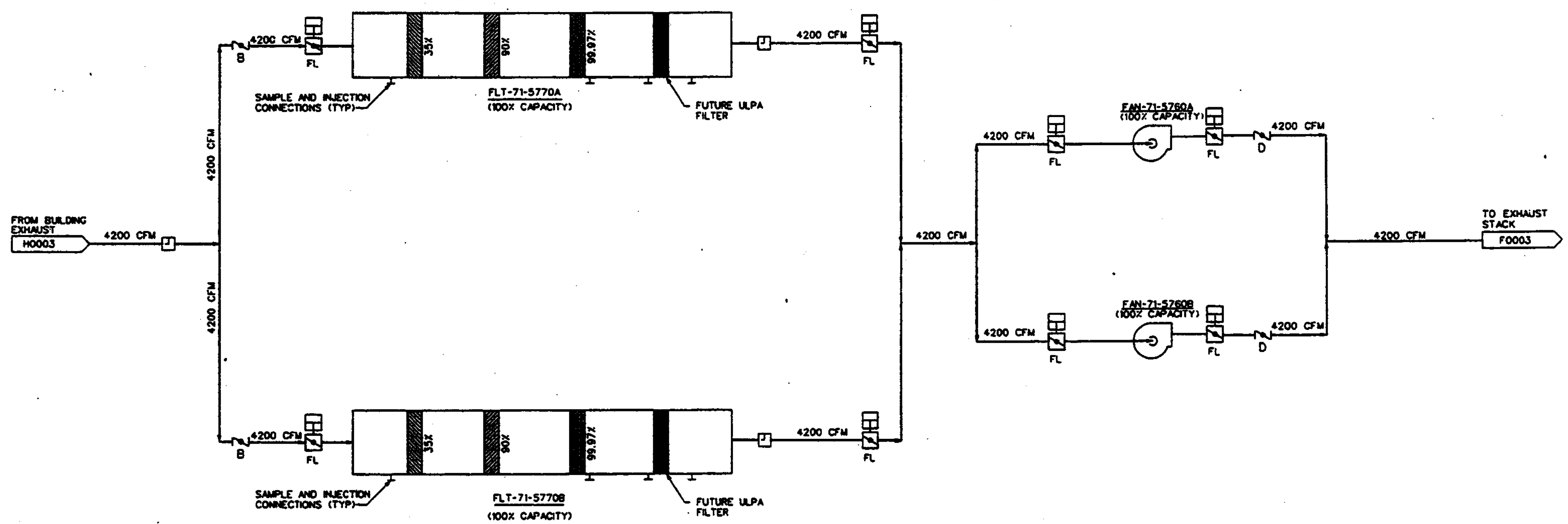
T.A. NUMBER: N/A — PROJECT NO.: 40430 — PROJECT NO.: 35H19605 — FILENAME: 94XH1304.DGN

DRAWING NUMBER: 94X-3900-H-01304 — SHEET NO.: H0003 — REV. NO.: C

PRELIMINARY
NOT FOR CONSTRUCTION

NOTES:

4267



FLT-71-5770A
BUILDING ULPA/HEPA EXHAUST MODULE "A"

FLT-71-5770B
BUILDING ULPA/HEPA EXHAUST MODULE "B"

FAN 71-5760A
BUILDING FILTRATION EXHAUST FAN "A"
4200 CFM @ 12" WC SP

FAN 71-5760B
BUILDING FILTRATION EXHAUST FAN "B"
4200 CFM @ 12" WC SP

REF DWG NO.	DRAWING TITLE
H0001	HVAC SYSTEMS AND EQUIPMENT DESIGNATORS
H0002	HVAC LEGEND, SYMBOLS & ABBREVIATIONS
F0003	PROCESS VENT & PACKAGING SYSTEMS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02		
B	ISSUED FOR REVIEW	03/15/02	BOC	BL
A	ISSUED FOR REVIEW	01/11/02	CCS	BL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

JACOBS

PROJECT NAME: SILO 3

000439

DRAWING TITLE: HVAC AIR FLOW DIAGRAM EXHAUST FILTRATION UNITS

DRAWN BY: B. D. COLLINS DATE: 01/07/02 TECHNICAL LEAD: B. D. CINGILLI DATE: 01/07/02 CHECKED BY: C. SMITH DATE: 01/07/02

PLANT/BLDG NO.: NA FLOOR: NA SCALE: NONE CLASS: U

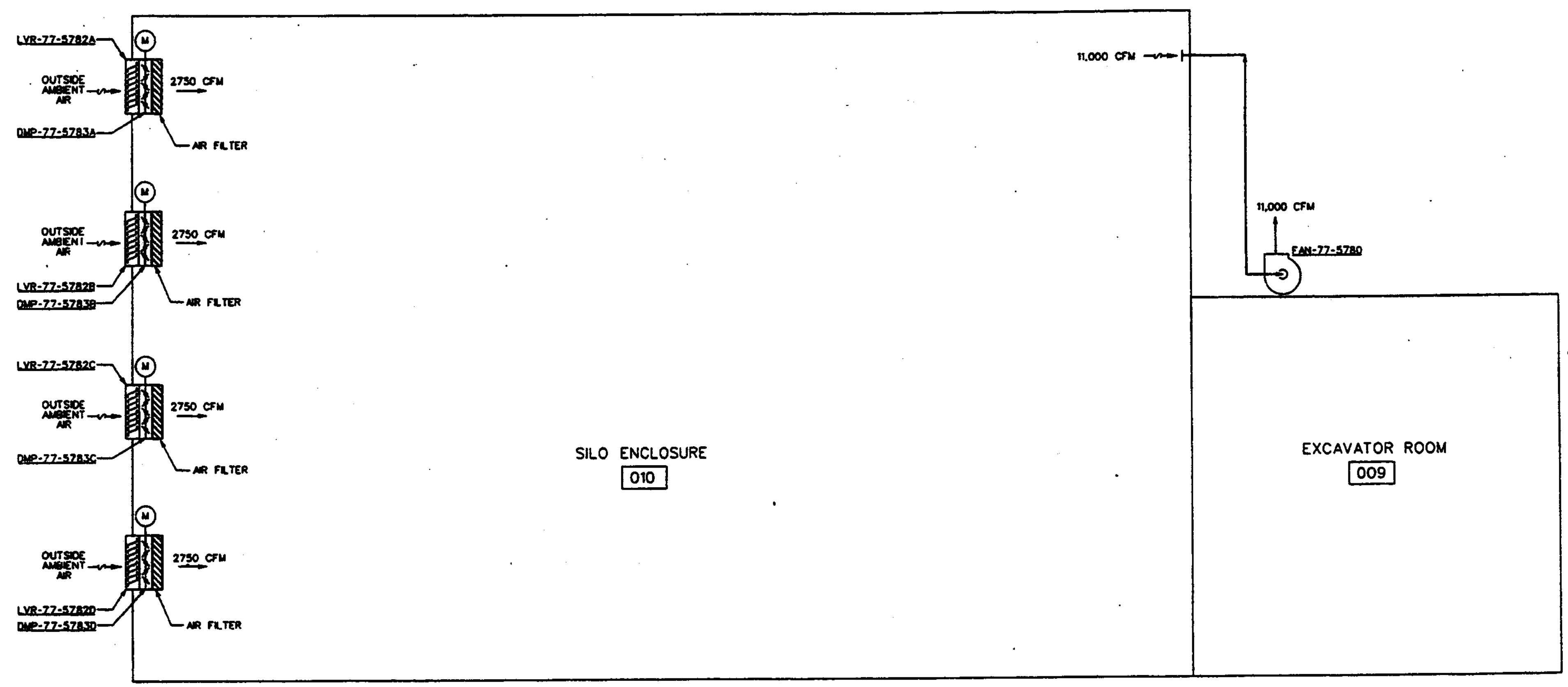
T.O. NUMBER: N/A PROJECT NO.: 40430 JEG PROJECT NO.: 35N19605 FILENAME: 94xh1349.DGN

