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ENGINEERING EVALUATION/COST ANALYSIS FOR REMOVAL ACTION NO. 27 MANAGEMENT OF CONTAMINATED STRUCTURES DECEMBER 1992

12/15/92

DOE-FN/EPA
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REPORT

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For Removal Action No. 27
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Fernald Environmental Management Project
Fernald, Ohio

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EXECUTIVE SUMMARY

This engineering evaluation/cost analysis (EE/CA) report has been prepared to support the proposed Removal Action No. 27 for managing 25 contaminated structures located within Operable Unit No. 3 at the Fernald Environmental Management Project (FEMP) near Fernald, Ohio.

Production activities at the FEMP ceased in 1989 and the production mission of the facility was formally ended in 1991. In 1986, the United States Department of Energy (DOE) and the United States Environmental Protection Agency (USEPA) entered into a Federal Facility Compliance Agreement (FFCA), which included provisions to remediate the FEMP pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The provisions of the 1986 FFCA relating to the Remedial Investigation/Feasibility Study (RI/FS) and remedial action were amended in 1990 with the signing of the Consent Agreement under CERCLA Section 120 and 106 (a). The 1990 Consent Agreement established five Operable Units. In 1991, the DOE and USEPA amended the Consent Agreement to revise the remediation schedules and to add additional removal actions.

One of the identified operable units, Operable Unit 3 (OU3), consists of the former Production Area and production-associated facilities and equipment. The extent of contamination is widespread within OU3 and production related buildings and support facilities are considered to be contaminated. As mentioned earlier, the 25 contaminated structures addressed by this report are located within OU3. These contaminated structures present a potential threat to health and the environment at the FEMP. The potential exists for uncontrolled release of contaminants from numerous sources within the structures, and the structures are beyond their design life. Therefore, to expeditiously minimize the potential risks and accelerate site cleanup, DOE plans to implement Removal Action No. 27 titled "Management of Contaminated Structures at the FEMP" prior to the implementation of a final remedial action for OU3. Removal Action No. 27 addresses the 25 contaminated structures indicated on Figure 1-1.

This engineering evaluation/cost analysis (EE/CA) is performed to analyze removal action alternatives and to support the selection of a preferred alternative to Decontaminate and Decommission these structures. In keeping with the DOE policy of integrating the requirements of CERCLA and NEPA, an assessment of the environmental impacts of implementing the preferred alternative, is also undertaken.

The objectives of this report are to:

1. identify alternatives and select a preferred alternative for managing the contaminated structures comprising Removal Action No.27;

2. document the selection of a response that will mitigate the potential threat to workers, the general public, and to the environment associated with these structures; and

3. identify and evaluate health and environmental impacts associated with the proposed action.

Seven initial alternatives were developed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (EPA 1990) and EPA's guidance on removal actions. These included:

- No Action;
- Drain Systems;
- Enhance Containment;
- Decontaminate Surfaces;
- Remove Equipment and Materials;
- Remove Equipment and Materials and Clean Surfaces; and
- Decontaminate and Dismantle.

To remain under consideration, the action had to be justified independently of the RI/FS-EIS and not prejudice the ultimate decision to be made in the RI/FS-EIS. Following an initial screening process, the viable options were reduced to two - No Action and Decontaminate and Decommission (D&D). These two alternatives were carried forward for evaluation and comparison as to their effectiveness in reducing public health and environmental risks, their cost, their implementability, and the environmental impacts of implementation. The preferred alternative, following this comparison, was that of D&D.

Having selected D&D as the preferred course, attention was directed to the actual removal steps that would be required for each of the structures constituting Removal Action No.27. These are summarized in the chart that follows.

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APPLICABILITY OF STANDARD D&D STEPS AND WASTE DISPOSITION FOR EACH CONTAMINATED STRUCTURE

Typical D&D Steps	Contaminated Structures																							
	3F	3G	4A	4C	7A	10D	13B	13C	13D	18K	18L	32A	32B	39A	39D	65	67	68	69	72	73A	73B	73C	73D	73E
A: Remove Loose Equipment		○	○	○	○	○	○					○	○	○	○				○						
B: Containment/Seal Openings	1	○	○	○	○	8	○		22			○	○	○	○	○	○	○	○	○					
C: Clean Surfaces	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○	○	○					
D: Remove Asbestos	○	4	○	○	○		○	17	○			○		○					○						
E: Remove Process Equipment	○	○	○		○	9	○	18	18			○		31	○				○			43	○	○	○
F: Remove Sludges	○		○		○	10	○	19	19	24	24			○					○					○	○
G: Scabble Walls		○					13	○											○						
H: Scabble Floors	2	○	○	○	○	11	○	○	2			○	○	2	○	○	○	○	2	○	○				
I: Remove Roof Hardware			○		○		○					○		○	○				○						
J: Remove Transite		5	○	○	○							28	○	32				○		○					
K: Remove Steel Siding															○	○	○								
L: Remove Built-up Roofing							○	○		○		○			○				○		○				
M: Remove Structural Members	○	○	○	○	○		14	○	○	25	25	○	○	○	○	○	○	○	○	○	40				
N: Block Walls							15	20				29							37		41				
O: Core Slab		○	○	○	○	○	○	○	○	26	26	○	○	○	34	○	○	○	○	○	○				
Waste Disposition	3	6		7		12	16	21	23	27	27	30	30	33	34	35	35	36	38	39	42	44	45	46	47

Legend:

○ - Indicates applicability of Standard Step in D&D procedure.

A number (x) indicates applicability of Standard Step as modified by Note. No. *x*. For notes see page 2 of Table 6-2.

▒ - Indicates Standard Step in D&D procedure is not applicable.

TABLE 6-2 Cont.
Explanatory notes for variations to Standard D&D Steps:

1) Contain entire outdoor structure to facilitate asbestos removal.
2) Remove acid resistant bricks, dispose as LLW, or mixed waste, remove or scabble pad underneath.
3) Wastes: Asbestos as LLW, most steel cleaned, remainder LLW; material removed from steel may be mixed (Pb-based paint), rubbled pad LLW.
4) After scabbling floor, remove asbestos siding, two layers, and asbestos insulation in between. Is insulation friable? If so, contain whole building. Remove from outside in or vice versa, depending on construction details.
5) Transite panels and roof also.
6) May justify inside layer of siding as suitable for sanitary landfill. Remainder of transite LLW, steel cleaned and free released; remainder LLW; bolt covers, material from steel may be mixed.
7) Scabbling fines expected to be mixed waste. Most steel cleaned and released. Remainder LLW. Asbestos siding and insulation to LLW disposal site.
8) Put tent over pad, to break up concrete.
9) Move directly to decon facility and treat; some steel can be cleaned.
10) Clean bulk material before breaking up concrete.
11) Break up concrete in entirety.
12) Equipment, 50% released steel, 50% mixed waste, all concrete mixed, must be treated or disposed.
13) Metal frames removed with blocks.
14) Roof supports, if any,
15) Scabble or vacuum-blast walls where necessary. Built-up roofing removed.
16) Blocks to sanitary landfill. Roofing to LLW, steel (not large) to LLW, scabbled floor material mixed.
17) On vessel, may be moved intact after wrapping to clean-up area.
18) Only tanks and bins.
19) Sumps filled with soil, save for RI/FS.
20) Clean blocks as necessary/vacuum-blast.
21) Asbestos as LLW or Landfill. Most steel released, remainder LLW. Scabble fines LLW, shingle roof LLW or mixed.
22) Contain major parts of the facility in total to decon as necessary before moving.
23) Most steel released, remainder LLW, material removed from steel is mixed (Pb-based paint). Scabbled material mixed/organics.
24) Any sludge assumed removed.
25) Steel sides and framing.
26) Polymer lining.
27) Steel cleaned and released, lining possibly mixed because of 1,1,1 - Trichloroethane. Material removed from steel, mixed (Pb).
28) A small amount.
29) Vacuum-blast block walls as necessary, remove built-up roofing.
30) Block to sanitary landfill, most steel cleaned and released. Remainder LLW and material removed - mixed (Pb). Scabbling fines LLW, vacuum-blasting fines LLW, roofing to LLW.
31) Some equipment may require decontamination in place before movement to central facility.
32) Two layers of transite siding with asbestos insulation in between.
33) Asbestos to Landfill or LLW, most structural steel cleaned and released, remainder LLW, material removed - mixed, scabble fines - mixed.
34) Scabbling fines expected to be mixed waste.
35) Most steel cleaned and released. Remainder LLW, material removed LLW, scabbling fines mixed.
36) Most steel cleaned and released, scabbling fines mixed; transite to LLW.
37) 100% brick floor to be removed. Block walls vacuum-blasted as necessary, built-up roofing removed.
38) Bricks and scabbling fines mixed. Most steel cleaned and released. Remainder LLW. Material removed--mixed. Roofing to LLW. Wall fines - LLW.
39) Transite to LLW. Asbestos sandwich to LLW, most steel released, remainder and scabbling fines to LLW. Material removed off of steel, mixed (Pb).
40) Wood truss.
41) Vacuum-blast block walls as needed.
42) Released to LLW, except material taken off of steel - mixed.
43) Dewater, excavate and contain.
44) Expect mixed waste.
45) Tank to LLW.
46) Most steel released after cleaning, remainder LLW. Material removed from steel - mixed.
47) Most steel cleaned and released. Remainder, and material removed, to LLW.

In assessing the engineering, cost and environmental implications of the D&D alternative, it was shown that this alternative will remove potential adverse impacts to worker safety and will minimize potential risks to human health and the environment associated with the 25 structures. This alternative can be implemented by means of standard engineering practices and equipment and will be cost effective, with an overall cost of less than 147 million. It is consistent with the range of remedial actions envisioned for consideration in the upcoming RI/FS and will accelerate the CERCLA remediation. This action does not prejudice future decisions or limit the choice of reasonable alternatives because 1) the alternative can be pursued in a phased manner and coordinated with other FEMP interim actions, and 2) the management of the material associated with these structures is open to the full range of treatment and disposal options available from FEMP Waste Management Programs.

From the environmental perspective, qualitative analyses of potential impacts to topography, area soils, land use, surface water, groundwater, socioeconomic conditions, cultural resources and area ecology revealed no negative impacts from the implementation of the proposed action. Further, air quality modelling confirmed that exposure of on- and off-site personnel to airborne contaminants, even during the most conservative accident scenario, posed no health impact.

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NOTATION

Abbreviations, Acronyms, and Initialisms

ACM	asbestos-containing materials
AEC	Atomic Energy Commission
AL	action level
ALARA	as low as reasonably achievable
ALI	annual limit on intake
AOC	area of contamination
ARARs	applicable or relevant and appropriate requirements
ASI&IT	Advanced Source Inc. & International Technology
ASLs	analytical support levels
AWWT	advanced wastewater treatment
BDAT	best demonstrated available technology
BRA	baseline risk assessment
CEDE	committed effective dose equivalent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRP	Community Relations Plan
CSF	Central Storage Facility
DAC	derived air concentration
DCG	derived concentration guide
DEs	drum equivalents
DFO	Director's Findings and Orders
DFP	decontamination facility pad
DL	decision level
DOD	Department of Defense
DOE	Department of Energy
DOE-FN	Department of Energy Fernald Field Office
DQOs	data quality objectives
EA	Environmental Assessment
EDL	economic discard level
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	Environmental Protection Agency
ERMC	environmental restoration management contractor
FEMP	Fernald Environmental Management Project
FFCA	Federal Facilities Compliance Agreement
FICWD	Federal Interagency Committee for Wetland Delineation
FIPs	field implementation procedures
FMPC	Feed Materials Production Center
FS	feasibility study
FS/PP	feasibility study and proposed plan
FSP	field sampling plan
FUSRAP	Formerly Utilized Remedial Action Program

GM	gross measurement
GOCO	government-owned, contractor-operated
GRA	general response action
HEAST	Health Effects Assessment Summary Tables
HEPA	high-efficiency particulate air
HHEM-B	Human Health Evaluation Manual, Part B
HSL	Hazardous Substances List
HSP	Health and Safety Plan
HVAC	heating, ventilating, and air conditioning
HWMU	hazardous waste management unit
IRS&T	Industrial, Radiological Safety and Training Department
ISA	initial screening of alternatives
LDR	land disposal restrictions
LLI	lower large intestine
LLW	low-level waste
LSA	low specific activity
LWBR	Light-Water Breeder Reactor
MCL	maximum contaminant level
MCLG	maximum contaminant level goals
MCW	Malinkrodt Chemical Works
MSDSs	Material Safety Data Sheets
MSL	mean sea level
NAR	nitric acid recovery
NCP	National Contingency Plan
NFS	Nuclear Fuel Services
NEPA	National Environmental Policy Act
NLO	National Lead of Ohio
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NTS	Nevada Test Site
ODNR	Ohio Department of Natural Resources
OSHA	Occupational Safety and Health Administration
OU1	Operable Unit 1
OU2	Operable Unit 2
OU3	Operable Unit 3
OU4	Operable Unit 4
OU5	Operable Unit 5
OVA	organic vapor analyzer
PIC	pressurized ion chamber
PID	photoionization detector
PMCL	proposed maximum contaminant level
POTW	publicly owned treatment works
PPE	personal protective equipment

PRG	preliminary remediation goal
PSMCL	proposed secondary maximum contaminant level
PTO	permit to operate
QA/QC	quality assurance/quality control
RA	removal actions
RAAs	remedial action alternatives
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation and feasibility study
RLO	Port Hope Refinery, Richland Operations (Hanford, Washington)
RME	reasonable maximum exposure
RMI	Reactive Metals Inc.
ROD	record of decision
RPD	relative percent difference
RSE	removal site evaluation
S.R.	State Route
SAA	satellite accumulation area
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SFMP	Surplus Facilities Management Program
SHSO	Site Health and Safety Officer
SMCL	secondary maximum contaminant level
SMP	scrap metal pad
SOPs	standard operating procedures
SOWC	Southwest Ohio Water Company
SRP	Savannah River Plant
SRPC	soil and rubble pile cover
STEL	short-term explosive limit
SWCR	Site Wide Characterization Report
TBC	to be considered
TCLP	toxic characteristic leaching procedure
TSCA	Toxic Substances Control Act
TSS	tension support structure
UMTRAP	Uranium Mill Tailings Remedial Action Program
UST	underground storage tank
WEMCO	Westinghouse Environmental Management Company of Ohio
WL	working level
WP	work plan
WQC	water quality controls
XRF	X-ray fluorescence
Y-12	an Oak Ridge, Tennessee, facility

Chemical Symbols and Abbreviations

1,1,1-TCE	1,1,1-trichloroethane
$BaCl_2$	barium chloride
$BaSO_4$	barium sulfate
DAAP	diamyl amyl phosphonate
DSBPP	di-sec-butyl phenyl phosphonate
Fe_2O_3	ferric oxide
FeO	ferrous oxide
H_2	hydrogen
H_2SO_4	sulfuric acid
HCl	hydrochloric acid
HF	hydrogen fluoride
HNO_3	nitric acid
KF	potassium fluoride
KOH	potassium hydroxide
Mg	magnesium
$Mg(OH)_2$	magnesium hydroxide
MgF_2	magnesium fluoride
N_2	nitrogen
Na_2CO_3	sodium carbonate
NaF	sodium fluoride
NaI (Tl)	sodium iodide thallium
NaOH	sodium hydroxide
NH_3	ammonia
NOx	nitric oxides
PCB	polychlorinated biphenyl
TBP	tri-butyl phosphate
TCE	trichloroethylene
ThF_4	thorium tetrafluoride
U_3O_8	uranium oxide
UF_4	uranium tetrafluoride
UF_6	uranium hexafluoride
UNH	uranyl nitrate
UO_2	uranium dioxide
UO_3	uranium trioxide
VOCs	volatile organic compounds

Units of Measure

cm	centimeter
cm^2	square centimeter
dpm	disintegrations per minute
ft^2	square foot
gal	gallon
lb	pound
mrem	millirem
°F	degree Fahrenheit
°C	degree Celsius
ft	foot

ft^2	square foot
ft^3	cubic foot
ft^3/s	cubic feet per second
gal	gallon
gal/d-ft^2	gallons per day per square foot
gal/d-mi^2	gallons per day per square mile
in.	inch
lb	pound
m	meter
mg/L	milligrams per liter
mi	mile
µCi/g	microcuries per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
pCi/g	picocuries per gram
pCi/L	picocuries per liter
yd^3	cubic yards

1.0 INTRODUCTION

1.1 FEMP Site History

On July 18, 1986, a Federal Facility Compliance Agreement (FFCA) was jointly signed by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) pertaining to environmental impacts associated with DOE's Fernald Environmental Management Project (FEMP) in Fernald, Ohio. As a result of processing and disposal activities that took place throughout its production history, the FEMP is listed on the National Priorities List (NPL) of the U.S. Environmental Protection Agency (EPA). The FFCA is intended to ensure that environmental impacts associated with past and present activities at the FEMP are thoroughly and adequately investigated so that appropriate response actions can be formulated, assessed, and implemented.

In response to the FFCA, DOE initiated a Remedial Investigation/Feasibility Study (RI/FS) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). On April 9, 1990 DOE and EPA entered into a Consent Agreement that amended the 1986 FFCA under CERCLA Section 120 and 106(a) (Consent Agreement). In February 1991, DOE announced its intention to formally end production (rather than suspend it) and submitted a closure plan to Congress. This closure plan became effective in June 1991.