DRAWING INDEX CODE NO.: 94X-3900-H-01349 SHEET NO.: H0004 REV. NO.: C

PRELIMINARY
NOT FOR CONSTRUCTION

4267

NOTES:



LVR-77-5782A
SILO ENCLOSURE LOUVER A

DMP-77-5783A
SILO ENCLOSURE DAMPER A

LVR-77-5782B
SILO ENCLOSURE LOUVER B

DMP-77-5783B
SILO ENCLOSURE DAMPER B

LVR-77-5782C
SILO ENCLOSURE LOUVER C

DMP-77-5783C
SILO ENCLOSURE DAMPER C

LVR-77-5782D
SILO ENCLOSURE LOUVER D

DMP-77-5783D
SILO ENCLOSURE DAMPER D

FAN-77-5780
SILO ENCLOSURE EXHAUST FAN
11,000 CFM @ 1.5" WC SP

REF DWG NO.	DRAWING TITLE
H0001	HVAC SYSTEMS AND EQUIPMENT DESIGNATORS
H0002	HVAC LEGEND, SYMBOLS & ABBREVIATIONS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02		
A	ISSUED FOR REVIEW	03/15/02	BOC	BL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY JACOBS

PROJECT NAME: SILO 3 000440

DRAWING TITLE: HVAC AIR FLOW DIAGRAM SILO ENCLOSURE

TECHNICAL LEAD: CRAIG SMITH

SCALE: NONE
CLASS: U

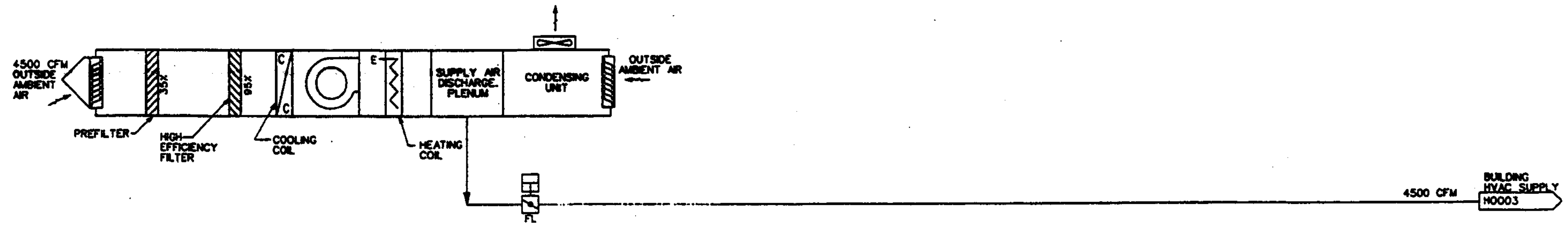
PROJECT NO. 40430
T.A. NUMBER N/A
35H19605
FILENAME 94xH01347.DGN

94X-3900-H-01347 | SHEET NO. H0005 | REV. NO. B

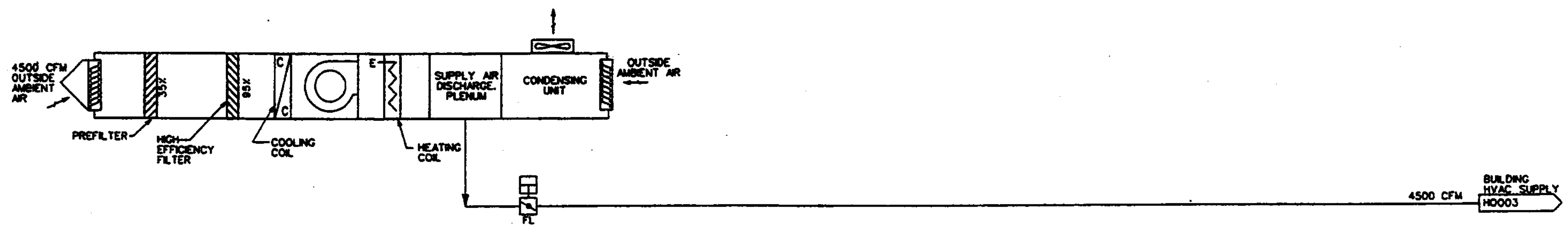
PRELIMINARY
NOT FOR CONSTRUCTION

NOTES:

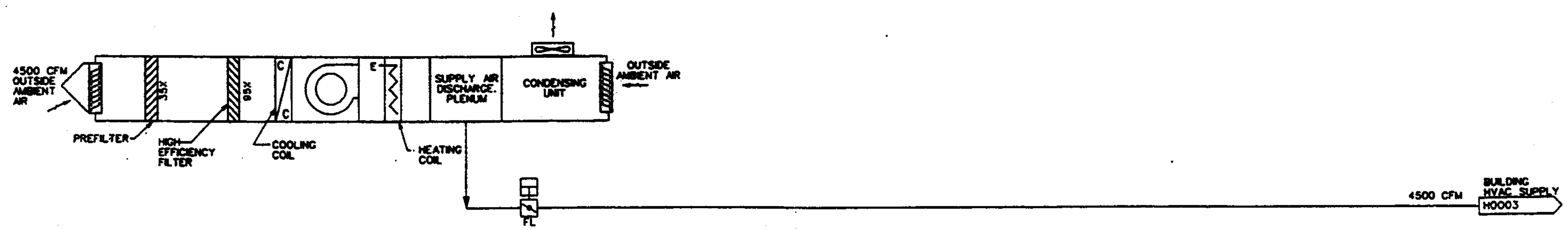
4267



ACU-70-5700



ACU-70-5710



ACU-70-5720

PACKAGED AIR CONDITIONING UNITS			
	ACU-70-5700	ACU-70-5710	ACU-70-5720
SUPPLY FAN	4500 CFM @ 2" WC SP 5 HP 3PH, 60 HZ 230/460V	4500 CFM @ 2" WC SP 5 HP 3PH, 60 HZ 230/460V	4500 CFM @ 2" WC SP 5 HP 3PH, 60 HZ 230/460V
CONDENSER FANS	3.6 AMPS/460V	3.6 AMPS/460V	3.6 AMPS/460V
COMPRESSORS	36.4 AMPS/460V	36.4 AMPS/460V	36.4 AMPS/460V
HEATING COIL	110 KW	110 KW	110 KW

REF DWG NO.	DRAWING TITLE
H0001	HVAC SYSTEMS AND EQUIPMENT DESIGNATORS
H0002	HVAC LEGEND, SYMBOLS & ABBREVIATIONS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	[illegible]	[illegible]
B	ISSUED FOR REVIEW	03/15/02	BOC	BL
A	ISSUED FOR REVIEW	[illegible]	CCS	BL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3

000441

DRAWING TITLE
HVAC
AIR FLOW DIAGRAM
PACKAGED AIR CONDITIONING UNITS

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
B. O. COLLINS	01/07/02	B. O. CINGLLI	01/07/02	C. SMITH	01/07/02