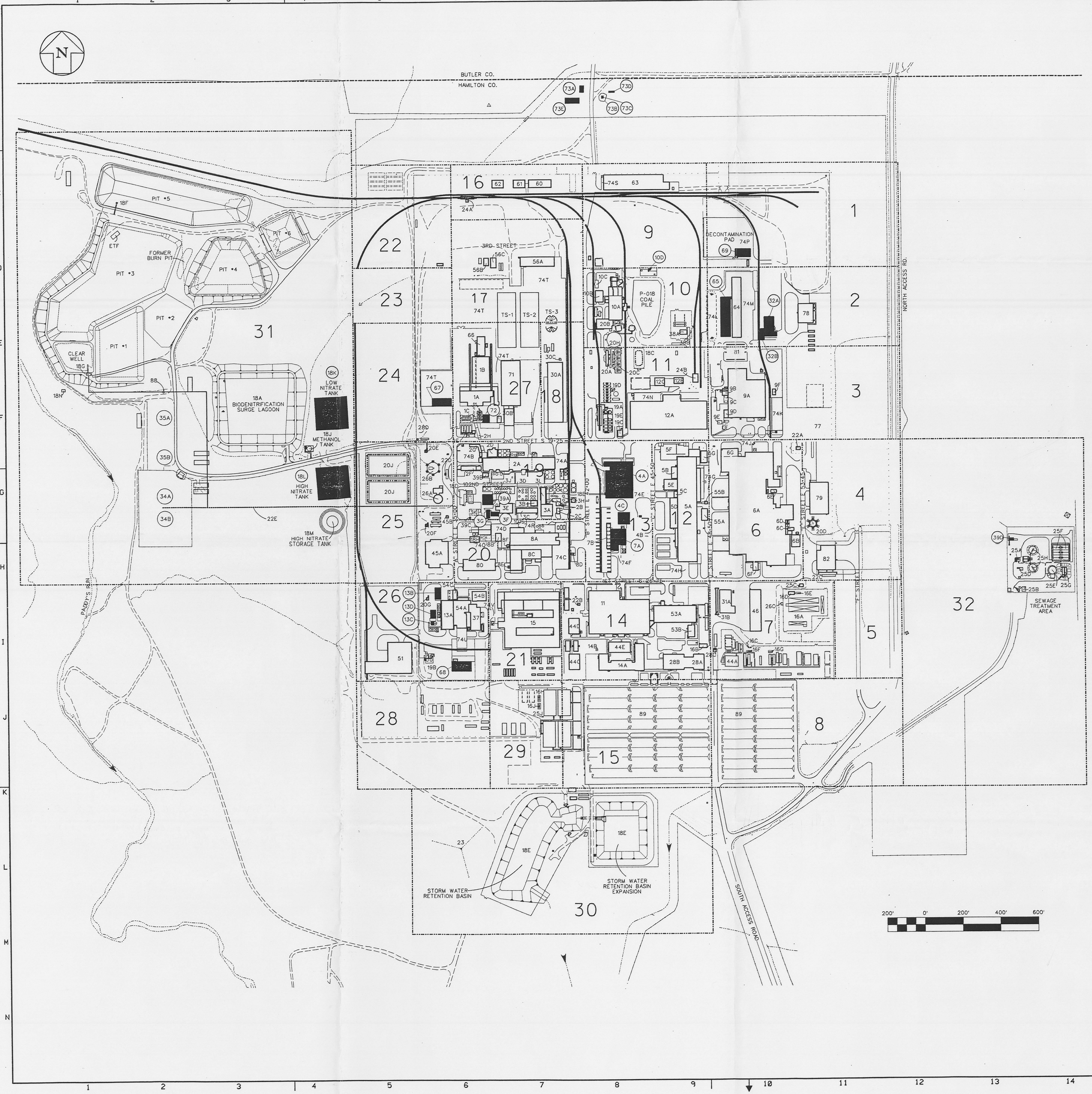
In September of 1991, the 1990 Consent Agreement was amended to redefine the operable unit approach in order to expedite the RI/FS process. The amended Consent Agreement also defined a procedure through which removal actions would be conducted by DOE to expeditiously minimize the potential risks to human health and the environment present at the FEMP prior to a final remedial action. The operable unit technical strategy adopted for the RI/FS involves the issuance of distinct RI/FS reports for each of five operable units into which the FEMP has been separated. By accommodating separate schedules for each operable unit, the remedial action decision process is proceeding to completion for the most problematical units while data collection and analysis continue for other operable units.

One of the identified operable units, Operable Unit 3 (OU3), consists of the former Production Area and production-associated facilities and equipment. DOE submitted to EPA in June 1992 a Draft RI/FS Work Plan Addendum for OU3 (DOE 1992a). OU3 includes all above- and below-grade improvements, including, but not limited to, all structures, equipment, utilities, tanks, solid waste, waste, product, thorium, effluent lines, K-65 transfer line, wastewater treatment facilities, fire training facilities, scrap metals piles, feedstocks, and coal pile. The former Production Area occupies about 136 acres near the center of the FEMP site and contains many buildings, scrap metal and soil piles, containerized materials, storage pads, a parking lot, roads, railroad tracks, above- and underground tanks, utilities, and equipment. Several impoundments, ponds, and basins also are included (see Figure 1-1, Site Map). Given the cumulative information regarding both radiological and chemical contaminants and the knowledge of process operations history, the extent of potential contamination is likely widespread within OU3 including the associated structures and other components listed above. Operable Unit 3 does not specifically include the soil and groundwater under the various improvements, but those resources are important as potential pathways between sources of contamination in the operable unit and receptors.

1.2 Basis for Engineering Evaluation/Cost Analysis

The potential threats to health and the environment posed by OU3 and its structures are not of a time-critical nature, since they currently pose no imminent or substantial endangerment which would necessitate the initiation of a removal action within six months. Nonetheless, the potential exists for uncontrolled release of contaminants from several sources within OU3. These sources include contaminated structures and their contents. Contaminants could be released by such mechanisms as precipitation and runoff, wind, and disturbance by humans or animals. Also, the structures are beyond their design life and some buildings are beginning to show signs of structural deterioration. Therefore, to expeditiously minimize the potential risks and accelerate the CERCLA cleanup process, DOE is planning to implement Removal Action No. 27 titled "Management of Contaminated Structures at the FEMP" prior to the implementation of a final remedial action for OU3. Removal Action No. 27 will be implemented to address the contaminated structures listed in Table 1-1.

Removal actions, as described in the National Oil and Hazardous Substances Contingency Plan (NCP) of March 1990 (40 Code of Federal Regulations [CFR] 300.415), are primarily intended to abate, minimize, stabilize, mitigate, or eliminate a release or a threat of release prior to a final action if there



FEMP SITE IDENTIFICATION

TS-1 TENSION SUPPORT STRUCTURE #1
TS-2 TENSION SUPPORT STRUCTURE #2
TS-3 TENSION SUPPORT STRUCTURE #3
1A PREPARATION PLANT
1B PLANT 1 STORAGE BLDG.
1C PLANT 1 ORE SILOS
2A ORE REFINERY PLANT
2B GENERAL/REFINERY SUMP CONTROL BLDG.
2C BULK LIME HANDLING BLDG.
2D METAL DISSOLVER BLDG.
2E NFS STORAGE & PUMP HOUSE
2F COLD SIDE ORE CONVEYOR
2G HOT SIDE ORE CONVEYOR
2H CONVEYOR TUNNEL (FROM PLANT 1)
3A MAINTENANCE BLDG.
3B OZONE BLDG.
3C NAR CONTROL HOUSE
3D NAR TOWERS
3E HOT RAFFINATE BLDG.
• 3F HARSHAW SYSTEM
• 3G REFRIGERATION BLDG.
3H REFINERY SUMP
3J COMBINED RAFFINATE TANKS
3K OLD COOLING WATER TOWER
3L ELECTRICAL POWER CENTER BLDG.
• 4A GREEN SALT PLANT
4B PLANT 4 WAREHOUSE
• 4C PLANT 4 MAINTENANCE BLDG.
5A METALS PRODUCTION PLANT
5B PLANT 5 INGOT PICKLING
5C PLANT 5 ELECTRICAL SUBSTATION
5D WEST DERBY BREAKOUT/SLAG MILLING
5E PLANT 5 FILTER BLDG.
5F PLANT 5 COVERED STORAGE PAD
5G PLANT 5 INGOT STORAGE SHELTER
6A METALS FABRICATION PLANT
6B PLANT 6 COVERED STORAGE AREA
6C PLANT 6 ELECTROSTATIC PRECIPITATOR (SOUTH)
6D PLANT 6 ELECTROSTATIC PRECIPITATOR (CENTRAL)
6E PLANT 6 ELECTROSTATIC PRECIPITATOR (NORTH)
6F PLANT 6 SALT OIL HEAT TREAT BLDG.
6G PLANT 6 SUMP BLDG.
• 7A PLANT 7
7B PLANT 7 OVERHEAD CRANE
8A RECOVERY PLANT
8B PLANT 8 MAINTENANCE BLDG.
8C ROTARY KILN/DRUM RECONDITIONING
8D PLANT 8 RAILROAD FILTER BLDG.
8E DRUM CONVEYOR SHELTER
8F PLANT 8 OLD DRUM WASHER
9A SPECIAL PRODUCTS PLANT
9B PLANT 9 SUMP TREATMENT FACILITY
9C PLANT 9 DUST COLLECTOR
9D PLANT 9 SUBSTATION
9E PLANT 9 CYLINDER SHED
9F PLANT 9 ELECTROSTATIC PRECIPITATOR
10A BOILER PLANT
10B BOILER PLANT MAINTENANCE BLDG.
10C WET SALT STORAGE BIN
• 10D CONTAMINATED OIL/GRAPHITE BURN PAD
11 SERVICE BLDG.
12A MAIN MAINTENANCE BLDG.
12B CYLINDER STORAGE BLDG.
12C LUMBER STORAGE BLDG.
13A PILOT PLANT WET SIDE
• 13B PILOT PLANT MAINTENANCE BLDG.
• 13C SUMP PUMP HOUSE
• 13D PILOT PLANT THORIUM TANK FARM
14A ADMINISTRATION BLDG.
14B BLDG. 14 EOC GENERATOR SET
15 LABORATORY
16A MAIN ELECTRICAL STATION
16B ELECTRICAL SUBSTATION
16C ELECTRICAL PANELS & TRANSFORMER
16D MAIN ELECTRICAL SWITCH HOUSE
16E MAIN ELECTRICAL TRANSFORMERS
16F TRAILER SUBSTATION #1
16G TRAILER SUBSTATION #2
16H 10 PLEXS NORTH SUBSTATION
16J 10 PLEXS SOUTH SUBSTATION
18A BDN SURGE LAGOON
18B GENERAL SUMP
18C COAL PILE RUNOFF BASIN
18D BIODENITRIFICATION TOWERS
18E STORM WATER RETENTION BASINS
18F PIT #5 SLUICE GATE
18G CLEARWELL PUMP HOUSE
18H BDN EFFLUENT TREATMENT FACILITY
18J METHANOL TANK
• 18K LOW NITRATE TANK
• 18L HIGH NITRATE TANK
18M HIGH NITRATE STORAGE TANK
18N WASTE PIT AREA STORM WATER RUNOFF CONTROL
19A MAIN TANK FARM
19B PILOT PLANT AMMONIA TANK FARM
19C TANK FARM CONTROL HOUSE
19D OLD NORTH TANK FARM
19E TANK FARM LIME SLITTER BLDG.
20A PUMP STATION & POWER CENTER
20B WATER PLANT
20C COOLING TOWERS
20D ELEVATED POTABLE STORAGE TANK
20E WELL HOUSE #1
20F WELL HOUSE #2
20G WELL HOUSE #3
20H PROCESS WATER STORAGE TANK
20J LIME SLURRY PITS
22A GAS METER BLDG.
22B STORM SEWER LIFT STATION
22C TRUCK SCALE
22D SCALE HOUSE & WEIGH SCALE
22E UTILITY TRENCH TO PIT AREA
23 METEOROLOGICAL TOWER
24A RAILROAD SCALE HOUSE
24B RAILROAD ENGINE HOUSE
25A CHLORINATION BLDG.
25B M.H. #175/EFF. LINE/SAMPLING BLDG.
25C SEWAGE LIFT STATION BLDG.
25D U.V. DISINFECTION BLDG.
25E DIGESTER & CONTROL BLDG.
25F SLUDGE DRYING BEDS
25G PRIMARY SETTLING BASINS
25H TRICKLING FILTERS
25J 10 PLEXS SEWAGE LIFT STATION
26A PUMP HOUSE-HP FIRE PROTECTION
26B ELEVATED WATER STORAGE TANK
26C MAIN ELECTRICAL STRAINER HOUSE
28A SECURITY BLDG.
28B HUMAN RESOURCES BLDG.
28C GUARD POST ON SOUTH END OF "D" STR.
28D GUARD POST ON WEST END OF "2ND" STR.
30A CHEMICAL WAREHOUSE
30B DRUM STORAGE WAREHOUSE
30C OLD TEN TON SCALE
31A ENGINE HOUSE/GARAGE
31B OLD TRUCK SCALE
• 32A MAGNESIUM STORAGE BLDG.
• 32B BLDG. 32 COVERED LOADING DOCK
34A K-65 STORAGE TANK (NORTH)
34B K-65 STORAGE TANK (SOUTH)
35A METAL OXIDE STORAGE TANK (NORTH)
35B METAL OXIDE STORAGE TANK (SOUTH)
37 PILOT PLANT ANNEX
38A PROPANE STORAGE
38B CYLINDER FILLING STATION
• 39A INCINERATOR BLDG.
39B WASTE OIL DECANT SHELTER
39C INCINERATOR SPRINKLER RISER HOUSE
• 39D SEWAGE TREATMENT PLANT INCINERATOR
44A TRAILER COMPLEX (6-PLEX)
44C TRAILER COMPLEX (7-PLEX S.)
44D TRAILER COMPLEX (7-PLEX N.)
44E TRAILER COMPLEX (10 PLEX)
45A RUST ENGINEERING BLDG.
45B UTILITY SHED EAST OF RUST TRAILERS
46 HEAVY EQUIPMENT BLDG.
51 SIX TO FOUR REDUCTION FACILITY #2
53A HEALTH & SAFETY BLDG.
53B IN-VIVO BLDG.
54A SIX TO FOUR REDUCTION FACILITY #1
54B PILOT PLANT SHELTER
54C PILOT PLANT DISSOCIATOR SHELTER
55A SLAG RECYCLING BLDG.
55B SLAG RECYCLING PIT/ELEVATOR
56A CP STORAGE WAREHOUSE
56B STORAGE SHED (WEST)
56C STORAGE SHED (EAST)
60 QUONSET HUT #1
61 QUONSET HUT #2
62 QUONSET HUT #3
63 KC-2 WAREHOUSE
64 THORIUM WAREHOUSE
• 65 (OLD) PLANT 5 WAREHOUSE
66 DRUM RECONDITIONING BLDG.
• 67 PLANT 1 THORIUM WAREHOUSE
• 68 PILOT PLANT WAREHOUSE
• 69 DECONTAMINATION BLDG.
71 GENERAL IN-PROCESS WAREHOUSE
• 72 DRUM STORAGE BUILDING
• 73A FIRE BRIGADE TRAINING CENTER BLDG.
• 73B FIRE TRAINING POND
• 73C FIRE TRAINING TANK
• 73D FIRE TRAINING BURN TROUGH
• 73E CONFINED SPACE BURN TANK
74A PLANT 2 EAST PAD
74B PLANT 2 WEST PAD
74C PLANT 8 EAST PAD
74D PLANT 8 WEST PAD
74E PLANT 4 PAD
74F PLANT 7 PAD
74G PLANT 5 EAST PAD
74H PLANT 5 SOUTH PAD
74J PLANT 6 PADS
74K PLANT 9 PAD
74L BUILDING 65 WEST PAD
74M BUILDING 64 EAST PAD & R.R. DOCK
74N BUILDING 12 NORTH PAD
74P DECONTAMINATION PAD
74Q PLANT 8 OLD METAL DISSOLVER PAD
74R PLANT 8 NORTH PAD
74S BUILDING 63 WEST PAD
74T PLANT 1 STORAGE PAD
74U PILOT PLANT PAD
74V LABORATORY PAD
77 FINISHED PRODUCTS WAREHOUSE (4A)
78 D & D BUILDING (UNDER CONSTR.)
79 PLANT 6 WAREHOUSE
80 PLANT 8 WAREHOUSE
81 PLANT 9 WAREHOUSE
82 RECEIVING/INCOMING MAT'LS. INSP.
88 CLEARWELL LINE
89 PARKING LOTS

• INDICATES DESCRIPTION OF STRUCTURE ADDRESSED BY REMOVAL ACTION NO. 27.

■ STRUCTURES TO BE ADDRESSED BY REMOVAL ACTION NO. 27.

--INDICATES PROPOSED LOCATIONS OF STRUCTURES.

NOTE:
NUMBERING SCHEME DOES NOT REFLECT ACTUAL M.M.I.C. SYSTEM SCHEME. CONTACT SITE SERVICES/MAINTENANCE INFORMATION SYSTEM FOR FURTHER ASSISTANCE.

NOTE:
SITE IDENTIFICATION SCHEME PER A.S.I. OPERABLE UNIT 3 PROGRAM REQUIREMENTS.

4005

EBASCO SERVICES INCORPORATED

WESTINGHOUSE ENVIRONMENTAL MANAGEMENT COMPANY

FERNALD ENVIRONMENTAL MANAGEMENT PROGRAM
ENGINEERING EVALUATION/COST ANALYSIS-
ENVIRONMENTAL ASSESSMENT (EE/CA-EA)
FOR REMOVAL ACTION NO.27
MANAGEMENT OF CONTAMINATED STRUCTURES

SITE MAP

TABLE 1-1

REMOVAL ACTION NO. 27 - CONTAMINATED STRUCTURES

No.	List of Contaminated Structures Addressed by EE/CA-EA
3F	Harshaw System
3G	Refrigeration Building
4A	Green Salt Plant, and Misc. Tanks
4C	Plant 4 Maintenance Building
7A	Plant 7 - Main Building
10D	Contaminated Oil/Graphite Burn Pad
13B	Pilot Plant Maintenance Building
13C	Sump Pump House
13D	Pilot Plant Thorium Tank Farm (West Tank Farm)
18K	Low Nitrate Tank
18L	High Nitrate Tank
32A	Magnesium Storage Building
32B	Building 32 Covered Loading Dock
39A	Incinerator Building
39D	Sewage Treatment Plant Incinerator
65	(Old) Plant 5 Warehouse
67	Plant 1 Thorium Warehouse
68	Pilot Plant Warehouse
69	Old Decontamination Building
72	Drum Storage Building (Warehouse for Integrated Demo)
73A	Fire Brigade Training Center Building
73B	Fire Training Pond
73C	Fire Training Tank
73D	Fire Training Burn Trough
73E	Confined Space Burn Tank

is a threat to public health or welfare or the environment. Additionally, removal actions are to be consistent with the anticipated long-term remedial action and contribute to the efficient performance of the long-term remedy, to the extent practicable. Removal Action No. 27 will satisfy these requirements. An engineering evaluation/cost analysis/(EE/CA) is performed to analyze removal action alternatives, and support the selection of a preferred alternative consistent with CERCLA requirements. Additionally, an EE/CA is also prepared because it has been determined that there is a planning period greater than six months before a response is initiated.