PLANT/BLDG NO. NA — FLOOR NA — SCALE NONE — CLASS U

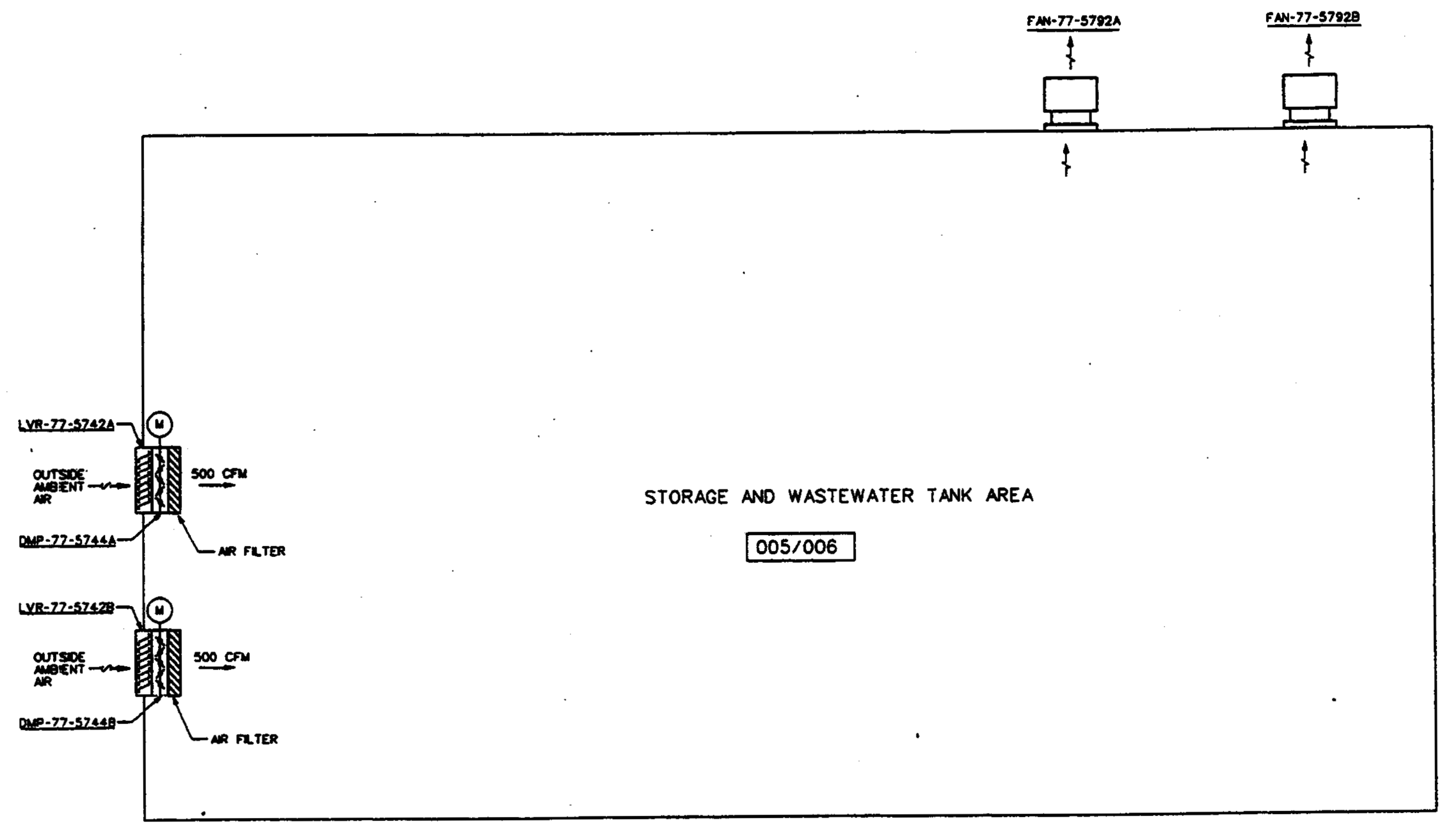
T.A. NUMBER N/A — PROJECT NO. 40430 — JE PROJECT NO. 35H19605 — FILENAME 94xH1348.DGN

DRAWING SHEET CODE NO. 94X-3900-H-01348 — SHEET NO. H0006 — REV. NO. C

PRELIMINARY
NOT FOR CONSTRUCTION

NOTES:

4267



LVR-77-5742A
STORAGE AND WASTEWATER TANK AREA LOUVER A

DMP-77-5744A
STORAGE AND WASTEWATER TANK AREA DAMPER A

LVR-77-5742B
STORAGE AND WASTEWATER TANK AREA LOUVER B

DMP-77-5744B
STORAGE AND WASTEWATER TANK AREA DAMPER B

FAN-77-5792A
STORAGE AND WASTEWATER TANK AREA EXHAUST FAN A
500 CFM @ 1/4" WC SP

FAN-77-5792B
STORAGE AND WASTEWATER TANK AREA EXHAUST FAN B
500 CFM @ 1/4" WC SP

REF DWG NO.	DRAWING TITLE
H0001	HVAC SYSTEMS AND EQUIPMENT DESIGNATORS
H0002	HVAC LEGEND, SYMBOLS & ABBREVIATIONS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02	BOC	BL
B	ISSUED FOR REVIEW	03/15/02	BOC	BL
A	ISSUED FOR REVIEW	01/11/02	CCS	BL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY JACOBS

PROJECT NAME SILO 3 000442

DRAWING TITLE
HVAC
AIR FLOW DIAGRAM
STORAGE AND WASTEWATER TANK AREA

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
B.D. COLLINS	01/07/02	C. SMITH	01/07/02	B.O. CINGILLI	01/07/02