The National Environmental Policy Act (NEPA) of 1969 established Federal requirements that environmental impacts associated with federal actions be evaluated before a final alternative is selected and an action is implemented. In August 1988, the DOE issued notice 5400.4 to confirm this policy and provide guidance on the integration of the CERCLA and NEPA process. Consistent with this DOE NEPA/CERCLA Integration Plan for the FEMP (January 1990), this CERCLA EE/CA document also addresses issues of NEPA interest.

1.3 Purpose of Document

This Engineering Evaluation/Cost Analysis (EE/CA) report has been prepared to support the selection of a removal action for managing 25 contaminated structures at the FEMP. The removal action is expected to continue up to, and possibly two years beyond, the ROD for OU3.

The objectives of this report are to:

1. identify alternatives and select a preferred alternative for managing the contaminated structures;
2. document the selection of a response that will mitigate the potential threat to workers, the general public, and the environment associated with the contaminated structures;
3. identify and evaluate health and environmental impacts associated with the proposed action consistent with requirements of NEPA.

This document includes the six basic elements of a standard EE/CA report as described in the

Environmental Protection Agency (EPA) EE/CA Guidance for Non-Time Critical Removal Actions. These elements, which are described in detail in Section 2.0 through 6.0 of this report, are as follows:

- Site Characterization;
- Identification of Removal Action Objectives;
- Identification of Removal Action Alternatives;
- Evaluation of Removal Action Alternatives;
- Comparison of Alternatives; and Recommendations; and
- Potential Environmental Impacts of Implementing the Preferred Alternative.

The several waste streams generated as part of the action proposed in this EE/CA are expected to be handled and dispositioned consistent with established FEMP waste management plans, procedures, and the regulations including Removal Action No. 9 -- Removal of Waste Inventories and Removal Action No. 17 -- Improved Storage of Soil and Debris. The FEMP Waste Management Plans identify release for unrestricted use as the highest priority for material disposition, and stress waste minimization and recycling. The EE/CA considers waste disposition throughout its development in this regard.

2.0 SITE CHARACTERIZATION

This section summarizes background information concerning the FEMP and OU3 relevant to the EE/CA in support of Removal Action No. 27 -- Management of Contaminated Structures. Included in this section is a brief survey of the site location and affected environment (Section 2.1), a summary of the production history and processes at the Fernald site (Section 2.2), an overview description of the contaminated structures included in Removal Action No. 27 (Section 2.3), and a summary of information on the nature and extent of contamination in structures included in Removal Action No. 27 (Section 2.4). Also, in Section 2.5 the site conditions which justify a removal action are discussed.

The site characterization information summarized within this section is based upon the data and information presented in the OU2 RI/FS-EIS (DOE 1992b), the Sitewide Characterization Report (SWCR) (DOE 1992c), the OU3 RI/FS Work Plan Addendum (DOE 1992a) and other references as noted.

2.1 Site Location and Affected Environment

The Fernald Environmental Management Project (FEMP), formerly known as the Feed Materials Production Center (FMPC), is located on a 1,050-acre site in a rural agricultural area about 18 mi northwest of downtown Cincinnati, Ohio. The site is near the villages of Fernald, New Haven, Ross, New Baltimore and Shandon, Ohio (Figure 2-1). OU3 focuses on the former Production Area and other areas suspected of contamination within FEMP, and is one of the largest and most complex of the FEMP Operable Units, largely due to the wide variety of former processing facilities. As part of OU3, Removal Action No. 27 is concerned with the decontamination and removal of the 25 structures within the former Production Area of the FEMP previously noted in Figure 1-1.

The FEMP is a government-owned, contractor-operated, federal facility that produced high-purity uranium metal products for the U.S. Department of Energy (DOE) and its predecessor agencies during the period 1952-1989. Thorium also was processed, but on a smaller scale, and still is stored on the site. Production activities were stopped in 1989, and the production mission of the facility was formally ended in 1991. The FEMP was included on the National Priorities List (NPL) in 1989.

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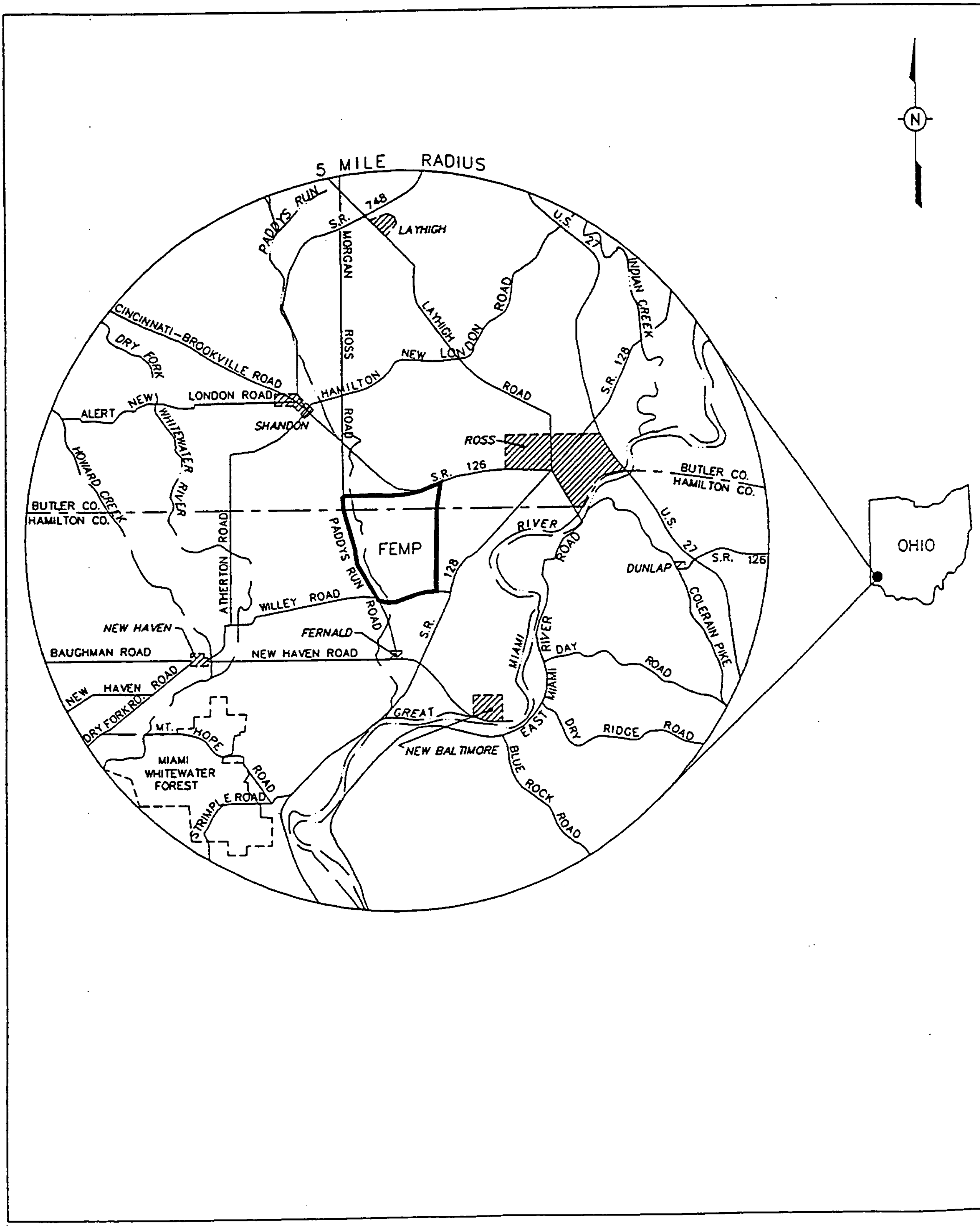


FIGURE 2-1 Location of FEMP Facility

Although environmental media are not considered part of OU3 or Removal Action No. 27, they are part of the potential transport and exposure pathways that must be considered. Also, to provide the basis for an assessment of the impacts of Removal Action No. 27 activities on the site environment, this section will include brief discussions of the local surface features, soils, geology and hydrogeology, surface water and aquatic ecology, vegetation, wildlife, meteorology and climatology, land use, socioeconomics, and cultural resources. More extensive discussions of these topics are provided in the Sitewide Characterization Report (SWCR) for the FEMP (DOE 1992c).

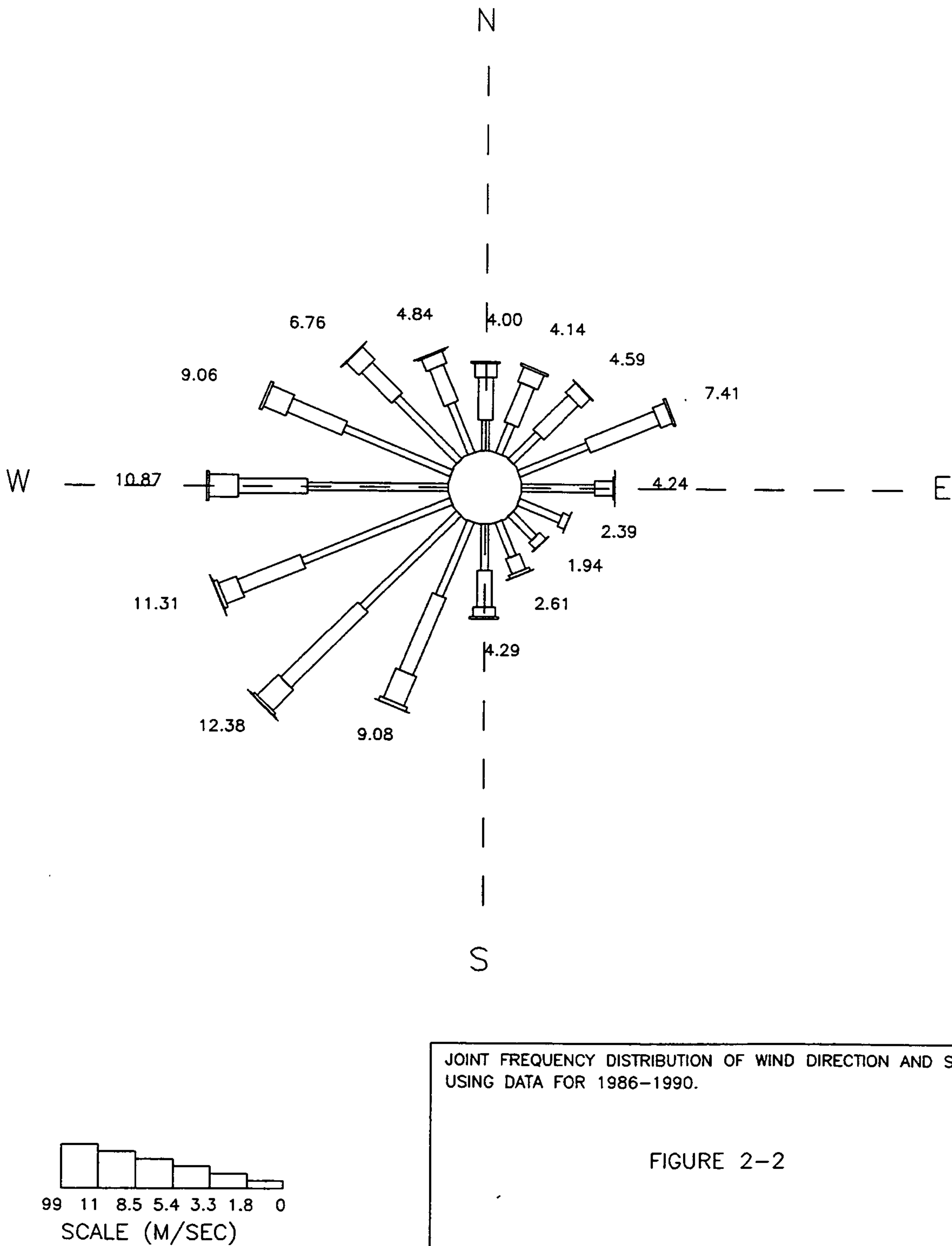
2.1.1 Climate and Meteorology

The climate of southwestern Ohio is characterized as continental, with a wide range of temperatures throughout the year. Climatological data recorded at the Greater Cincinnati Airport indicate that average monthly temperatures for the area range from 20°F in January to 76°F in July. Each year, there are approximately 20 days when the temperature exceeds 90°F and 25 to 30 days when the temperature remains at or below freezing (32°F). The average annual precipitation, including melted snow, is 41 inches. The average annual snowfall is 24 inches. Average monthly wind speeds range from 7 mph in August to 11 mph in March (National Oceanic and Atmospheric Administration 1989).

The meteorology of the FEMP site is typical of conditions throughout southwestern Ohio, but surface winds are often affected by the local terrain. The Great Miami River valley and the ridges surrounding the FEMP are the predominant features that influence wind patterns at the site. The gently rolling hills immediately surrounding the site, and the larger hills in the distance form the boundaries of the valley. The minimum distance from the FEMP site to the larger hills is approximately 0.5 miles to the north and 1.5 miles to the south-southeast.

Data collection from a meteorological tower in the southwestern area of the FEMP site began in August 1986. Figure 2-2 is a diagram showing wind speed and direction at the 10-m level of the FEMP tower during 1989. Instruments at the meteorological tower also measure temperature, lapse rate, dew point, relative humidity, barometric pressure, and precipitation.

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO
10 METER LEVEL



JOINT FREQUENCY DISTRIBUTION OF WIND DIRECTION AND SPEED USING DATA FOR 1986–1990.

FIGURE 2–2

2.1.2 Topography

The main physiographic features in the area around the FEMP are gently rolling uplands, steep hillsides along the major streams, and the Great Miami River valley, which is a relatively broad, flat-bottomed valley flanked on either side by bluffs that rise to a maximum of 300 feet above the general level of the valley floor. Maximum elevation along the northern boundary of the FEMP property is a little more than 700 feet above mean sea level (MSL) (see Figure 2-3).

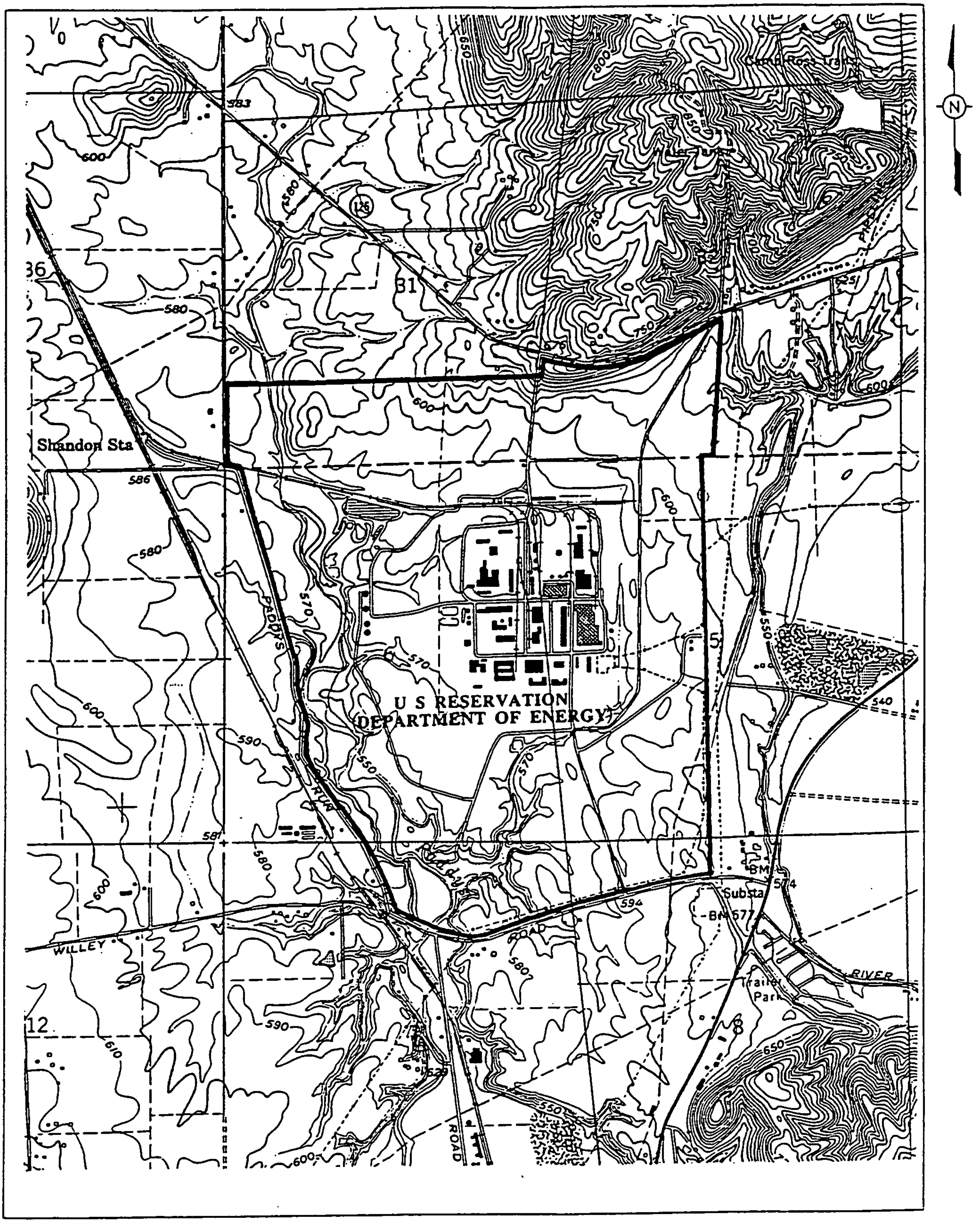
The former Production Area and Waste Storage Area of the FEMP rest on a relatively level plain at about 580 feet MSL. The plain slopes from 600 feet above MSL along the eastern boundary of the FEMP to 570 feet MSL at the K-65 silos, and then drops off towards Paddys Run at an elevation of 550 feet MSL.

All drainage on the FEMP is from east to west into Paddys Run, with the exception of the extreme northeast corner, which drains east toward the Great Miami River.

2.1.3 Soils

Soils in the region of the FEMP were formed from source materials deposited by the action of Wisconsin and Illinoisan glaciers. These parent materials consist mainly of glacial till, but also include sand, gravel, glacial-lake clays, and silty clays. Three major soil associations, exist in the vicinity of the FEMP: Russell-Xenia-Wynn, Fincastle-Xenia-Wynn, and Fox-Genesee (U.S. Department of Agriculture 1980, 1982; Lerch et al. 1982).

Before development of the FEMP, soils of the Production Area consisted primarily of Fincastle silt loams. Fincastle soils are light colored, medium acidic, and moderately high in productivity when properly managed. Moisture-supplying capacity is moderate, as is fertility and organic content. The Fincastle series consists of deep, nearly level, somewhat poorly drained soils on broad flats. Permeability is low and the available water capacity is high. The seasonal high perched water table is commonly found between 1 and 3 feet below the ground surface from January to April. In areas where these soils are predominant, artificial drainage is required for moderate crop productivity. Because of Production Area development, native soils have been covered by gravels, paving materials, and facilities; and backfill



SOURCE:
USGS (1981)
SHANDON, OHIO
QUADRANGLE

SCALE
1:24,000

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FIGURE 2-3 Topographic Map of the FEMP

materials have been introduced around structure foundations. Areas that are currently planted with grass and maintained as lawns or buffer zones tend to represent native Fincastle soils.

2.1.4 Geology and Hydrogeology

The FEMP is located within a 2 to 3 mile-wide subterranean valley known as the New Haven Trough. This valley formed as a result of Pleistocene glaciation and subsequently filled with glacial outwash materials and till. The bedrock in the vicinity of the FEMP consists of predominantly flat-lying, olive-gray Ordovician shales with thin, interbedded layers of limestone. This shale forms the floor and valley walls of the New Haven Trough. The buried valley is generally carved into this shale between 60 feet and more than 200 feet below the pre-erosional land surface in the vicinity of the FEMP. Within some areas, glacial overburden deposits overlie the bedrock uplands and portions of outwash materials where they form the thick, unconsolidated sediment layers beneath the soil zone.

Large groundwater supplies occur in outwash deposits of the buried channel aquifer and are recharged by three principal sources: recharge from bedrock, precipitation recharge, and recharge by stream infiltration. Although the shales and limestones have a low permeability, small amounts of water occur in erratically distributed joints and cracks and produce seepage into the glacial deposits. The average permeability of the bedrock has been estimated to be five gallons per day per square foot (5 gal/d-ft^2) of contact with the glacial deposits. Recharge by precipitation amounts of approximately 570,000 gal/d-mi^2 of catchment area and represents the dominant source of recharge on a regional basis. Under natural conditions, the gradient of groundwater flow is from the aquifer to the Great Miami River, except during dry periods, when the gradient is reversed. Intermittent recharge to the aquifer also occurs along Paddys Run.

The groundwater in the regional aquifer enters the FEMP study area from the buried valleys on the west, north, and east. Natural gradients cause the groundwater to exit the FEMP study area by either flowing east to the Great Miami River upstream from New Baltimore, or by flowing south through the branch of the bedrock channel west of New Baltimore (as shown in Figure 2-4).

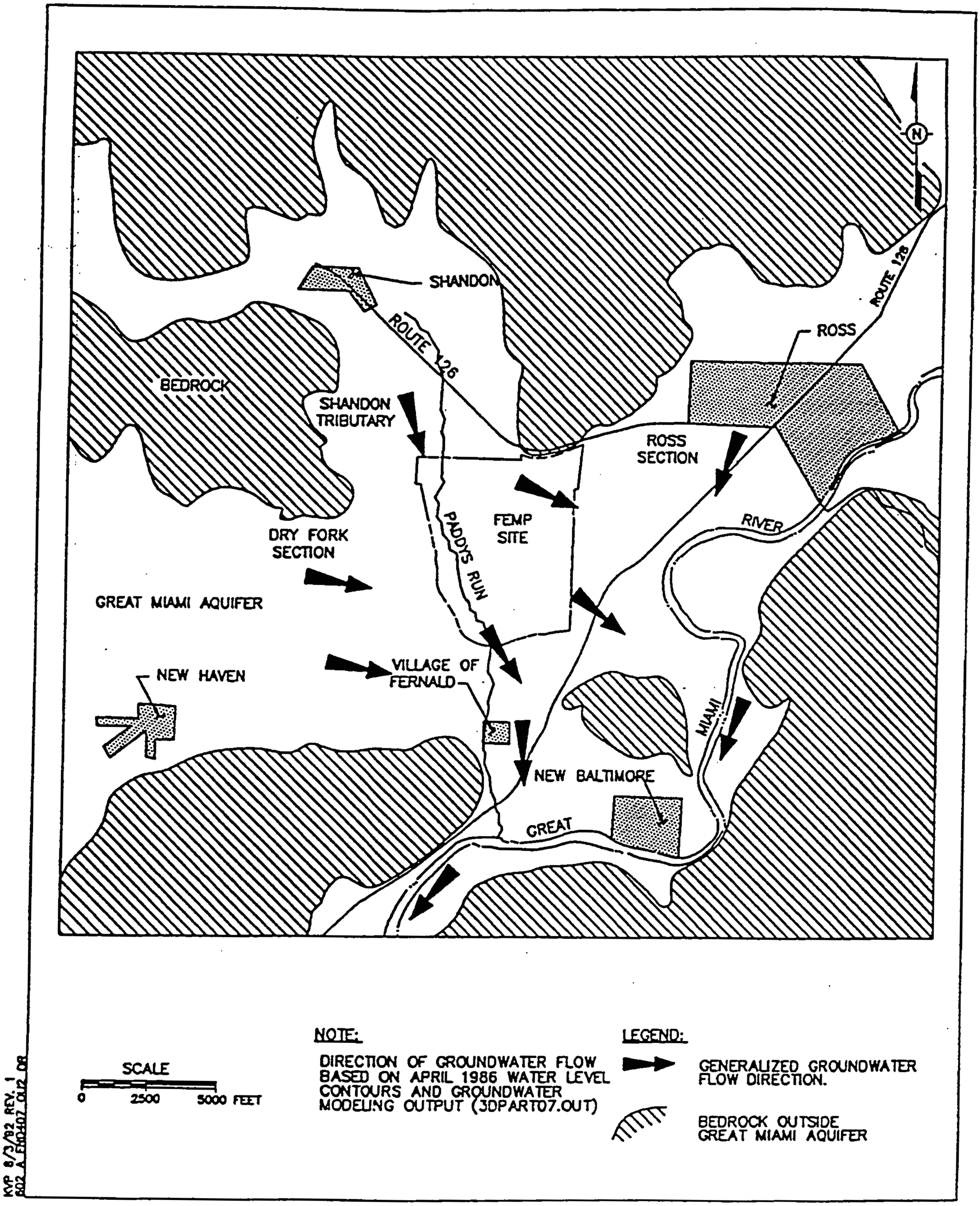

FIGURE 2-4 Generalized Groundwater Flow in Buried Channel Aquifer

The major hydrogeologic unit beneath the Production Area is glacial overburden that was deposited during a series of advances and retreats of a small lobe of ice that was part of the leading edge of the Wisconsin glacier. The glacial overburden ranges from about 20 to 50 feet thick across the Production Area, thickening to the west. Discontinuous sand lenses are scattered throughout the glacial overburden. These lenses are more prevalent and thicker under the western half of the Production Area than under the eastern half, where almost no sand lenses are found.

The presence of yellow-brown clay below gray clay (color differences which reflect weathering) is direct evidence that perched groundwater is moving laterally within the glacial overburden. Groundwater flow within the clays is controlled by joints and fractures. The occurrence of flow and contaminant transport along fracture systems makes the prediction of flow paths within the dominantly clay-bearing zones much more difficult than when flow occurs in more uniformly permeable sand beds.

Beneath the Production Area, the depth of weathering in the glacial overburden is variable, typically ranging from 7 to 14 feet. Overall, there is no systematic variation; however, the depth of weathering may be relatively constant over wide areas. Weathered glacial overburden is missing entirely in a few locations where the surface is protected from infiltration. This is evident in borings in the Plant 1 area and under Plant 6. The most consistent depth of weathering is found in the northeastern portion of the Production Area, where the glacial overburden is composed primarily of clay with relatively few sand or silt beds. The depth of weathering is 9-12 feet over the majority of the northeastern quadrant.

Because many piezometers and wells in the glacial overburden do not yield significant amounts of water, the flow system is considered to be discontinuous, with very limited potential for lateral groundwater flow over large areas.

2.1.5 Surface Water

The surface waters of primary concern with respect to the FEMP are the Great Miami River, which is the receiving stream for the major NPDES-permitted discharge from the FEMP, and Paddys Run, which receives uncontrolled stormwater runoff from the southwest quadrant of the site; and also drains the west side of the FEMP and accepts NPDES-permitted emergency overflows from the stormwater retention basin via the storm sewer outfall ditch (Figure 2-5).

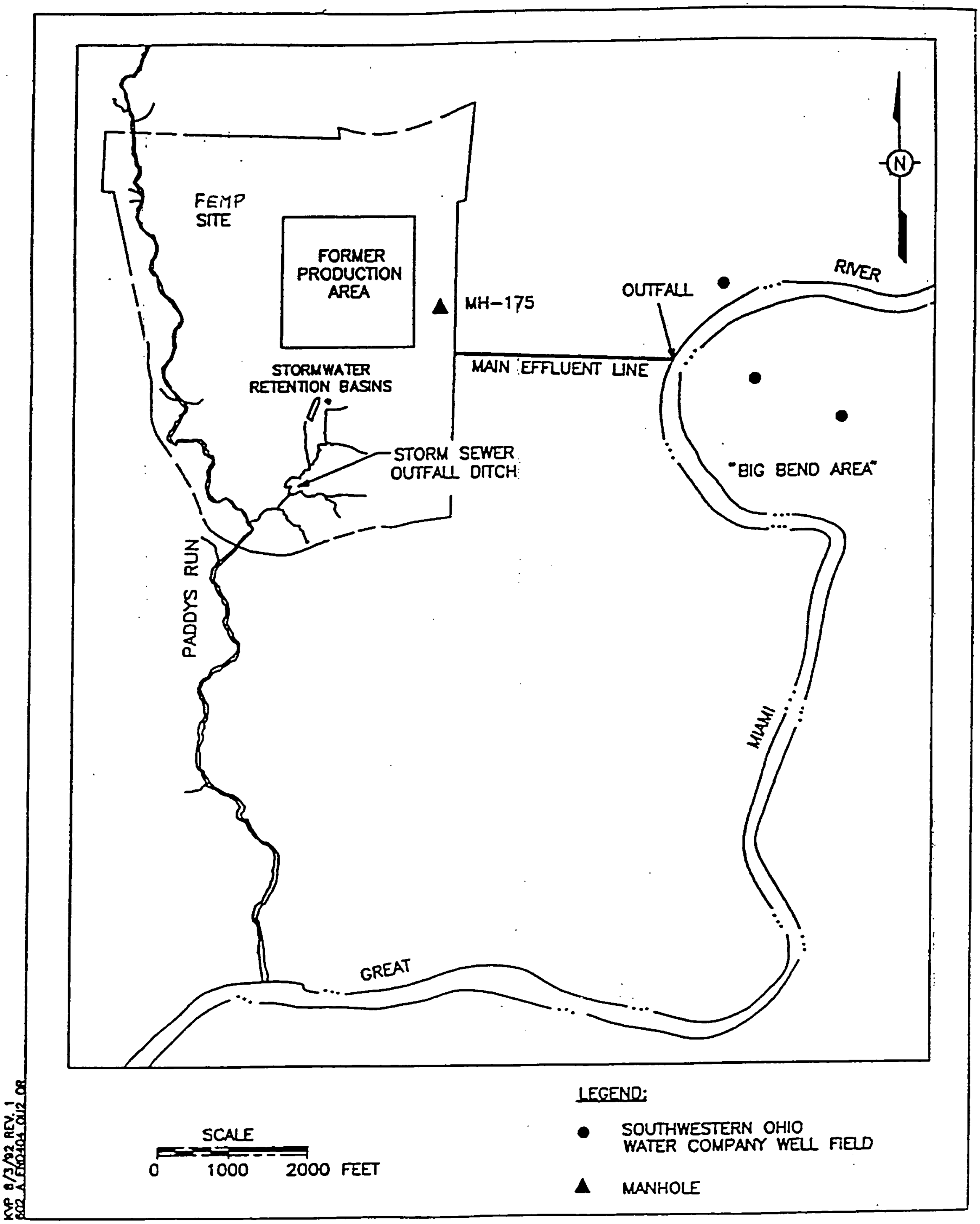

FIGURE 2-5 Surface Water Hydrology

Natural surface drainage from the FEMP is primarily to Paddys Run, which originates north of the facility, drains southward along the western boundary of the FEMP, and enters the Great Miami River approximately 1.5 miles south of the FEMP (Figure 2-5). Paddys Run is approximately 8.8 miles long and drains an area of 15.8 square miles. Paddys Run is an extremely steep-sided stream, having cut to depths of 6.1 feet or more through the geological deposits upon which the FEMP is built. This stream loses flow to the underlying aquifer along much of its course because of the highly permeable channel bottom, which is carved into the Great Miami Aquifer. Paddys Run is an ungaged, intermittent stream that flows primarily between January and May, with an estimated discharge for this period ranging

between 0.2 and 4.0 ft^3/sec. Between June and December, flow north of silos 1 and 2 (located near the western boundary of the FEMP site) is reduced to a trickle, and there is typically no flow south of the silos except during and immediately following rainfalls.

A principal drainage feature of the FEMP is the unnamed tributary of Paddys Run that drains a large area south and east of the storm sewer outfall ditch and provides the discharge path from the outfall ditch to Paddys Run. This drainage originates east of the Production Area, flows southwest across the southern portion of the facility, and enters Paddys Run near the southwest corner of the property (Figure 2-5).

Much of the stream bottom of this drainage, which also collects runoff from an area east of the Production Area, is composed of sand and gravel. Vertical seepage rates through the stream bottom are similar to those in Paddys Run. This drainage is generally dry most of the year, with flows occurring during and immediately after precipitation.

For the most part, surface water runoff within the Production Area is collected by a storm sewer system. The stormwater retention basins were constructed in October 1986 and December 1989 at the head of the storm sewer outfall ditch, and stormwater runoff from the Production Area is now conveyed to these retention basins. The stormwater retention basins are designed to retain the runoff from a 10-year, 24-hour rainfall. After at least a 24-hour retention period to allow for settling of suspended solids, the water is pumped out of the basins to the Great Miami River via the FEMP's main effluent line. Stormwater from the Production Area now enters the storm sewer outfall ditch only as a result of overflows from the stormwater retention basin.

2.1.6 Wetlands and Floodplains

Floodplains within the FEMP property are confined to the north-south corridor containing Paddys Run.

Outside the boundaries of the FEMP, the 100-year floodplain of the Great Miami River extends west of the "Big Bend" area nearly to the eastern boundary of the facility. The 100-year floodplain of the river also extends northward along Paddys Run (Figure 2-6).

Jurisdictional wetlands, as defined by the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (Federal Interagency Committee for Wetland Delineation [FICWD] 1989), within FEMP boundaries were identified and delineated with the "off-site" method described by the FICWD (1989), supplemented by an on-property field reconnaissance. Details of that study are provided in the Sitewide Characterization Report. Results of the field reconnaissance indicated that wetlands at the FEMP are limited to a small forested wetland of approximately 50 acres in the northern portion of the facility and emergent wetlands associated with tributaries and drainage ditches that feed into Paddys Run (Figure 2-7).

Paddys Run and the remainder of its tributaries, including the storm sewer outfall ditch, are characterized by unvegetated stream channels incised into surrounding uplands. These unvegetated stream channels do not meet the wetland criteria and would be classified as "other waters of the United States." As such, they would not be protected by Executive Order 11990 or other wetlands regulations, but remedial actions affecting them would still be subject to the substantive requirements of the Clean Water Act (CWA).

There are no jurisdictional wetlands in the area directly affected by Remedial Action No. 27.

2.1.7 Aquatic Ecology

Aquatic environments on and adjacent to the FEMP include the Great Miami River, Paddys Run, and wetlands. The Great Miami River is classified by Ohio Environmental Protection Agency (OEPA) as a warm water habitat (OEPA 1982, 1989a). These waters are capable of supporting balanced, reproducing populations of warmwater fish and associated vertebrates, invertebrates, and plants on an annual basis (OEPA 1987).