PLANT/BLDG. NO. NA — FLOOR NA — SCALE NONE — CLASS U

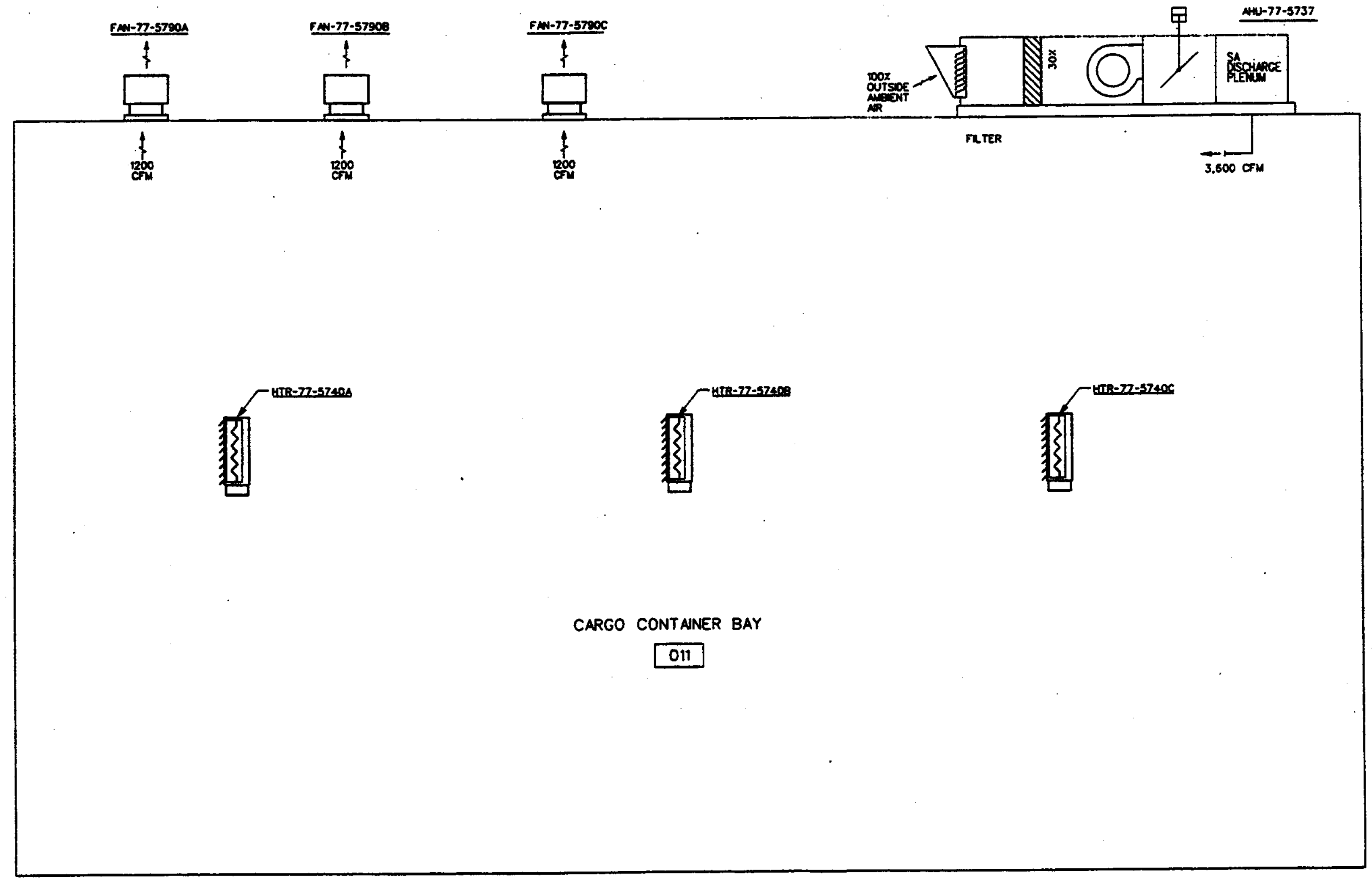
T.D. NUMBER N/A — PROJECT NO. 40430 — JEG PROJECT NO. 35H19605 — FILENAME 94zh1423.DGN

DRAWING INDEX CODE NO. 94X-3900-H-01423 — SHEET NO. H0007 — REV. NO. C

PRELIMINARY
NOT FOR CONSTRUCTION

NOTES:

4267



FAN-77-5790A
CARGO CONTAINER BAY
EXHAUST FAN A
1200 CFM @ 1/4" WC SP

FAN-77-5790B
CARGO CONTAINER BAY
EXHAUST FAN B
1200 CFM @ 1/4" WC SP

FAN-77-5790C
CARGO CONTAINER BAY
EXHAUST FAN C
1200 CFM @ 1/4" WC SP

AHU-77-5737
CARGO CONTAINER BAY
AIR HANDLING UNIT
3600 CFM @ 1" WC SP

HTR-77-5740A
INFRARED SPACE HEATER
13.5 KW

HTR-77-5740B
INFRARED SPACE HEATER
13.5 KW

HTR-77-5740C
INFRARED SPACE HEATER
13.5 KW

REF DWG NO.	DRAWING TITLE
H0001	HVAC SYSTEMS AND EQUIPMENT DESIGNATORS
H0002	HVAC LEGEND, SYMBOLS & ABBREVIATIONS

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
C	ISSUED FOR EPA REVIEW	04/30/02		
B	ISSUED FOR REVIEW	03/15/02	BOC	BL
A	ISSUED FOR REVIEW	01/11/02	CCS	BL

PRELIMINARY
NOT FOR CONSTRUCTION

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

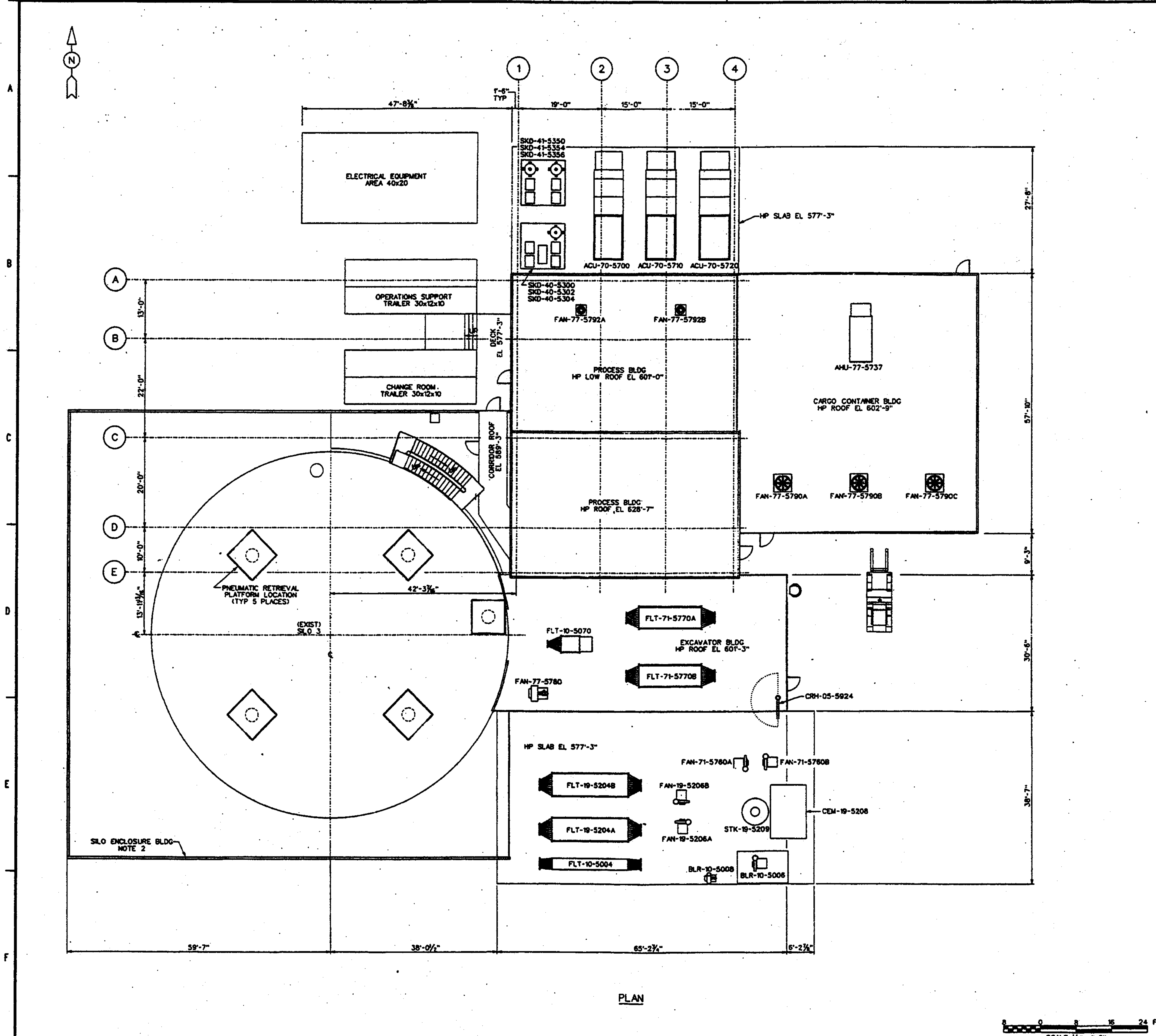
PROJECT NAME
SILO 3 000443

DRAWING TITLE
HVAC
AIR FLOW DIAGRAM
CARGO CONTAINER BAY

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
B. D. COLLINS	01/07/02	B. G. CINGILLI	01/07/02	C. SMITH	01/07/02

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
NA	NA	NONE	U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-H-01350	H0008	C
JES PROJECT NO. 35H19605	FILENAME 94xh1350.DGN			



PLAN

GENERAL NOTES:

1. FOR SPECIFIC ROOM IDENTIFICATION NUMBERS REFER TO DWG 49X-3900-M-01464.
2. SILO ENCLOSURE ROOF NOT SHOWN FOR CLARITY.

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02	JN	RL
A	ISSUED FOR REVIEW	03/15/02	JN	RL

UNITED STATES
DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME
SILO 3 000444

DRAWING TITLE
MECHANICAL
GENERAL ARRANGEMENT
PLOT PLAN

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02

FLOOR	SCALE	CLASS
N/A	⅛" - 1'-0"	U

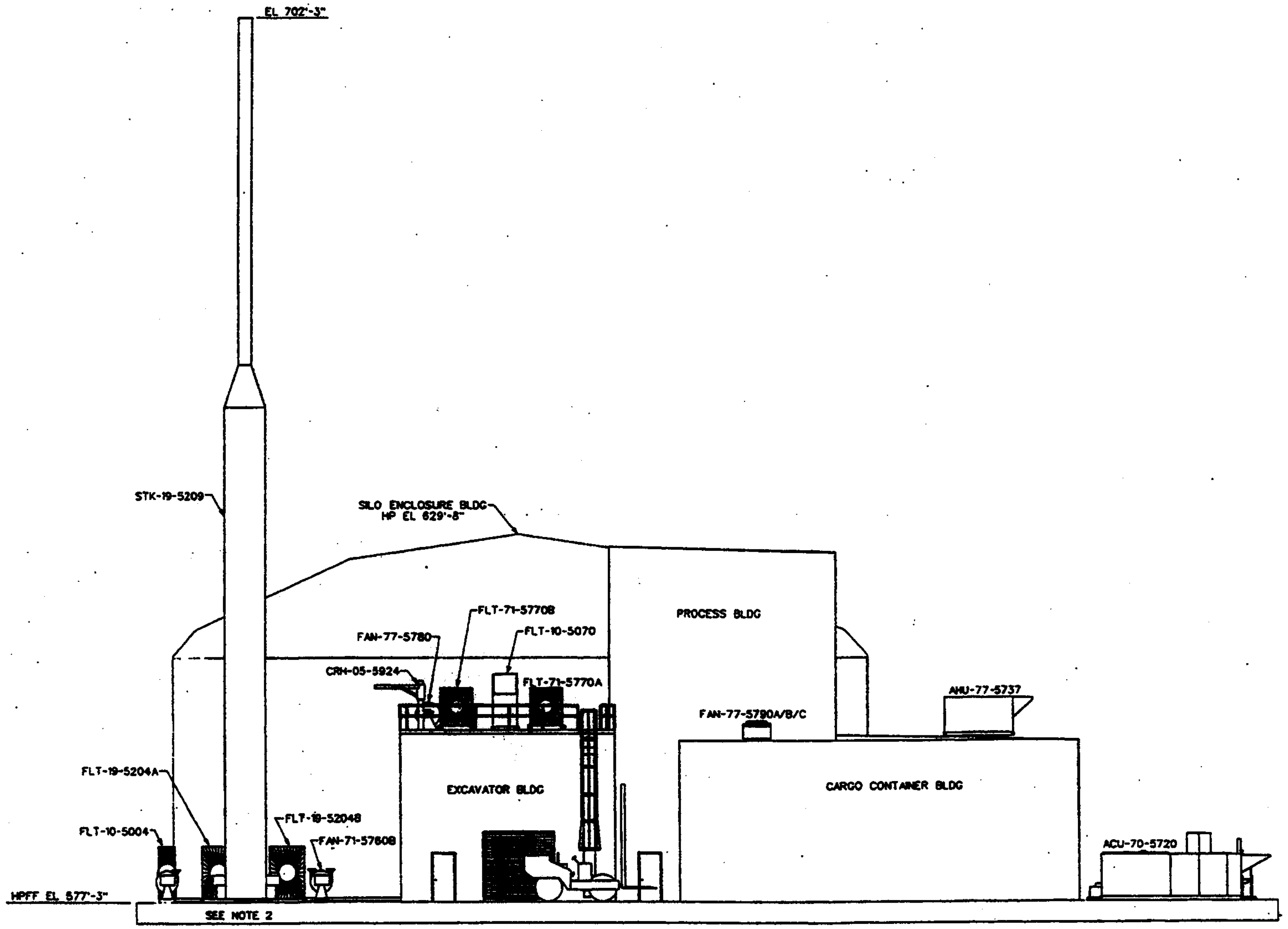
T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-M-01461	M0001	B

JE PROJECT NO. 35H19605
FILENAME 94X0M1461.DGN

DATE: 04/30/02
TIME: 08:06:58 PM
USER: PriceTC

GENERAL NOTES:

1. FOR SPECIFIC ROOM IDENTIFICATION NUMBERS REFER TO DWG 49X-3900-M-01464 (M0003).
2. CEM-19-5208 NOT SHOWN FOR CLARITY.



EAST ELEVATION

0 8 16 24 FT
SCALE: 1/8" = 1'-0"

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02	JN	RL
A	ISSUED FOR REVIEW	03/13/02	JN	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3 000445