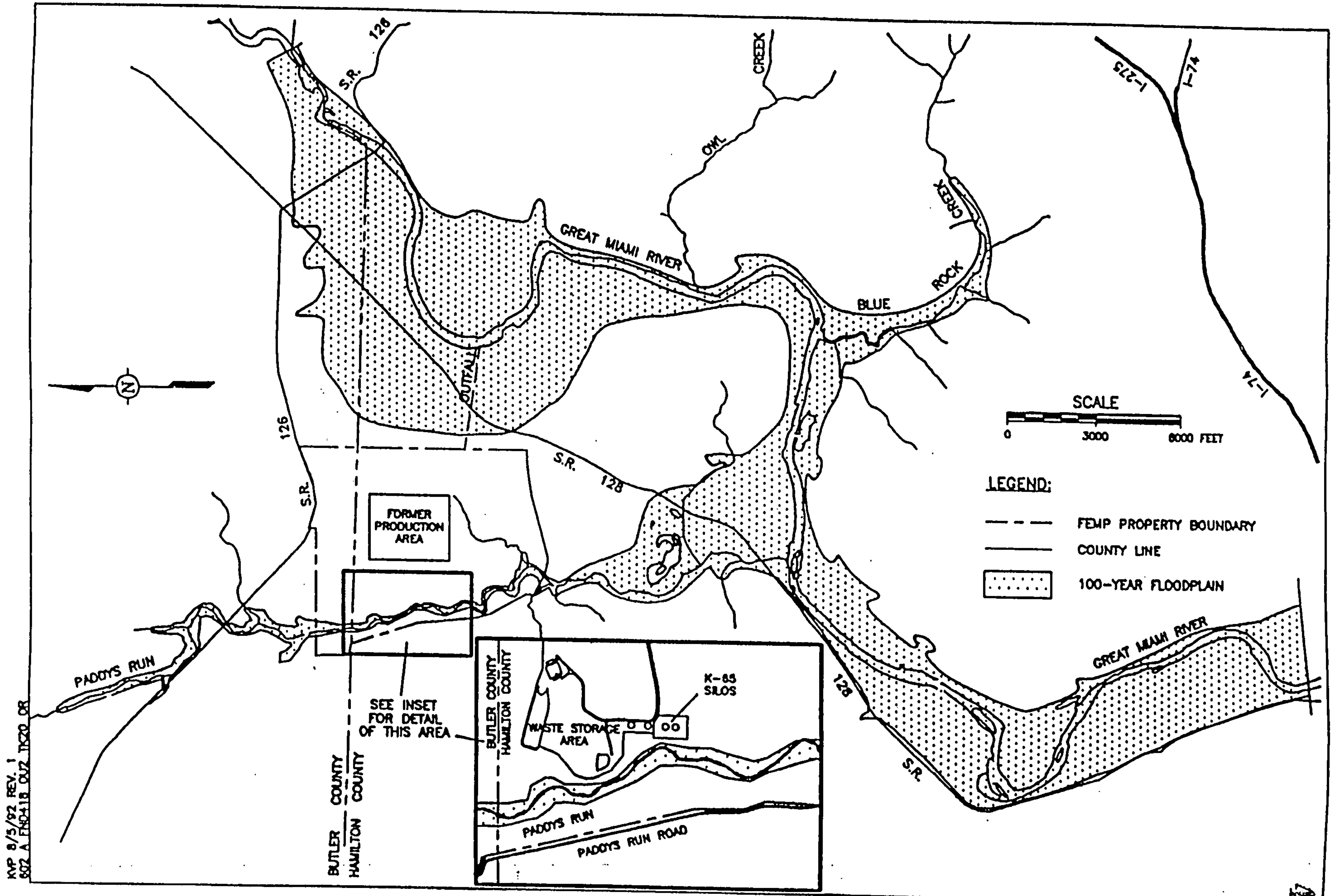

FIGURE 2-6 Great Miami River & Paddys Run 100-Year Floodplain

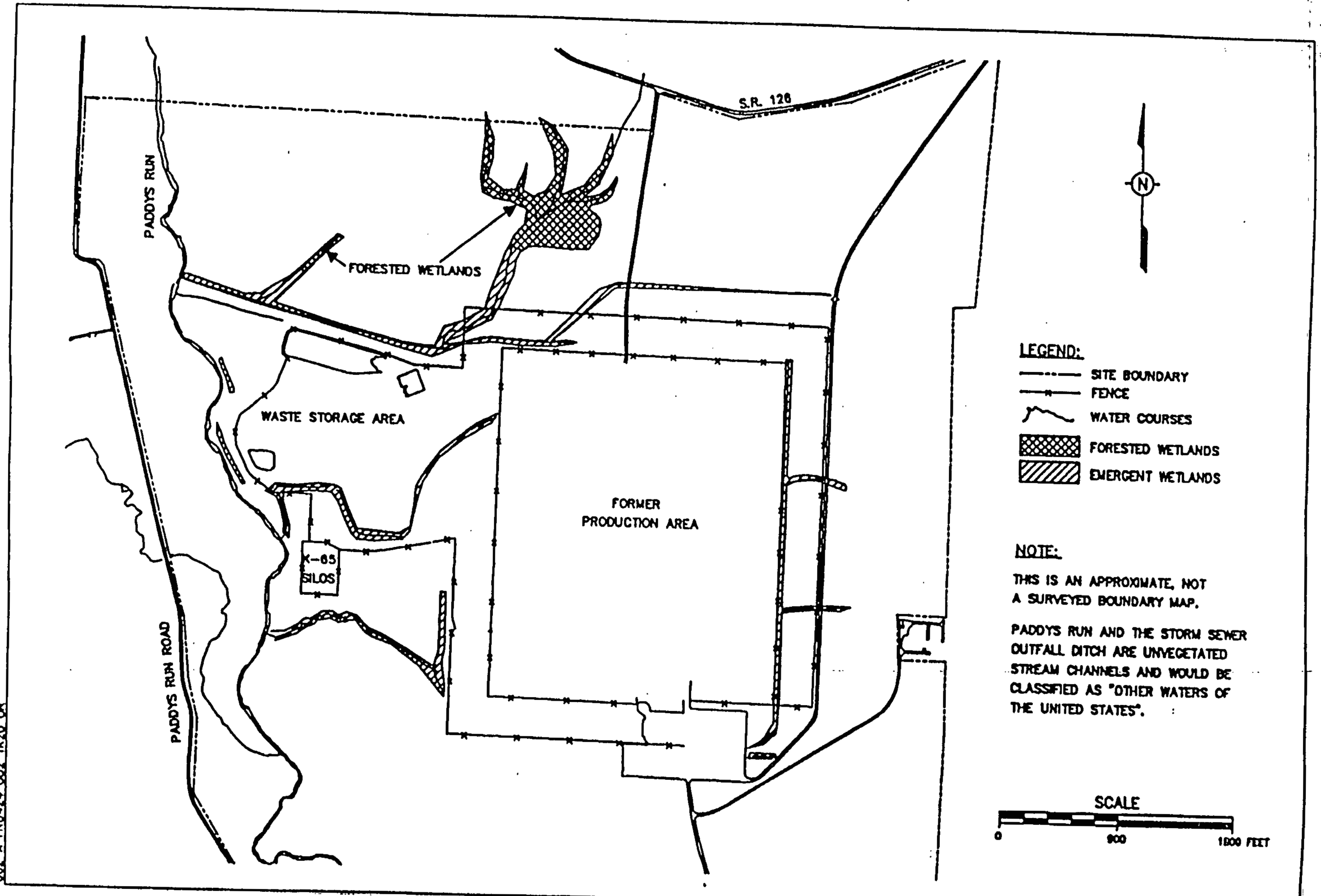

FIGURE 2-7 Approximate Boundaries of Jurisdictional Wetlands at the FEMP

The OEPA conducted intensive fishery surveys along the Great Miami River and the lower reaches of five tributary streams in 1980 and 1989 (OEPA 1982, 1989a) and found that the river immediately downstream from the FEMP (Segment 10, 24.7 to RM 9.2) was capable of supporting a well-balanced, healthy fish community, thereby attaining CWA goals. The most common fish in Segment 10 included shiners, sunfish, catfish, drum, gizzard shad, carp, and goldfish. The fish with the greatest total weight in Segment 10 included carp, goldfish, catfish, drum, gizzards shad, and suckers.

In another study, twenty-five fish species were collected in 1989 by University of Cincinnati researchers for the site operator (Miller et al 1989). The study reported the most common species collected to be the gizzard shad (Dorosoma cepedianum) and stated that the Great Miami River fishery was stable over the period 1984 to 1989.

The Great Miami River also supports a diverse benthic macroinvertebrate community, with approximately 60 different taxa identified in samples taken from the river in the vicinity of the FEMP. OEPA studies indicated little change in benthic composition throughout the segments of the river in the vicinity of the FEMP site and no apparent adverse effects on water quality related to the various discharges within the segments (OEPA 1982). Although aquatic plants and algae adjacent to the FEMP have not been specifically characterized for the ongoing site studies, Miller et al (1988) did observe the green filamentous alga Cladophora sp. and the aquatic vascular plants Myriophyllum sp. and Potomogeton sp. at sites above and below the FEMP outfall.

Paddys Run and adjacent aquatic habitats harbor small fish, amphibians, and a variety of benthic macroinvertebrates. Twenty-three species of fish were recorded in Paddys Run on the FEMP by Facemire et al (1990). The benthic macroinvertebrate community in Paddys Run is typical of streams in the region. Approximately 70 different taxa of benthos have been found in the stream during site investigative studies, the great majority of which are insects.

No aquatic habitat exists within the area directly affected by Removal Action No. 27.

2.1.8 Vegetation

Onsite terrestrial communities are heavily affected by current FEMP land management practices, particularly within the Production Area of FEMP. Most FEMP lands are subject to grazing, mowing, bush-hogging or bulldozing.

The FEMP is in the Oak-Hickory Forest Section of the Eastern Deciduous Forest, as described by Bailey (1978). Ecological communities on the FEMP consist of grazed and ungrazed pastures, two pine plantations, deciduous woodlands, riparian woodlands and a reclaimed fly ash pile area.

Land use outside the Production Area and waste storage areas at the facility is predominantly agricultural, resulting in a landscape dissected by open pasture, with forests occupying drainages or used as natural fencerows or hedges. The understory is often grazed or altered by clearing or selective cutting. This has led to the development of a number of distinct terrestrial habitats, as mentioned above, described and recognized within the FEMP boundaries by Facemire et al. (1990).

Vegetative species recorded at the FEMP overall include 47 species of trees and shrubs and 190 species of herbaceous plants. The dominant tree species in the pine plantation is white pine, with Norway Spruce occurring occasionally. Common trees in the deciduous woodlands are white ash, American elm, shellbark hickory, and slippery elm. Dominant tree species in the riparian woodlands are eastern cottonwood, hackberry, American elm, and box elder. The reclaimed fly ash pile is dominated by American elm, eastern cottonwood, and black locust. Typical grasses found on the FEMP are red fescue, Kentucky bluegrass, timothy, and red top. Herbs include teasel, red and white clovers, and goldenrod.

The 136-acre tract of land near the center of the facility comprising the former Production Area is a typical industrial complex with transite, cinderblock, concrete, corrugated steel and other type structures. Gravel, concrete and asphalt are the predominant groundcover. Vegetation is virtually nonexistent within the Production Area. Although small pockets of grass occur in proximity to some of the contaminated structures involved in this removal action, the use of herbicides and continued grounds maintenance (mowing) have limited these vegetative areas from developing any further.

2.1.9 Wildlife

Mammal species observed on the FEMP include whitetailed deer, coyote, red fox, opossum, raccoon, groundhog, eastern cottontail, fox squirrel, and several species of bats. Common small mammals are the white-footed mouse, short-tailed shrew, meadow vole, meadow jumping mouse, and eastern chipmunk.

Ninety-eight species of birds have been identified at the FEMP outside of the Production Area, including breeding birds, wintering birds, and spring migrants (DOE 1992b). The most common breeding species in all habitats were the mourning dove, American robin, blue jay, American crow, American goldfinch, northern bobwhite, and common grackle. The species occurring in greatest abundance were the goldfinch, song sparrow, and American robin. Facemire (1990) attributed the diversity of birds in FEMP habitats to the availability of many small, discontinuous patches of habitat. Raptor species observed on site were the northern harrier, red shouldered hawk, Cooper's hawk, red-tailed hawk, and American Kestrel. In addition, two owl species, the eastern screech owl and great horned owl, are common.

Amphibians and reptiles that occur on the FEMP include spring peeper, eastern box turtles and snapping turtles. Snakes were the most commonly observed reptiles, with the eastern garter snake, Butler's garter snake, and black rat snake occurring in upland habitats. The northern water snake and the queen snake were observed in Paddys Run.

Approximately 130 insect families from 15 orders are represented in FEMP habitats. Leaf hoppers are consistently abundant across all the habitats, while less abundant groups included short-horned grasshoppers, leaf beetles, springtails, fruit flies, dark-winged fungus gnats, ants, bees, and wasps.

Virtually no natural wildlife habitat exists within the former Production Area at the FEMP. As a result, wildlife within the area of study for Removal Action No. 27 is extremely limited. However, some of the buildings, Building 7a being the most notable, support a colonies of feral pigeons. Building 7a is the tallest building in the Production Area and has been abandoned since the 1970's. Although no surveys have been conducted, several dozens of pigeons probably reside in Building 7a, using surrounding farmlands for feeding areas. The historical presence of these birds has lead to an accumulation of droppings which are considered to constitute a biohazard because of their potential to support histoplasmosis-causing fungi.

2.1.10 Threatened and Endangered Species

No federally listed threatened or endangered species have been observed on the FEMP or its immediate vicinity, although suitable habitat for the federally endangered Indiana Bat occurs along Paddys Run. There are reports of the state recognized Cave Salamander in the vicinity of FEMP but no observations have been made within the site boundaries, even within the marginal habitat which occurs along Paddys Run (DOE 1992c).

The northern harrier, listed as state endangered, has been observed flying over the FEMP area (Facemire et al. 1990). Other raptors observed on the FEMP include Cooper's hawks near the boundary of the southern pine plantation in the southwest corner of the property and a red-shouldered hawk in the deciduous woodlands north of the Production Area. Both species are listed as rare species of native Ohio wild animals by ODNR (ODNR 1982).

No threatened or endangered species have been observed within the Production Area itself, nor is there suitable habitat to support any.

2.1.11 Land Use

The land adjacent to the FEMP is primarily devoted to open uses such as agriculture and recreation (Figure 2-8). A number of permanent seasonal produce markets and one retail nursery also are in the area. Commercial activity is generally restricted to the village of Venice (Ross), approximately 3 miles northeast of the facility, and along State Route (S.R.) 128 just south of Ross. Industrial use is concentrated in the areas south of the FEMP, along Paddys Run Road, in Fernald, and in a small industrial park on S.R. 128 between Willey Road and New Haven Road. Concentrations of residential units are situated northeast of the FEMP in Ross and directly east in a trailer park adjacent to the intersection of Willey Road and S.R. 128. Other residences are scattered around the area, generally in association with farmsteads. Camp Ross Trails, owned by the Great Rivers Girl Scout Council, is located within one mile to the northeast of the FEMP. A total of more than 400 acres of the open acreage on the FEMP is currently being leased for grazing purposes to three local dairymen. Pine plantations are located to the northeast and southwest of the former Production Area.

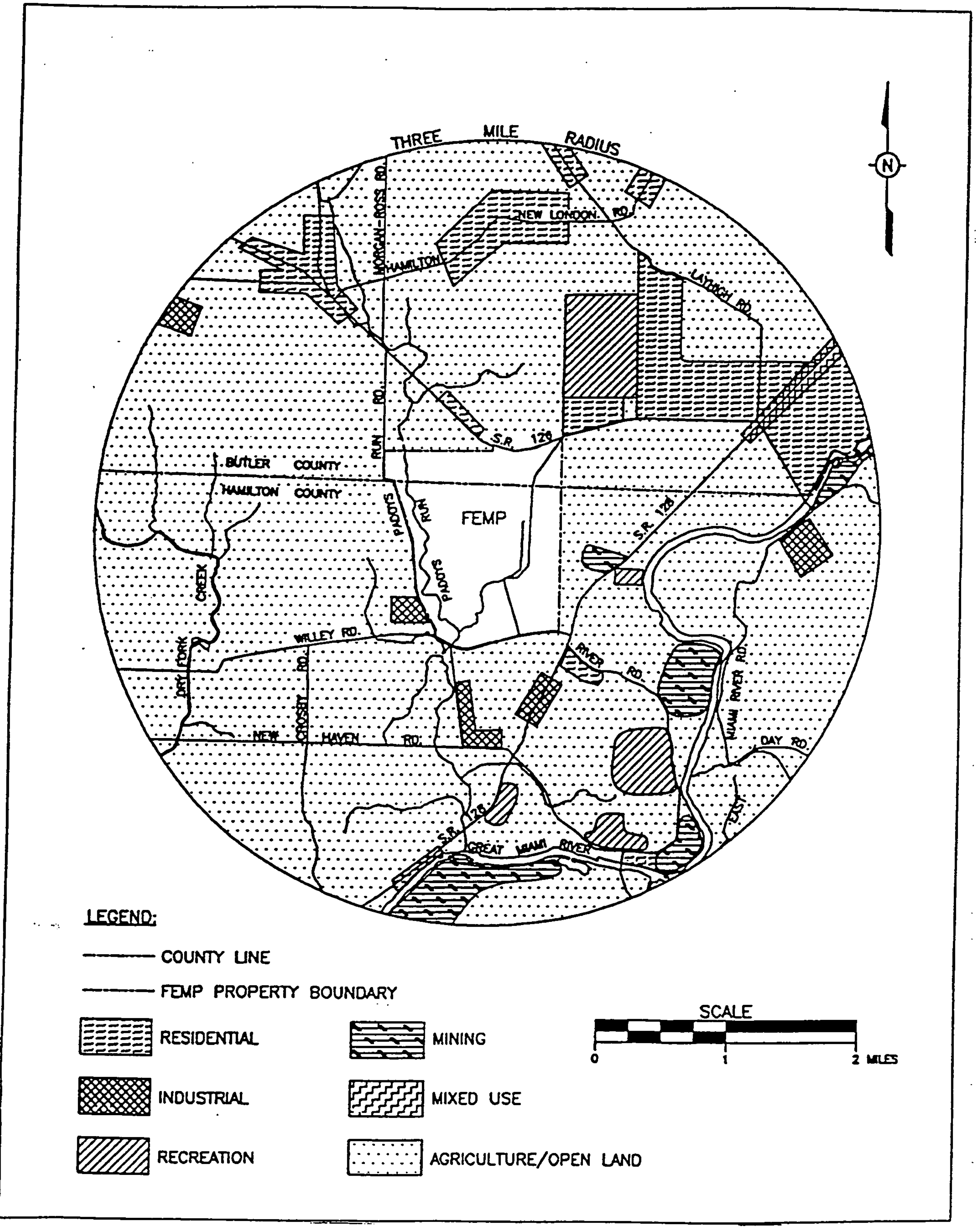

FIGURE 2-8 Land Use Adjacent to the FEMP

All Removal Action No. 27 structures lie within the former Production Area near the center of the FEMP. This area is a typical industrial complex with transite, cinderblock, concrete, corrugated steel and other type structures used in production processing at the FEMP. Asphalt and gravel roadways provide access among the structures. The areas between and around the structures are overlain with gravel, concrete, and asphalt.

2.1.12 Socioeconomic and Regional Setting

The FEMP is located approximately 18 miles northwest of Cincinnati, the focal point of a regional market encompassing the following eight counties in Ohio, Kentucky, and Indiana: Hamilton, Butler, Clermont, and Warren counties in Ohio; Boone, Campbell, and Kenton counties in Kentucky; and Dearborn County, Indiana. These eight counties also define the Cincinnati Consolidated Metropolitan Statistical Area (Figure 2-9). Population within the eight-county metropolitan area was over 1.7 million in 1990. Labor force in the multi-county area was over 920,000 with unemployment at approximately 5.5 percent in December of 1991.

2.1.12.1 Demography

The residential population within a 5-mile radius of the FEMP totals 22,927 persons (Ohio Data Users Center 1991) (Figure 2-10). The heaviest concentrations of population lie in a corridor extending from the east-northeast to the southeast of the FEMP. This corridor includes portions of the villages of Ross and New Baltimore and some low-density residential areas in Colerain Township. The estimated daytime residential/employment population within the five-mile radius of the center of the FEMP was 17,921 in 1990, increasing to 21,237 when enrollment of the schools in the area was included.