DRAWING TITLE: MECHANICAL GENERAL ARRANGEMENT

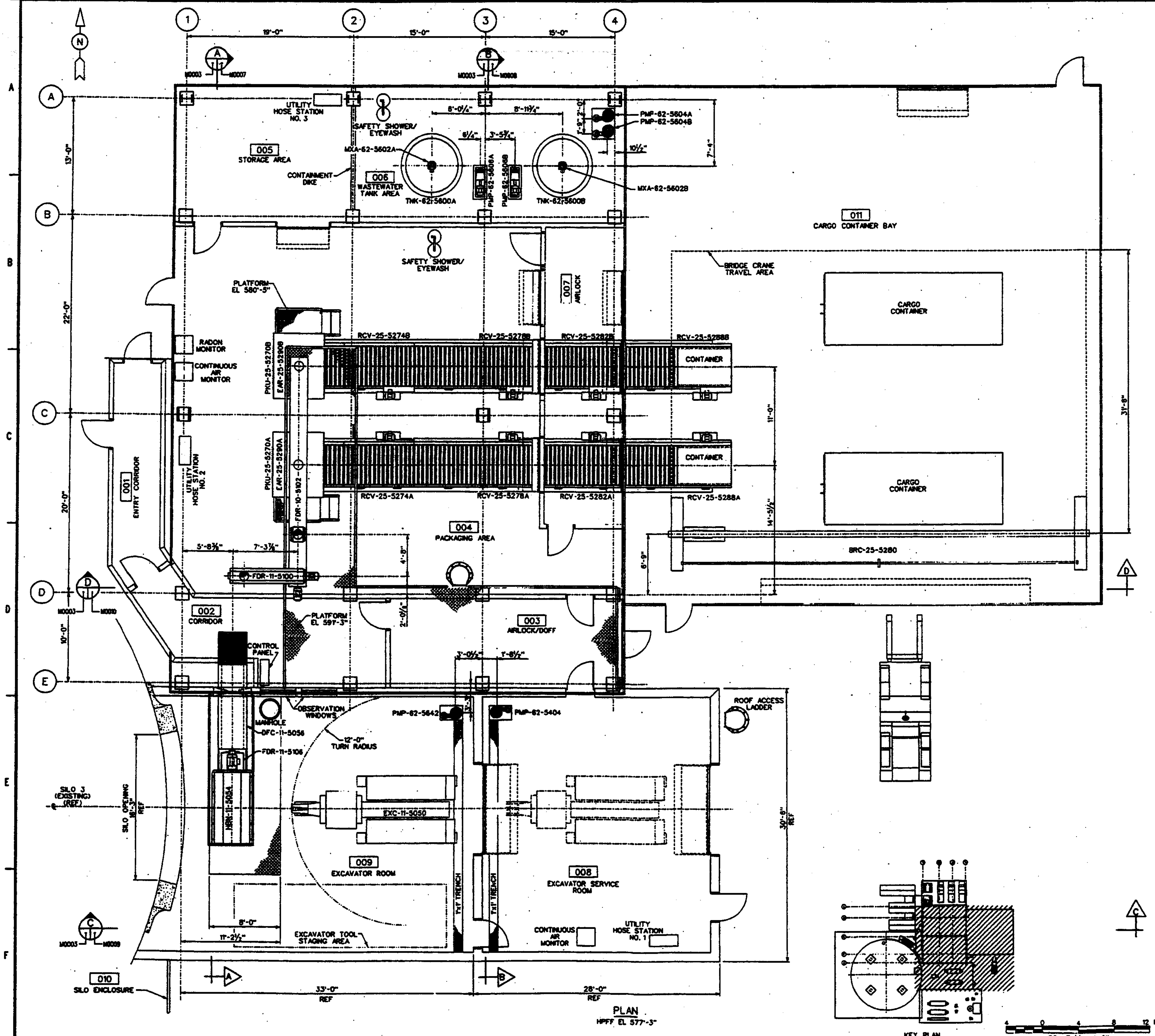
DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02

FLOOR	SCALE	CLASS
N/A	1/8"=1'-0"	U

T.A. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-M-01463	M0002	B
JEG PROJECT NO. 35H19605	FILENAME 94X01463.DGN			

4267

GENERAL NOTES:



SECTION AND DETAIL KEY

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02	JM	RGL
A	ISSUED FOR REVIEW	03/18/02	JN	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY
JACOBS

PROJECT NAME: SILO 3 000446

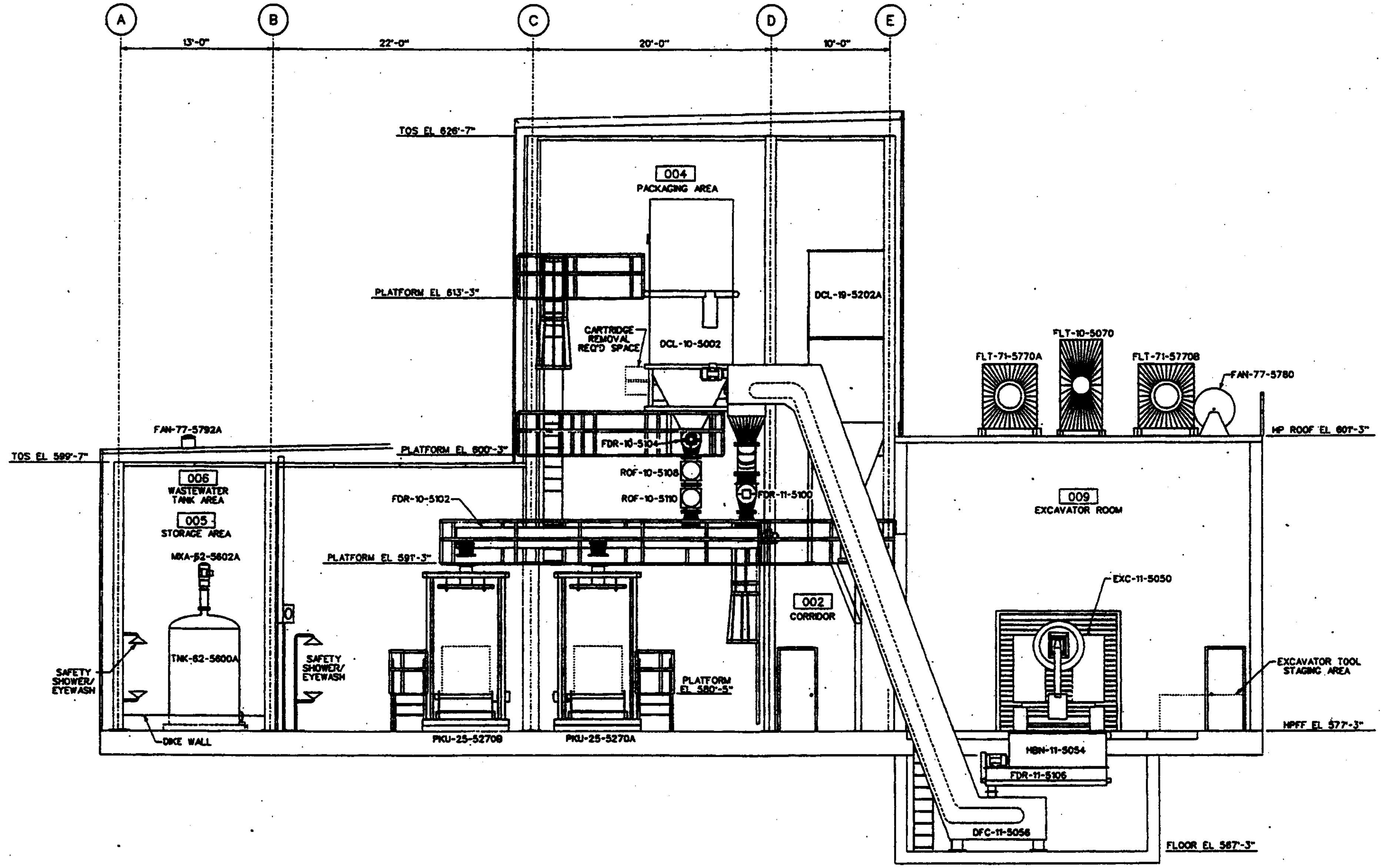
DRAWING TITLE: MECHANICAL GENERAL ARRANGEMENT 1ST FLOOR PLAN

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02

FLOOR: 1ST — SCALE: ¼" = 1'-0" — CLASS: U

T.O. NUMBER: N/A — PROJECT NO.: 40430 — PROJECT NO.: 35H19605 — FILENAME: 94300464.DGN

94X-3900-M-01464 — SHEET NO.: M0003 — REV.: B



SECTION A
LOOKING EAST
M0003 M0004 M0007

SCALE: 1/4" = 1'-0"