The projected population distribution within a five-mile radius of the FEMP for the year 2010 is shown in Table 2-1. Total estimated population for the study area in 2010 is 27,500 residents. The corridor extending from the south-southwest through the west of the FEMP is anticipated to experience strong growth between 1990 and 2010, with certain individual segments demonstrating significant growth trends. The corridor between east-southeast and southeast has been projected to decline during the same period and the area to the east-northeast of the FEMP is expected to exhibit very slow growth. The remaining

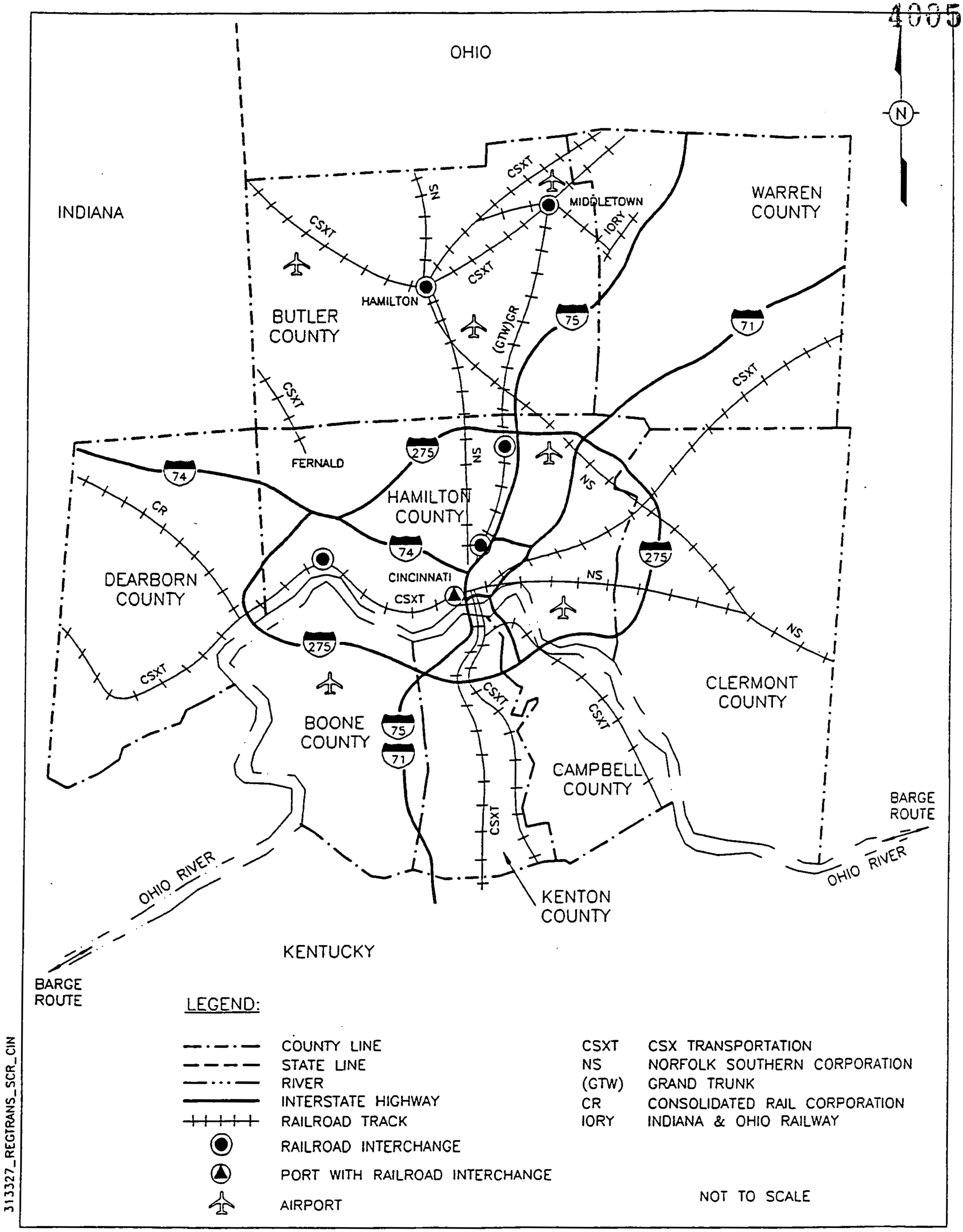

FIGURE 2-9 Cincinnati Consolidated Metropolitan Statistical Area and Regional Transportation Resources

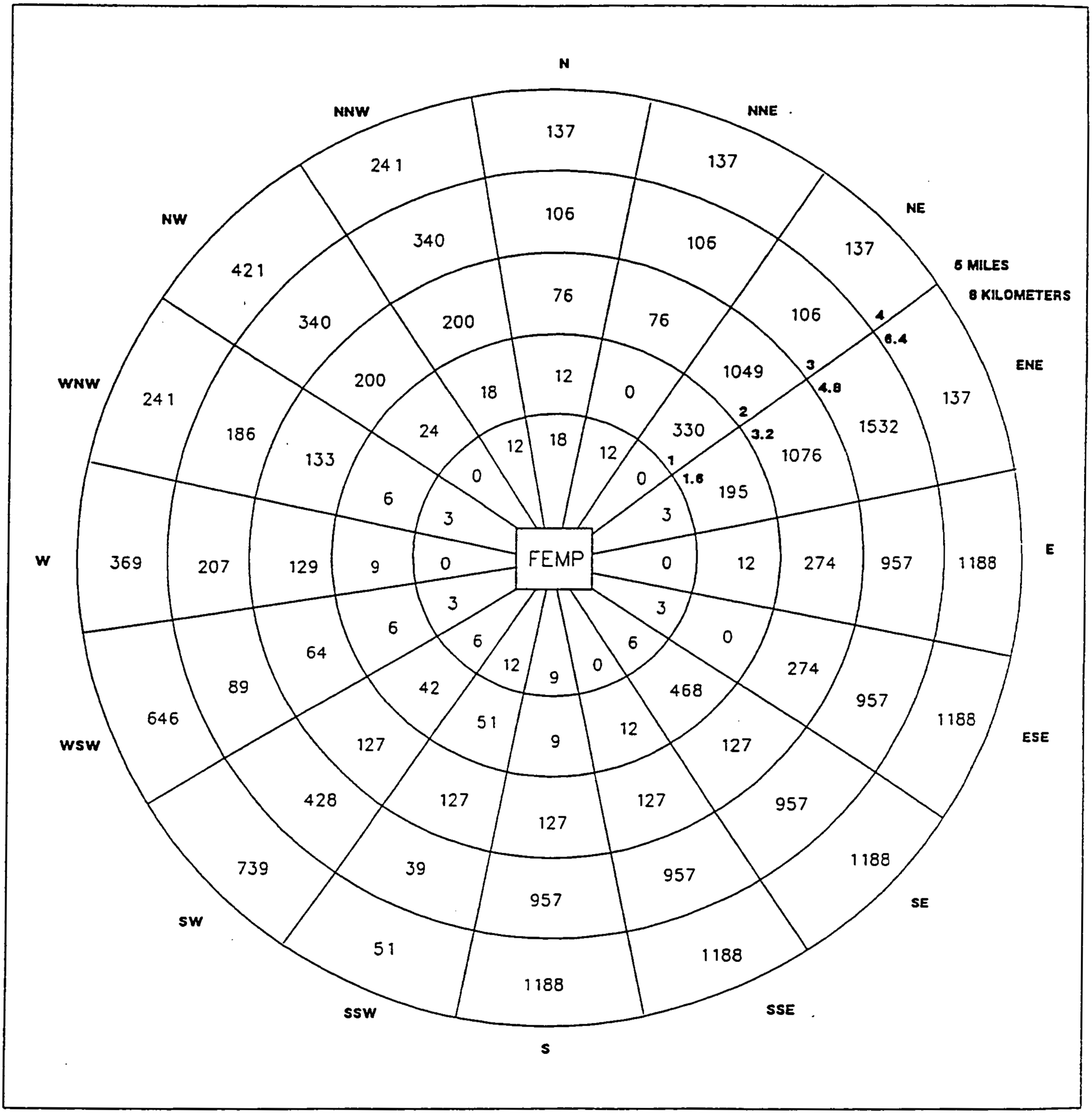

FIGURE 2-10 Residential Population Distribution Within a Five-Mile Radius of the FEMP, by Distance and Direction, 1990

TABLE 2-1

PROJECTED RESIDENTIAL POPULATION DISTRIBUTION WITHIN A FIVE-MILE RADIUS OF THE FEMP, BY DISTANCE AND DIRECTION, 2010

Direction	Distance					
	0 - 1 Mile	1 - 2 Miles	2 - 3 Miles	3 - 4 Miles	4 - 5 Miles	Total
North	19	14	89	124	160	406
North-northeast	13	0	89	124	181	407
Northeast	0	385	1,224	129	171	1,909
East-northeast	3	213	1,084	1,640	140	3,808
East	0	12	323	1,227	1,581	3,143
East-southeast	2	0	323	1,208	1,524	3,057
Southeast	5	416	126	1,208	1,499	3,254
South-southeast	0	12	139	1,126	1,386	2,663
South	8	11	160	1,145	1,360	2,684
South-southeast	15	90	151	52	58	366
Southwest	9	79	197	572	1,078	1,935
West-southwest	4	11	89	123	902	1,129
West	0	14	166	263	443	886
West-northwest	3	7	145	202	262	619
Northwest	0	26	218	370	458	1,072
North-northwest	13	21	221	373	262	890
Total	94	1,311	4,744	9,886	11,465	27,500
Cumulative total	94	1,405	6,149	16,035	27,500	

SOURCES: "Ohio Population by Governmental Unit, 1980-1990," Ohio Data Users Center, Ohio Department of Development, February 1991.

"Transportation Analysis Zone Projections for the Year 2010," Ohio-Kentucky-Indiana Regional Council of Governments, 1988.

sectors have moderate population growth forecasted. The areas with significant growth potential have more than offset those other areas with slower or even negative growth projections to result in a positive anticipated growth rate.

2.1.12.2 Local and Regional Economy

Hamilton County is the economic nucleus of the eight-county Cincinnati metropolitan area. The majority of business and industry, population, labor force, and transportation resources are located within this county. Butler County is usually second only to Hamilton County in the availability of these resources. The greatest concentrations of employment for the area counties in 1989 were in private industry and most specifically in the services. Farm employment accounted for a larger percentage of the total in Butler County (2.3 percent) than in Hamilton County (0.2 percent) and the eight-county CMSA (1.5 percent), but was still lower than both Ohio (3.5 percent) and national averages (4 percent). Between 1984 and 1989, total employment in Hamilton County increased by 15 percent. During that same time period, Butler County's employment expanded by 12.9 percent, the eight-county CMSA by 18.7 percent, Ohio by 12.9 percent, and the nation's employees increased by 13.9 percent. Employment growth in Hamilton County and the metropolitan area was faster than in the state or the nation. The industries with the greatest increases during this time were in the private sector and included agricultural services, construction, and the service sector.

FEMP-related activity is responsible for a large portion of employment in the six-township area with over 1300 working on the complex in 1991. Within a two-mile radius of the center of the FEMP, employment is heaviest in service industries including engineering and consulting services, restaurants, recreation, glazing, equipment leasing, automotive repairs, and personal services. Seven manufacturers are located in the area with products including fabricated steel products, prefabricated homes, pallets, wooden boxes, countertops, small engines, chemicals, and concrete. Agricultural employment includes dairy, landscaping services, crop farming, and seasonal produce market activities.

2.1.12.3 Transportation

The Greater Cincinnati - Northern Kentucky International Airport, located approximately 12 miles south of downtown Cincinnati in northern Kentucky, is the largest airport in the region. It served 8.6 million passengers in 1989 and transferred over 60.7 million pounds of cargo. Four other, smaller airports in the two-county area all provide general aviation services. Rail and river transport are also available in the two-county area. A state-of-the-art switching facility for transshipment between rail and highway transportation is located in Cincinnati. Rail and highway cargo can be transshipped to barges at the Port of Cincinnati. Two rail lines operated by Conrail and one operated by CSX Transportation run through the area of the FEMP. One spur extends onto the FEMP and is linked to CSX (DOE 1992c).

As indicated in Figure 2-9, three interstate highways (I-71, I-74, and I-75) provide interregional access to locations within the Cincinnati area and two interstate connectors (I-275 and I-471) provide intraregional highway access. The primary roads providing access to the FEMP include S.R. 128, S.R. 126, New Haven Road, Willey Road, and Paddys Run Road. There are currently no weight restrictions for road traffic, but some area bridges have posted load limits. S.R. 128 (Hamilton-Cleves Road) is a heavily traveled north-south route, reportedly in good condition, that generally follows the course of the Great Miami River. Truck traffic averages 800 to 1000 daily from the City of Hamilton to the Ohio River and additional traffic would have to exceed 300 to 400 more trucks per day before an impact would be felt on the roadways (Lawall 1990). Willey Road between S.R. 128 and the entrance to the FEMP is also in good condition, having been recently resurfaced. There are no weight restrictions on the road as long as vehicular safe load limits are followed.

On Willey Road west of the FEMP entrance is a rainbow arch bridge that could pose a restriction to traffic. This bridge is currently rated a 6 on a scale of 0 to 9, where 0-1 indicates a bridge closed due to poor condition, and a 9 designates a new bridge. Should there be an indication of potential increased traffic on this section of Willey Road, an in-depth examination of the bridge will be necessary. If the bridge is found to be in structurally poor condition, a load limit could be placed on the bridge and a legal limit imposed on traffic from the FEMP with checks conducted on delivery weights. An additional factor to be considered is that this rainbow arch bridge has been determined to be eligible for the National Register of Historic Places (NRHP).

2.1.13 Cultural Resources

2.1.13.1 Historical and Archaeological Resources

The area surrounding the FEMP has a large and diverse historical and archaeological resource base. According to records kept by the Miami Purchase Association for Historic Preservation, an unusually high percentage of the existing 19th century buildings in the area are historically important. Within the vicinity of the FEMP (a two-mile radius from the boundary) there are three properties listed in the National Register of Historic Places (NRHP) and a number of additional structures that have been judged eligible for inclusion in the listing. Six major archaeological sites lie within five miles of the FEMP and five of these are included in the NRHP. More information about the historic buildings and archaeological sites in the vicinity of the FEMP is available in the SWCR (DOE 1992c).

The Ohio State Historic Preservation Officer (SHPO) has stated that remedial activity within the boundaries of the FEMP will not adversely affect any properties listed on or eligible for the NRHP (Luce 1987). The area of concern involved in Removal Action No. 27 is a highly disturbed industrial area. It is highly unlikely there are any undisturbed archaeologic or historic sites within this area.

2.1.13.2 Aesthetics

Land surrounding the FEMP is primarily devoted to open land use such as agriculture and recreation creating a rural visual setting. Views in the area are predominately of maintained open fields. Concentrations of residential units are situated immediately north of the FEMP and in a trailer park directly to the east. Other residences are scattered around the area, generally associated with farmsteads, adding to the rural setting. The FEMP, itself, is the most visually intrusive land use in the area.

2.2 Production History and Processes

2.2.1 Overview

The United States Atomic Energy Commission (AEC) established the Feed Materials Production Center (FMPC) at Fernald in the early 1950s in order to produce high grade uranium metal from natural uranium ore concentrates. These uranium metal products were subsequently used in nuclear weapons production conducted at other DOE facilities. High grade uranium and other special products were produced at the Fernald site for 37 years until production operations were discontinued in 1989.

A variety of chemical and metallurgical processes were used at the FEMP to manufacture uranium products. The principal products produced by the FEMP included a variety of highly purified uranium metal forms of various sizes in assorted isotopic assays. Both uranium ore concentrates and recycle materials were converted into high purity uranium metal having several standard isotopic assays. The isotopic values ranged up to 1.4 percent uranium-235 by weight of the total uranium content of the product. However, most of the metal produced was depleted uranium. From 1953 through 1955, the FEMP refinery processed pitchblende ore from the Belgian Congo. Pitchblende ore contains daughter products of the uranium decay chains and is particularly high in radium content. No chemical separation or purification was performed on this ore prior to its arrival at the FEMP. Beginning in 1956, the refinery feedstock consisted of uranium concentrates (yellowcake) from Canada and the United States. In the production of yellowcake, most of the uranium daughters had been removed; however, radium-226 remained in amounts that varied with the process used. Canadian concentrates were not processed after 1960.

Over the course of the Fernald site's 37-year production history, the isotopic level of the bulk of the uranium production shifted from normal (naturally occurring level of 0.711% U-235) at the outset of operations, to slightly enriched (0.86, 0.95, 1.25, and 2.10% U-235) during the 1960s and 1970, and to primarily depleted products (0.14 and 0.20% U-235) during the 1980s. Throughout its production history, the FEMP produced a relatively consistent product line consisting of uranium and thorium compounds or metal.

2.2.2 Principal Production Plants and Processes

The principal production processes at the FEMP site included:

1. Recovery of uranium oxides from ores and recycled materials through acid digestion.
2. Conversion of uranium oxides or uranium hexafluoride to uranium tetrafluoride.
3. Production of uranium metal products from a uranium tetrafluoride intermediate.

4. Preparation and refining of various uranium products through metal fabrication and machining and heat treating processes.

The principal production process at the FEMP are shown on Figure 2-11 and are summarized in Table 2-2. Also shown on Table 2-2 are the Production Plants associated with the principal production processes.

During the manufacturing process, high quality uranium compounds were introduced into the FEMP processes at several points. Impure starting materials were dissolved in nitric acid and the uranium was purified through solvent extraction to yield a solution of uranyl nitrate. Evaporation and heating converted the nitrate solution to uranium trioxide (UO_3) powder. This compound was reduced with hydrogen to uranium dioxide (UO_2) and then converted to uranium tetrafluoride (UF_4) by reaction with anhydrous hydrogen fluoride. Uranium metal was produced by reacting UF_4 and magnesium metal in a refractory-lined reduction vessel to produce uranium derby metal via a thermite reaction. The special products plant remelted this derby metal with available scrap and cast the purified uranium metal into large diameter ingots known as billets.

Various uranium metal fabrication processes were also housed at the FEMP. The metal fabrication plant drilled these ingots to form rods which were sent for further processing to DOE facilities located at Reactive Metals, Incorporated (RMI), Ashtabula, Ohio, for extrusion into bars. Some of the extrusions were returned to the FEMP for heat treating and fabrication into target element cores for DOE reactors.

Production ceased in the summer of 1989 and plant resources were focused on a clean-up program. In June 1991, the FEMP was officially closed as a federal production facility.

2.3 Description of Contaminated Structures

This EECA addresses the 25 contaminated structures listed in Table 1. These structures are highlighted in Figure 1-1 to show their relative locations. These 25 structures were selected in recognition of current and planned facility usage and none of them are anticipated to be used in the future to support the FEMP remediation process.

FEMP PROCESS FLOW CHART

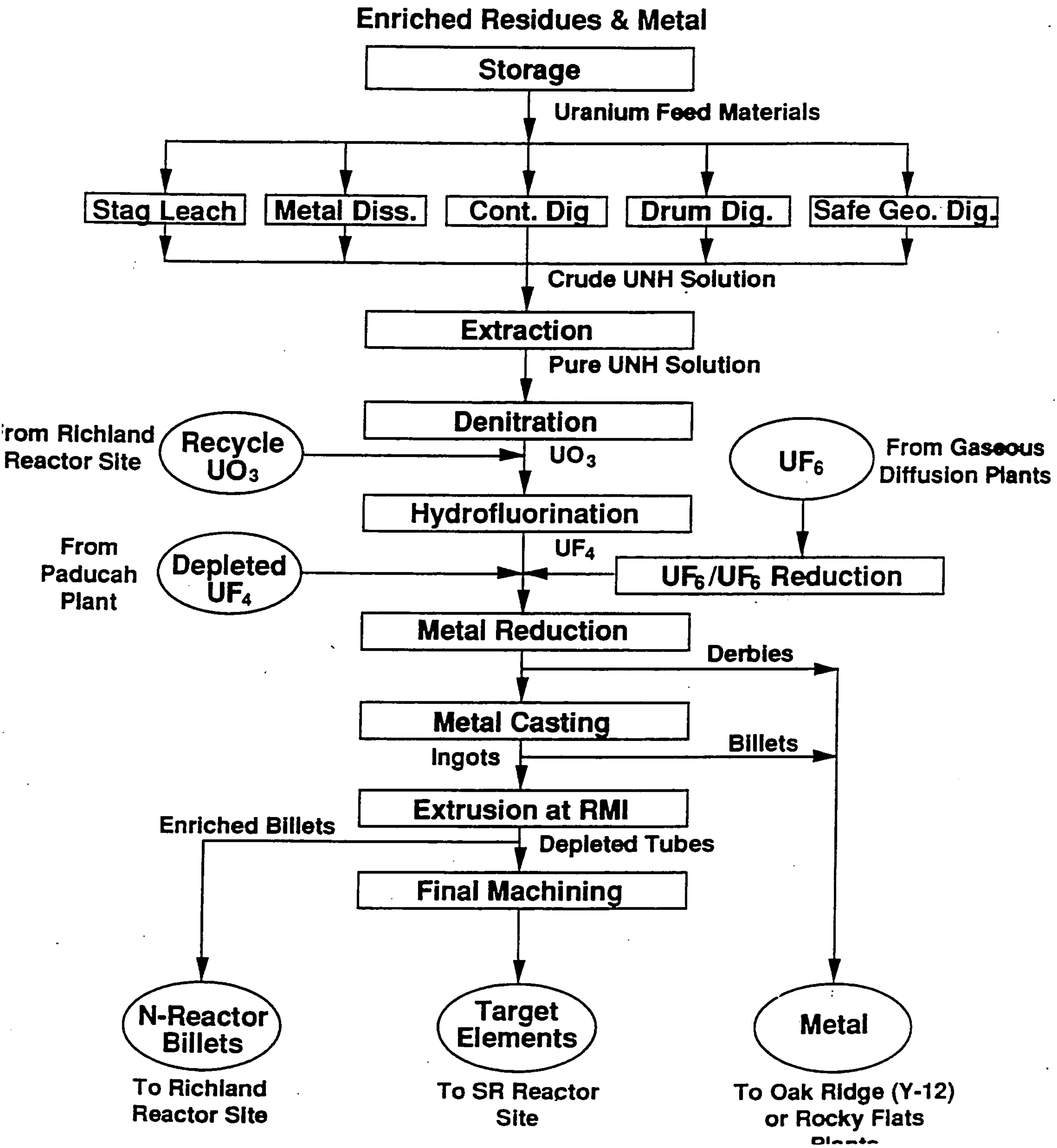

FIGURE 2-11 FEMP Process Flow Chart

TABLE 2-2

PRINCIPAL PRODUCTION PROCESSES AT THE FEMP SITE

PRODUCTION PROCESS		ASSOCIATED STRUCTURE
1)	Incoming materials are sampled and analyzed for uranium content.	Plant 1 - Sampling Plant
2)	Uranium is recovered from recycled materials and converted to high-purity UO_3.	Plant 2/3 - The Refinery
3)	The UO_3 is treated to form uranium dioxide (UO_2), or brown oxide. The UO_2 is converted to UF_4.	Plant 4 - Hydrofluorination (The Green Salt Plant)
4)	As an alternative method of producing UF_4 (green salt), incoming UF_6 from other DOE facilities is reduced to UF_4	Pilot Plant - The UF_6 to UF_4 Reduction Plant
5)	The UF_4 is converted to uranium metal derbies. Some derbies are melted to form ingots.	Plant 5 - The Metals Production Plant
6)	Special oversized ingots are cast from derbies and recycled metal. Ingots are machined into billets.	Plant 9 - The Special Products Plant
7)	Billets are heat treated for offsite extrusion. Final machining, inspection, and shipping of finished products are carried out.	Plant 6 - The Metals Fabrication Plant
8)	Metal scraps remaining from production are recycled by roasting and filtering.	Plant 8 - The Scrap Recovery Plant
9)	Samples of materials are tested and analyzed throughout the production process to ensure that final products are of the highest quality.	Analytical Laboratories

Table 2-3 describes and provides general FEMP production background for each of the 25 contaminated structures addressed by this EE/CA. Included in this table is a brief description of the physical attributes of each structure, past processes and/or uses along with associated major equipment. Additionally, where applicable, the present usage and contents have been included.

Also, area or equipment declared a Hazardous Waste Management Unit (HWMU) consistent with State of Ohio Hazardous Waste Regulations have been highlighted, with italic type on Table 2-3.

2.4 Nature and Extent of Contamination

As indicated in Sections 2.2 and 2.3, the processes and operations at the FEMP required the use of a variety of source feed materials, a variety of radiochemical and chemical reactants and catalysts as well as chemicals for ancillary operations. The production operations also generated a wide variety of waste materials containing both radiological and chemical constituents. Over the course of operations at the FEMP, materials handling procedures resulted in the spread of both chemical and radiological contaminants throughout OU3 including the 25 contaminated structures addressed by this document. The results of ongoing investigations also indicate that both chemical and radiological contaminants are present in soil, water, and air media at the site. Since the contaminated structures addressed in this EE/CA are similarly contaminated, they may serve as current and future sources of contamination for environmental media.

In this section and Appendix A, an overview of existing information on chemical and radiological contamination associated with the contaminated structures is presented. This summary is based upon data presented in the OU3 RI/FS Work Plan Addendum (DOE, 1992) wherein additional information is available. It should be noted that existing information on contamination used in this section represents potential conditions prior to Safe Shutdown activities being implemented. The levels of contamination will be reduced by Safe Shutdown activities which are scheduled for completion prior to initiation of the Removal Action addressed by this document.

2.4.1 Chemical Contamination

Very limited information is available on the extent of chemical contamination for the individual contaminated structures. This is primarily due to emphasis on radiological monitoring throughout the

TABLE 2-3 Description of Structures and Processes

Structure/Facility	Description	Processes/Uses	Equipment/Contents[a]
Harshaw digestion fume recovery (3F)	A 19- x 40- x 35-ft multilevel open steel structure, 35 ft high.	**Harshaw Fume Recovery** - The Harshaw system was installed to relieve the fume load of the NAR in facility 3D. Nitrogen oxide fumes from the metal dissolver and digestion were collected to produce nitric acid. This process was not successful.	-Absorber towers, tanks.
Refrigeration building (3G)	Building type A, 16- x 44- x 14-ft single-level building, 14 ft high.	**Refrigeration** - Provided cooling for the Harshaw NO_x fume scrubber system in facility 3F.	-Original equipment removed. Currently used as file storage and for small instrument repairs. To be used for storage of returned chain-of-custody samples.
Green salt plant (4A)	Building type A, 146- x 194- x 71-ft multilevel building with 5 floors , 71 ft high	**Ammonia Dissociation** - Catalytically cracked anhydrous ammonia to H_2 and N_2 (dissociated ammonia - DA) for use in the hydrofluorination process.	-Catalytic ammonia dissociator reactors.
		Hyrdofluorination - UO_3, produced primarily at the FMPC or the DOE Hanford works (UO_3 first converted to U_3O_8), was reduced with DA in heated fluid bed reactors and passed countercurrent to anhydrous hydrofluoric acid (AHF) in 3-stage heated horizontal continuous-flow reactor banks to produce UF_4 product.	-Fluid-bed reactors, horizontal ribbon-screw reactors, dust collection equipment, blending equipment, excess H_2 burner.
		AHF Vaporization - AHF provided from the main tank farm is vaporized for use in the hydrofluorination process.	-Vaporizers, superheaters.
		Hydrofluoric Acid Recovery - Excess AHF from the hydrofluorination process is filtered and scrubbed for recovery. Aqueous HF is transferred to the main tank farm.	-Filters, condensors, scrubbers.
		UF_4 Repackaging - UF_4 received from the DOE Paducah facility and FMPC operations are blended and repackaged for quality control.	-Material handling equipment, blending equipment, dust collector.
		Moving Bed Experimental Reactor - (1955-1958) Vertical packed-bed reactor for hydrofluorination.	-Reactor in place minus related equipment.
		Nitrogen Generation - Produced and stored nitrogen gas for purging operations in Plant 4.	-Original nitrogen generator system replaced with new.
		HF Refrigeration - Used to reclaim HF fumes as anhydrous from Plant 4 and Plant 7 operations.	-Equipment removed.
		Thorium Tetrafluoride - (1954) Thorium oxide from Plant 9 was hydrofluorinated in bank 7 and returned to Plant 9.	-Existing reactor bank 7 equipment.

TABLE 2-3 Description of Structures and Processes

Structure/Facility	Description	Processes/Uses	Equipment/Contents[a]
		Water Treatment - Originally, one of two steel tanks received floor sump liquids, was lime neutralized, and filtered to the second tank, which pumped to the general sump. Filter cake was drummed and sent for sampling. In more recent years, no processing was done. Collected liquids were transferred to the general sump or Plant 8 directly.	-Steel tank (one removed), plate & frame filter.
		Storage - Drummed materials and hoppers (UF_4, OU_3, *HF residues*,[b] etc.) have been stored at various times in many areas of the plant.	-Currently storing drums.
Plant 4 maintenance building (4C)	Building type A, 60- x 60- x 14-ft single-level building, 14 ft high.	**Maintenance** - Maintain equipment from the chemical areas, primarily Plant 4.	-Tools, equipment, spare parts, offices. Currently in use.
Plant 7 (7A)	Building type A, 82- x 112- x 102-ft multilevel building, 102 ft high with 7 floors.	**UF_5 to UF_4 Reduction** - (1954-1956) Heated cylinders of UF_6 to vapor under the west shed, then contacted with hydrogen gas in a tubular reactor to reduce UF_6 to UF_4 and by-product HF. Drummed out product and collected HF for transfer to Plant 4's refrigeration system.	-UF_6 to UF_4 reactor and all support equipment removed in early 1950s.
		N_2 Generator - Similar to Plant 4 nitrogen generator. Provided nitrogen for plant users.	-N_2 generator (removed).
		Storage - Store miscellaneous materials.	-Miscellaneous stored materials.
Oil burner/graphite burner pad (10D)	A concrete pad approximately 55 x 85 ft.	**Graphite Burner** - Small, open, gas-fired furnace used for oxidizing scrap graphite crucibles/molds for uranium recovery.	-Graphite burner.
		Oil Burner - A small refractory brick enclosure housed removable steel pots. Contaminated oil/solvent was continuously fed into the burning pot. Combustion was aided by an air jet into the top of the pot. The oil was pumped from drums into an oil-water separator tank, then into the steam-heated tank (where the oil was preheated) before going to the burner pot. Combustion was self-sustained. Ash was drummed for uranium recovery.	-Oil burner enclosure, tank (other equipment removed).
		Sump - Decanted surface water was pumped from the sub-grade pit into portable tanks and sent to Plant 8.	-Steam eductor (removed).
Pilot plant maintenance building (13B)	Building type, 30- x 60-ft single-level building, 12 ft high.	**Maintenance** - Maintain equipment in the pilot plant. Required moving equipment into the building for repairs.	-Tools, equipment, spare parts. Currently in use.

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TABLE 2-3 Description of Structures and Processes

Structure/Facility	Description	Processes/Uses	Equipment/Contents[a]
Sump pump house (13C)	Building type B, 12- x 16-ft single-level building, 8 ft high.	**Sump Pump House** - Area includes 2 large sump hold tanks (2 subgrade concrete pits) which received filtered sump effluent, which was sampled and pumped to the general sump. 2 smaller tanks were hold tanks for extraction solvent. An *abandoned sump*[b] hole may also have been used.	-Tanks Not currently in use.
Pilot plant thorium tank farm (13D)	A 50- x 75-ft open concrete diked area west of building 13A.	**Thorium Tank Farm** - Used for storage of thorium nitrate tetrahydrate (TNT), HNO_3, NaOH, *spent solvents (T-5 and T-6 tanks)*,[b] and water. Also contained a dust collector, packed tower fume scrubber, and an extraction product (TNT) receiving tank.	-Tanks, dust collector, fume scrubber (~6,000 gal of TNT remain in T-2).
Low nitrate tank (18K)	A 180- x 180-ft polymer-lined temporary steel-sided reservoir of 1,000,000-gal capacity.	**Low Nitrate Tank** - A temporary tank used during the reconstruction of the biodenitirification surge lagoon th hold low nitrate waste waters. Control of nitrate levels to the biodenitrification process was accomplished by blending of the high and the low nitrate tank flows.	-1 lined steel-sided basin.
High nitrate tank (18L)	A 180- x 180-ft polymer-lined temporary steel-sided reservoir of 1,000,000-gal capacity.	**High Nitrate Tank** - A temporary tank used during the reconstruction of the biodenitirification surge lagoon th hold high nitrate waste waters.	-1 lined steel-sided basin.
Magnesium storage building (32A)	Building type B, 52- x 103- x 17-ft. to 30 ft. multi-level building, 30 ft. high.	**Magnesium Storage** - Stored drummed or bagged magnesium metal turnings for use in the Plant 5 reduction process.	-Currently in use. Used for interim storage of excess equipment.
Magnesium storage covered loading dock (32B)	Covered concrete railroad dock, approximately 18 x 60 ft.	**Dock** - The dock is covered and has a ramp for vehicle access.	-Miscellaneous. Currently in use.

TABLE 2-3 Description of Structures and Processes

Structure/Facility	Description	Processes/Uses	Equipment/Contents[a]
Incinerator building (39A)	Building type A, approximately 40- x 60-ft multilevel building, 37 ft high with 2 floors.	**Trash Baler Operation** - Trash, primarily paper and cardboard, are baled to provide the greatest density for shipment to offsite disposal.	-Trash baler.
		Solid Waste Incinerator - (1980-1987) A cylindrical fire brick-lined, gas-fired furnace used to incinerate burnable trash from the site. Ash was drummed for uranium recovery processing.	-Incinerator, feed conveyor.
		Liquid Waste Incinerator[b] - (1983-1987) A waste solvent and oil incinerator used for burnable liquids from the site. Residues were treated for uranium recovery.	-Incinerator.
		Drum Dryer - Used to dry refinery raffinate cake for discard. Raffinate slurry was filtered on a rotary drum filter, dropped to a gas-fired rotary furnace, dried, and packaged. The furnace was later used to dry sump cakes from Plant 8 for refinery feed.	-Rotary filter, drum dryer, dust collection equipment (all removed).
Sewage treatment plant incinerator (39D)	Outdoor waste incinerator equipment situated on a 16- x 20-ft concrete pad.	**Waste Incineration** - (1954-1979) An outdoor incinerator structure used for a variety of site wastes. Replaced by the building 39A incinerator.	-Incinerator and stack.
Old plant 5 warehouse (65)	Building type C, 50- x 210- x 22-ft single-level building, 22 ft high.	**Storage** - Stores drummed thorium compounds.	-Currently storing drums.
Plant 1 thorium warehouse (67)[b]	Building type C, 40- x 100- x 22-ft single-level building, 22 ft high.	**Storage** - Stores drummed thorium compounds.	-Currently storing drums.
Pilot plant warehouse (68)[b]	Building type A, 50- x 100- x 14-ft single-level building, 14 ft high, with significant concrete content.	**Storage** - Stored a Co-60 source, thorium compounds, pilot plant equipment, and RCRA waste drums.	-Currently storing drums.
Decontamination building (69)	Building type B, 43- x 83- x 18-ft single-level building, 18 ft high.	**Decontamination** - Various processes are utilized for radiologically decontaminating equipment, tools, vehicles, and scrap: Acid soak vats, caustic soak vat, high pressure water, and steam spray.	-Tanks, vats, spray units. Portion currently in use.
Drum storage building (72)	Building type A, 31- x 41- x 15-ft single-level building, 11 ft high.	**Storage** - Stored industrial cleaning equipment and control panels for ore silo operation. Now used for enriched drum storage, enriched and normal fuel rods.	-Currently storing drums and fuel rods.

TABLE 2-3 Description of Structures and Processes

Structure/Facility	Description	Processes/Uses	Equipment/Contents[a]
Fire brigade training center building (73A)	Building type B, 18- x 35- x 19-ft multilevel building, 19 ft high.	**Fire Brigade Training** - Used for "hot" and smoke drills for training site fire brigade members. Straw, wood, tires, etc. were used. A tanker truck and an office-type trailer are abandoned nearby.	-Building (empty and condemned), tanker truck, trailer.
Fire training pond (73B)[b]	A 45-ft diameter pond and drain pit.	**Fire Brigade Training** - Used for training brigade members in fighting combustible liquid fires. A small horizontal elevated tank in the center of the pond was used to simulate a combustible liquid tank (never filled). Excess water was drained from the area to the drain pit so that combustible liquids would not overflow the pond.	-Contaminated water, empty tank.
Fire training tank (73C)[b]	A small horizontal tank above the fire training pond, 5 ft. diameter.	See pond 73B.	-See pond 73B.
Fire training burn trough (73D)[b]	A steel trough, 6 x 30 ft.	**Fire Brigade Training** - A steel trough, partly subgrade, for volatile liquid fire training. Used oil was ignited for extinguisher training.	-Burn trough, water.
Confined space burn tank (73E)	An 9-ft diameter horizontal steel storage tank.	**Fire Brigade Training** - A steel storage tank from the old tank farm, with one end cut off, converted for use in simulated rescue training.	-Tank from tank farm (end removed).