GENERAL NOTES:

4267

SECTION AND DETAIL KEY

REF DWG NO.	DRAWING TITLE

B	ISSUED FOR EPA REVIEW	04/30/02		
A	ISSUED FOR REVIEW	03/15/02	JH	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

JACOBS

SILO 3 000447

MECHANICAL GENERAL ARRANGEMENT SECTION A

D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02
		N/A		1/4" = 1'-0"	U

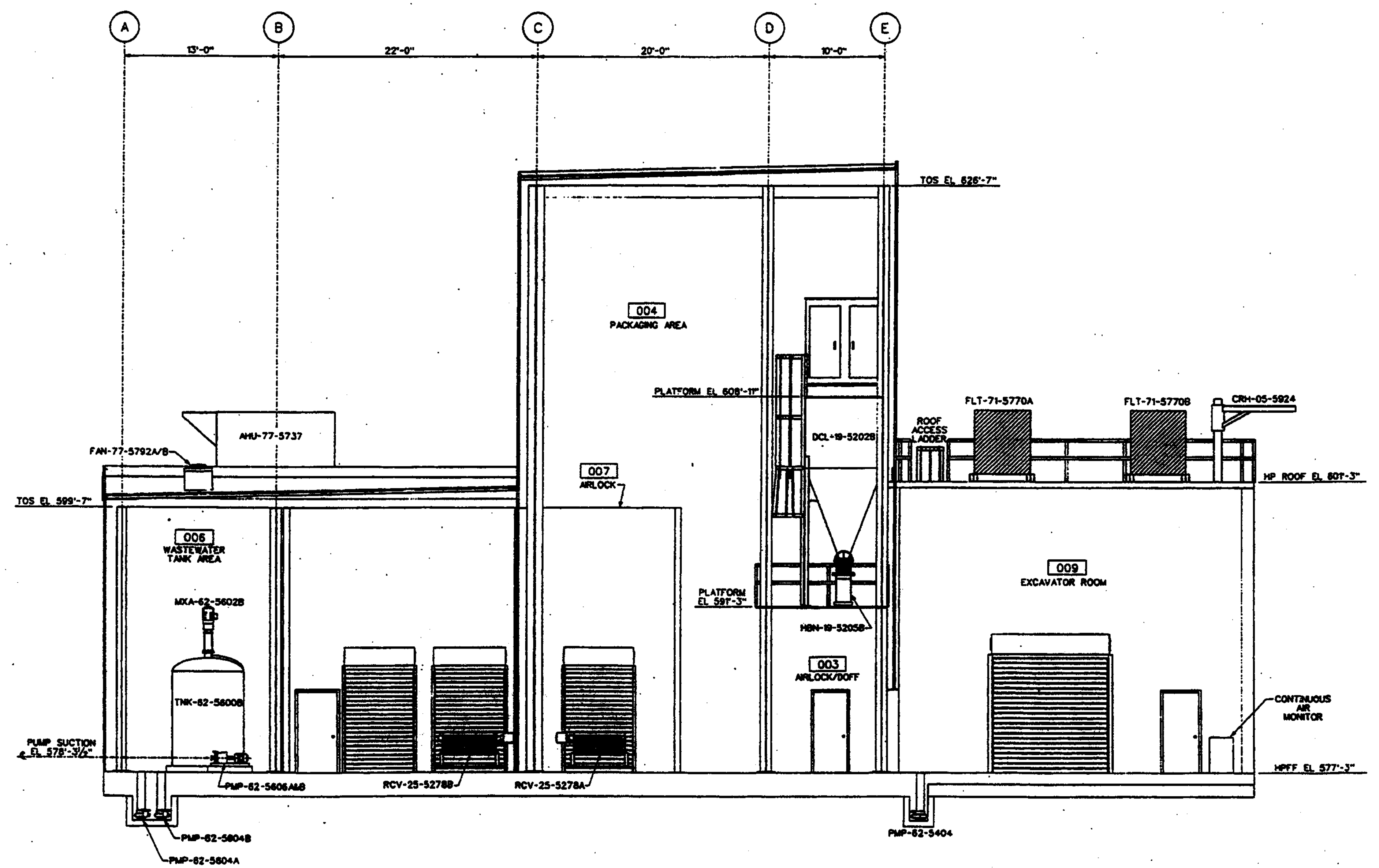
N/A | 40430 | 94X-3900-M-01467 | M0007 | B

DATE: 04/30/02

4267

GENERAL NOTES:

SECTION AND DETAIL KEY



SECTION
LOOKING EAST

M0003
M0004
M0008

SCALE: ¼" = 1'-0"

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02	J7	Rk
A	ISSUED FOR REVIEW	03/15/02	JH	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

JACOBS

PROJECT NAME: SILO 3

000448

DRAWING TITLE: MECHANICAL GENERAL ARRANGEMENT SECTION B

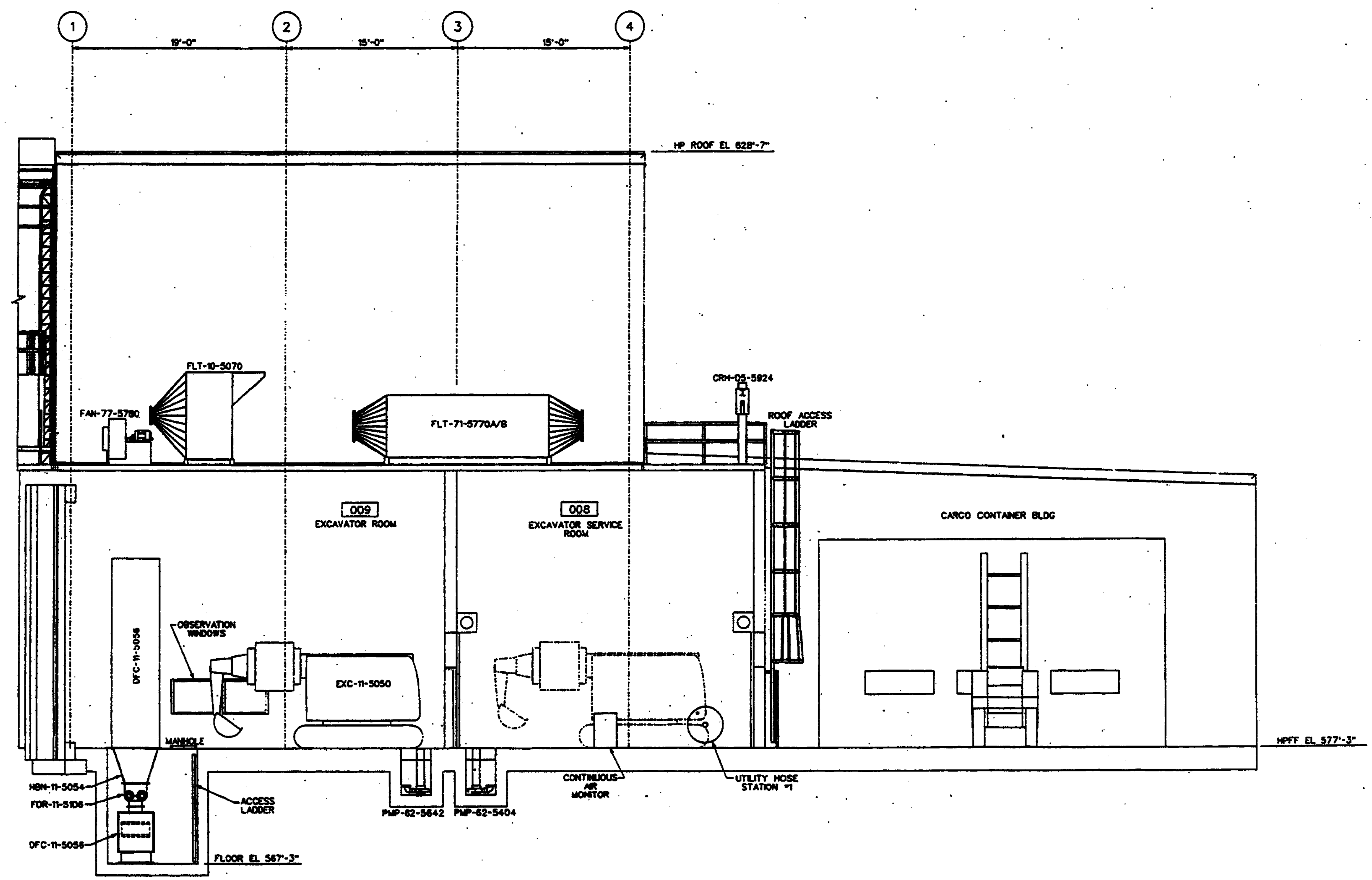
DRAWN BY	DATE	MECHANICAL LEAD	DATE	CHECKED BY	DATE
D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02

PLANT/BLDG. NO.		SCALE	CLASS
	N/A	¼" = 1'-0"	U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-M-01468	M0008	B
35H19605	94X01468.DGN			

GENERAL NOTES: **4267**

SECTION AND DETAIL KEY



SECTION C
LOOKING NORTH

M0003 M0004 M0009

SCALE: 1/4" = 1'-0"

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02	JN	RL
A	ISSUED FOR REVIEW	03/18/02	JN	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

JACOBS

PROJECT NAME: SILO 3 **000449**

DRAWING TITLE: MECHANICAL GENERAL ARRANGEMENT SECTION C

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02

PLANT/BLDG. NO.	AREA	SCALE	CLASS
	N/A	1/4" = 1'-0"	U

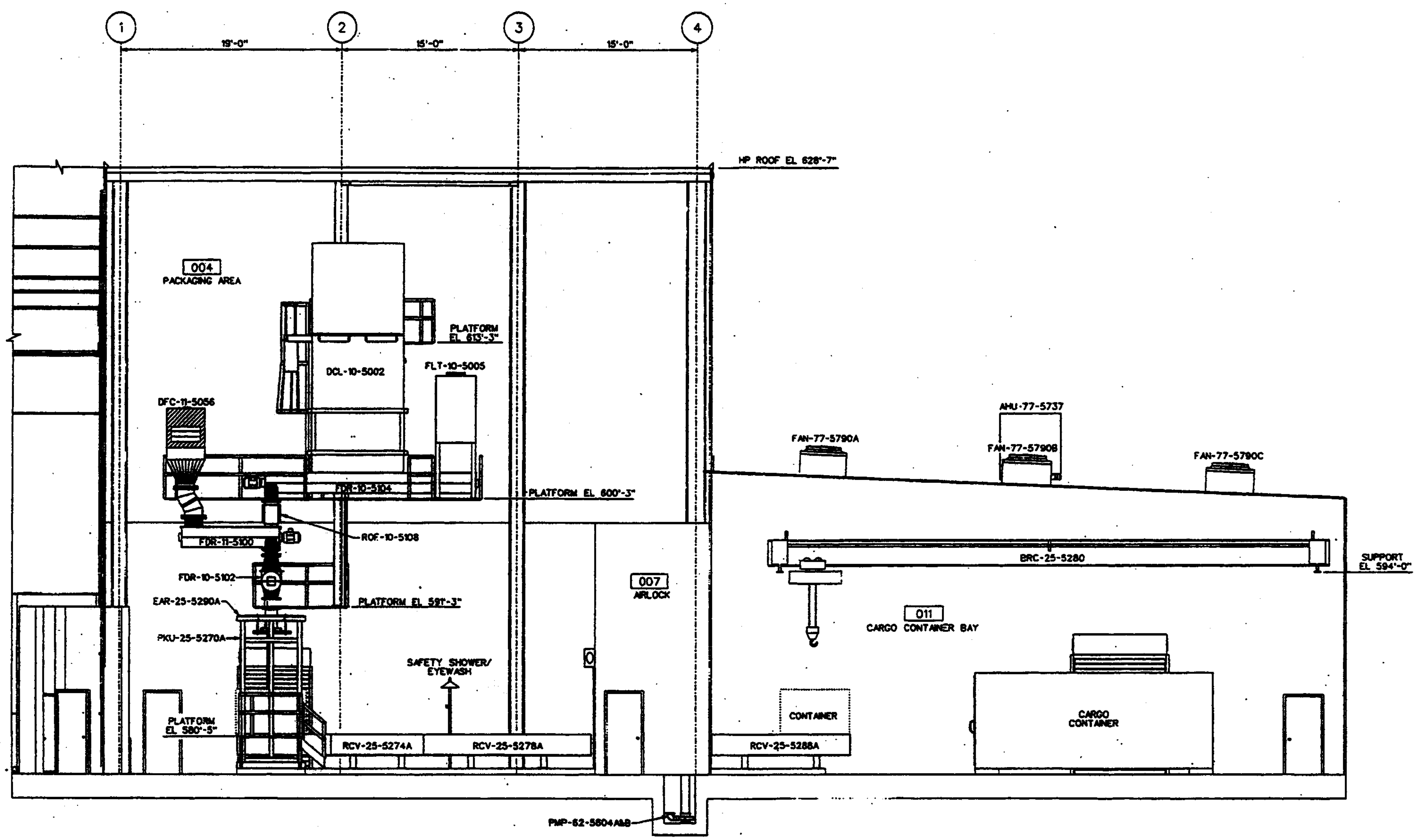
T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94X-3900-M-01469	M0009	B
JEG PROJECT NO. 35H19605	FILENAME 94X01469.DGN			

DATE: 04/30/02 TIME: 08:06:37 PM

GENERAL NOTES:

4267

SECTION AND DETAIL KEY



SECTION D
LOOKING NORTH

M0003
M0004
M0010

SCALE: 1/4" = 1'-0"

REF DWG NO.	DRAWING TITLE

REV. NO.	ISSUE OR REVISION PURPOSE - DESCRIPTION	DATE	REV. BY	APPR.
B	ISSUED FOR EPA REVIEW	04/30/02		
A	ISSUED FOR REVIEW	03/15/02	JN	RL

UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

THIS DRAWING PREPARED BY

JACOBS

PROJECT NAME: SILO 3

000450

DRAWING TITLE: MECHANICAL GENERAL ARRANGEMENT SECTION D

DRAWN BY	DATE	TECHNICAL LEAD	DATE	CHECKED BY	DATE
D. DAVIS	3/12/02	C. SMITH	3/12/02	J. NELSON	3/12/02

PLANT/BLDG. NO.	FLOOR	SCALE	CLASS
	N/A	1/4" = 1'-0"	U

T.O. NUMBER	PROJECT NO.	DRAWING INDEX CODE NO.	SHEET NO.	REV. NO.
N/A	40430	94XM-3900-M-01470	M0010	B
35H19605	94XM1470.DGN			