[a] Associated minor and support equipment and utilities are not detailed in this compilation.

[b] Unit declared a RCRA Hazardous Waste Management Unit (HWMU).

FEMP. As a result most available chemical data is qualitative in nature. In general, the extent of contamination of individual structures addressed by the EE/CA must be indirectly inferred from available information on production processes and operations associated with each structure as well as the overall FEMP. Additional data will be gathered as part of ongoing RI activities.

The information presented in Appendix A summarizes the available information on potential chemical contaminants associated with the 25 contaminated structures. The information presented in Appendix A is qualitative in nature and based upon information developed in the OU3 RI/FS Work Plan Addendum (DOE, 1992a). It should be emphasized that the information presented in Appendix A represents potential contamination which may be present in the contaminated structures.

In addition to the broad spectrum information on potential OU3 chemical contaminants (Appendix A), Table 2-4 summarizes information on potential chemical contaminants associated with the principal production plants previously discussed in Section 2.3. Included in Table 2-4 are summaries of some of the more important production feed materials, intermediate and final products , and waste and by-product streams known to have been associated with the production processes at the FEMP.

The information summarized in Table 2-4 demonstrates the wide variety of both radioactive and non-radioactive chemicals which were associated with the principal production processes at the FEMP. An evaluation of the chemicals presented in Table 2-4 indicates that the contaminants potentially present, vary widely in terms of their environmental properties, specifically their toxicities, reactivities, and mobilities.

Limitations in the availability of quantitative information pertaining to the concentrations of these chemicals which may be present in the 25 contaminated structures, makes prioritizing their respective environmental hazards difficult. However, it should be recognized that toxicities, reactivities, and mobilities of many of these constituents are such that they possess the potential to contribute significantly to health and environmental risks.

An examination of the information presented in Table 2-5 and in Appendix A reveals the reoccurring presence of several classes of chemical or contaminant groups *of potential environmental concern in structures addressed by the EE/CA. Principal chemical contaminant groups of concern are summarized

TABLE 2-4
FACILITY PRODUCTION INFORMATION

Facility	Production Feed Materials	Final and Intermediate Products	Waste/By-Product Streams
Plants 1, 2, & 3	Uranium feed, HNO_3, TBP, kerosene, Na_2CO_3, NaF, water, MgF_2	Uranyl nitrate, UO_3, and MgF_2	TBP, kerosene, aqueous raffinate, NO_x fumes, and filter cakes
Plant 4	UO_3, NH_3 (gas), HF (anhydrous), H_2, KOH, and water	UO_2, UF_4, H_2, and N_2 (gas)	N_2, HF (aqueous), and KF
Plant 5	UF_4, Mg, MgF_2, graphite, and UO_3	Uranium derby, uranium ingot, and MgF_2	Uranium slag and graphite
Plant 6	Ingots, NaCl, KCl, K_2CO_3, Li_2CO_3, water, oil, HNO_3, and caustics	Uranium billets, uranium cores/tubes, briquettes	Bath waters, bath oil, uranium turnings, contaminated HNO_3, and contaminated heat treating salts
Plant 7	UF_6 and NH_3	H_2, N_2, UF_4, and HF (anhydrous)	HF (aqueous)
Plant 8	Slag/sump cakes, floor sweepings, dust collector materials, furnace salts, HCl, NH_3, water, lime, uranium residues, ThF_4, and graphite, H_3PO_4	Ammonium diuranate, uranyl ammonium phosphate, uranium oxides, and dried filtrates	Waste tailings and aqueous raffinate from ADU precipitator, and nonrecoverable residues
Plant 9	Dolomite, MgF_2, UF_4, Mg, derbies, $HNO_3K_2CO_3$, Li_2CO_3, HF, caustic, reject cores, graphite, thorium nitrate, calcium, and zinc chloride	Ingots, derbies, ThF_4, thorium metal, and briquettes	Heat bath oil, uranium turnings, contaminated HNO_3, contaminated heat treating salts, spent acids, zinc, MgF_2, and graphite

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TABLE 2-4
FACILITY PRODUCTION INFORMATION

Facility	Production Feed Materials	Final and Intermediate Products	Waste/By-Product Streams
Pilot Plant	Diamyl amyl phosphonate (DAAP), UF_6, NH_3, ingots, derbies, TBP, kerosene, uranyl nitrate, calcium, zinc chloride, oxalic acid, HNO_3, thorium compounds, caustic, $BaCl_2$, H_2SO_4, graphite, and di-sec-butyl phenyl phosphonate (DSBPP)	UF_4, thorium compounds, ingots, derbies, thorium derbies, uranyl nitrate, $BaSO_4$, HF (anhydrous), and graphite	HF (aqueous), TBP, kerosene, aqueous raffinate, NO_x fumes, filter cakes, DAAP, DSBPP, MgF_2, and zinc

WE-156T.2-4

in Table 2-5, and are briefly summarized as follows:

- Radiological -- A variety of radioactive chemical constituents are potentially present in many structures. Of particular concern from the EE/CA perspective are the production plants (Plant 4 and Plant 7) due to the large volumes of uranium which were processed. Also of concern are certain warehouses (Structures 67, 68, etc.) which currently house containerized radioactive wastes.

- Inorganics-Trace Metals -- A variety of non-radioactive trace metals may be present (see Table 2-5). Potential sources of trace metal contaminants included processed ores, acid digestion processes, machining processes, heat treating and pickling processes, decladding operations, laboratory operations, precipitation processes, etc. Structures where metal contamination may be present include 4A, 10D, 13B, 69, and 73B and C.

- Inorganics-Non Trace Metals -- A number of inorganic compounds were utilized both directly and indirectly in uranium production processes. Examples of production usage included acids (HNO_3) for ore digestion and decladding operations (HNO_3 and HF); ammonia for wastewater handling and fume recovery; calcium, magnesium, and lithium oxides and carbonates for water treatment, derby cleaning, etc. Structures where inorganics are suspected to potentially be present include 4A, 7A, 13C, 18K, 32A and B, 39A, 69, etc.

- Volatile Organics -- Volatile organics and particularly chlorinated organics were frequently used in production and maintenance areas primarily as cleaning solvents. Structures where chlorinated solvent contamination or solvent contaminated equipment is potentially suspected to be present include buildings 4C, 10D, 13D, 18K, 18L, 32A, 39A, 69, and 73B, C, and D.

- Semivolatile Organics -- A number of semivolatile organics particularly polycyclic aromatic hydrocarbons (PAHs) and alkanes are potential contaminants which may be associated with certain production processes and ancillary operations. Examples include solvents and organics used in building maintenance as well as kerosenes and oils utilized in certain machining and

CHEMICAL CONTAMINANT GROUPS OF ENVIRONMENTAL CONCERN

Chemical Class	Representative Constituents	Usage/ Comments	Representative Potential Sources																								
			3F	3G	4A	4C	7A	10D	13B	13C	13D	18K	18L	32A	32B	39A	39D	65	67	68	69	72	73A	73B	73C	73D	73E
Radiological	Uranium 235, 238 Thorium 228, 232 Radium 228 Radon 220 Plutonium 239, 241 Americium 241 Actinium 228 Strontium 90 Cesium 137 Cobalt 60	Uranium production processes and misc.		●	●	●	●	●		●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	
Inorganics - Metals	Arsenic Barium Beryllium Cadmium Copper Lead Mercury Nickel Zinc Zirconium	Process wastes Chemical Additives			●			●	●												●			●	●		
Inorganics - Nonmetals	Ammonia Calcium Substances Magnesium Substances Lithium Substances Nitric acid HF Hydrofluoric acid Phosphorus Substances Sodium Substances	Process wastes Chemical additives	●	●	●		●			●	●	●	●	●	●	●					●					●	●
Volatile Organics	Benzene Toluene Ethyl benzene 1,1,1-Trichloroethane Trichloroethene Trachloroethene 1,1-Dichloroethene 1,2-Dichloroethene Carbon disulfide Methylene Chloride	Primarily solvents for cleaning				●		●			●	●	●	●		●					●			●	●	●	
Semivolatile Organics	PAHs • Benzo(a)pyrene • Pyrene • Fluorene • Phenanthrene • Naphthalene, etc. Phenol, Phthalates Alkanes (Oil)	Associated with Production Process Chemicals				●		●	●		●					●	●							●	●	●	
PCBs	PCBs	Electrical Distribution System						●																●		●	

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heat treating operations. Structures where semivolatile organics are suspected to potentially be present include 4A, 10D, 13B and D, 39A and D, and 73B, C and D.

- PCBs -- May be potential contaminants primarily associated with oils used in the electrical distribution system including electrical substations. Only a few of the 25 structures encompassed by this EE/CA (10D, 73B and D) are currently suspected of containing PCB contamination.

- Miscellaneous -- A variety of miscellaneous chemicals were used in various ancillary activities and production processes. Examples include tributyl phosphate in ore purification processes, oils for lubricating and heat treating, and zirconium for plasma spraying.

As was previously discussed, quantitative information on the potential concentrations of these contaminants or their possible distributions within the confines of individual contaminated structures has not been investigated.

Asbestos

In addition to the chemical contaminants discussed above, many of the 25 contaminated structures have been identified as possessing asbestos containing material (ACM). The results of analyses of bulk samples (Diagnostic Engineering Inc., 1992) do, however, indicate wide variations in the percentages of samples displaying positive ACM analysis results. Structures identified as potentially containing ACM include Plant 4, Plant 7 and 13B (see Appendix A, Table A-4 for more details).

Biohazard

A possible source of contamination which is of biological origin occurs in Plant 7 and sections of Plant 4. In these locations there is an accumulation of pigeon guano which is suspected of supporting a histoplasmosis-inducing fungus. The total quantity of droppings or the prevalence of the infecting fungus has not yet been quantified.

2.4.2 Radiological Contamination

The radiological contamination data base at the FEMP significantly exceeds that available for chemical contamination. This is in part a result of the ongoing radiation survey program at the FEMP. As part of this program, the following types of radiological information are available:

- radiological smear and direct survey samples for many individual OU3 components;
- smear and direct survey information on some abandoned in-place equipment;
- radon and radon-220 monitoring; and
- airborne alpha and beta-emitting particles.

It should, however, be noted that all of these types of information are not available for all contaminated structures addressed by this EE/CA nor for all associated pieces of equipment. The primary radiological contaminants are listed in Table 2-6.

TABLE 2-6

PRIMARY RADIOLOGICAL CONTAMINANTS FOUND IN MONITORING EFFORTS

Element	Isotope
Uranium	233, 234, 235, 236, 238
Thorium	228, 230, 232
Radium	226, 228
Radon	220, 222
Decay Products (Radon Daughters)	
Lead	
Polonium	
Bismuth	

Based upon compiled data and information on radiological contamination, structures have been classified in terms of their respective radiological surface contamination levels. The radiological levels which have been established for purposes of qualitative comparison of site structures are based on DOE guidelines as summarized in Table 2-7. The ranges of radiological contamination associated with the various contamination levels (low, medium, high, etc.) are presented in Table 2-8.

It should be noted that in establishing radiological contamination guidelines, it has been assumed that contamination in structures is largely surficial and uranium and its daughters are the principal contaminants. These assumptions are likely to be generally valid for most structures except for those potentially dominated by thorium contamination. Examples of the latter would include the Thorium Warehouses.

TABLE 2-7

GUIDELINES FOR INDOOR/OUTDOOR STRUCTURE SURFACE CONTAMINATION

Radionuclide[b]	Allowable Surface Residual Contamination[a] (dpm/100 cm^2) Average[c,d]	Maximum[d,e]	Removable[d,f]
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129[g]	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000 α	15,000 α	1,000 α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above[h]	5,000 ß-τ	15,000 ß-τ	1,000 ß-τ

[a] As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[b] Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[c] Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[d] The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at a depth of 1 cm.

[e] The maximum contamination level applies to an area of not more than 100 cm^2.

TABLE 2-7 (Cont'd)

GUIDELINES FOR INDOOR/OUTDOOR STRUCTURE SURFACE CONTAMINATION

[f] The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that total residual surface contamination levels are within the limits for removable contamination.

[g] Guidelines for these radionuclide are not given in DOE Order 5400.5; however, these guidelines are considered applicable until guidance is provided.

[h] This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Sources: U.S. Department of Energy, DOE Order 5400.5, Radiation Protection of the Public and the Environment, Office of Environment, Safety and Health (February 1990).

TABLE 2-8

BASIS FOR RELATIVE CONTAMINATION[a]

Contamination Class	Removable Surface Contamination (dpm/100 cm^2)[b]	Total Surface Contamination (dpm/100 cm^2)[b]
Low	0 - 1,000	0 - 5,000
Medium	1,000 - 10,000	5,000 - 50,000
High	Above 10,000	Above 50,000

[a] Values apply to either alpha or beta-gamma radiation
[b] Disintegrations per minute per 100 cm^2

The results of the overall radiological evaluation for the 25 structures addressed by this EE/CA are summarized in Table 2-9. As indicated therein, several buildings warrant a "high" contamination classification level based upon available data. These include the Green Salt Plant (4A), the Sump Pump House (13C), the Incinerator Building (39A) and the Fire Training Trough (73D). For many of the 25 structures, including warehouses and storage buildings, detailed data on radiological contamination levels is currently unavailable. Radiological data have been compiled for approximately half of the 25 structures (Table 2-9). Of these structures maximum radiological levels in the Green Salt Plant (4A) are among the higher levels of removable surface contamination at the site. Maximum removable alpha and beta-gamma surface contamination levels for structure 4A exceed 30,000 and 150,000 dpm/100 cm^2 respectively. Again, it should be noted that a number of structures encompassed by this EE/CA have not as yet been classified either due to limited data or due to complications presented by potential thorium contamination.

2.4.3 Mixed Wastes

As discussed previously, radiological contamination appears to be relatively widespread throughout the 25 contaminated structures. In addition, removable surface radiological contamination appears to account for only a limited portion of the total surface radiological contamination. Considered in conjunction with

TABLE 2-9
RADIOLOGICAL CONTAMINATION CLASSIFICATION FOR STRUCTURES[a,b,c]

Contaminated Structures		High	Medium	Low
3F	Harshaw System[d]			•
3G	Refrigeration Building	•		
4A	Green Salt Plant	•		
4C	Plant 4 Maintenance Building			•
7A	Plant 7		•	
10D	Cont. Oil/Graphite Burn Pad	ND	ND	ND
13B	Pilot Plant Maintenance Building[d]			•
13C	Sump Pump House	•		
13D	Pilot Plant Thorium Tank Farm[e]			•
18K	Low Nitrate Tank	ND	ND	ND
18L	High Nitrate Tank	ND	ND	ND
32A	Magnesium Storage Building	ND	ND	ND
32B	Building 32 Covered Loading Dock	ND	ND	ND
39A	Incinerator Building	•		
39D	Sewage Treatment Plant Incinerator[d]			•
65	(Old) Plant 5 Warehouse	ND	ND	ND
67	Plant 1 Thorium Warehouse	ND	ND	ND
68	Pilot Plant Warehouse[d]			•
69	Decontamination Building	ND	ND	ND
72	Drum Storage Building	ND	ND	ND
73A	Fire Brigade Training Center Building[f]			•
73B	Fire Training Pond[f]		•	
73C	Fire Training Tank[f]			•
73D	Fire Training Burn Trough[f]	•		
73E	Fire Training Burn Tank[f]			•

[a] See Table 2-8 for ranking criteria.
[b] Classification based on total contamination criteria unless otherwise noted.
[c] ND -- No data available -- indicated by light shading.
[d] Assessment based on limited fixed and/or removable data presented in Table A.4-1 of the OU3 WPA.
[e] No data for fixed contamination.
[f] Assessment based on radiological sample data contained in Figure 3 of the Removal Site Evaluation for Contamination at the Fire Training Facility dated July 14, 1992.

information on site materials handling practices and the potential chemical contamination discussed in Section 2.4.1, it is therefore likely that many of the subcomponent materials and wastes, etc. associated with the 25 contaminated structures will fall into the category of mixed wastes. The volumes of material included in this category are currently uncertain although they may ultimately be reduced prior to final remediation by on-site radiological decontamination and/or on-site chemical treatment.

2.5 Site Conditions Which Justify a Removal Action

Generally, the potential threats to health and the environment posed by the 25 contaminated structures are not of a time-critical nature, since they pose no imminent or substantial endangerment which would necessitate the initiation of a removal action within six months. However, they do fulfill the criteria specified by the NCP for non-time-critical removal actions. The specific factors to be considered in determining the appropriateness of a removal action under Section 300.415 of the NCP are:

1. Actual or potential exposure to hazardous substances or pollutants or contaminants of nearby populations animals, or food chains;

2. Actual or potential contamination of drinking water supplies or sensitive ecosystems;

3. Hazardous substances, pollutants or contaminants--in drums, barrels, tanks, or other bulk storage containers--that may pose a threat of release;

4. High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface, that may migrate;

5. Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;

6. Threat of fire or explosion;

7. Availability of other appropriate federal or state mechanisms to respond to a release; and

8. Other situations or factors that may pose threats to public health or welfare or the environment.

Of these conditions, the first, third, fifth, and eighth are potentially the most relevant to the need for removal actions to address the 25 contaminated structures. Although other conditions such as potential for structural deterioration and failure, may be important for specific components.

2.5.1 Potential for Releases to the Environment

Within the structures addressed by this EE/CA, there are large amounts of radiological and chemical waste which have the potential to be released to the environment.

Many of the structures contain large amounts of radiological (both fixed and removable) and chemical wastes, and production intermediates and end-products, in various degrees of containment. Some of these materials are contained in the process equipment (vessels and piping). Others are not contained except by the building structures themselves.

Estimates of the amounts of the various wastes and other hazardous materials contained in the structures have been developed as part of the RI/FS planning process for OU3 (DOE 1992a).

The estimated total volume of potentially contaminated materials in the structures include materials used in the construction of the buildings and process equipment, as well as other noncontainerized materials currently contained in the structures. The total amounts of the major classes of these materials currently in the structures have been estimated as: concrete, 192,062 cu. ft.; cement block, 15,443 cu. ft.; steel 3,373 cu. ft.; transite, 6,682 cu. ft.; and other 192,257 cu.ft.

The amounts of these wastes, products, and other contaminated materials that could be released to the environment, and the extent to which they would represent a risk to humans and environmental receptors, has not been estimated quantitatively. A conceptual model of potential release pathways has been developed (DOE 1992a) which identifies specific natural and man-made release mechanisms and how each of these mechanisms could lead to exposures to humans and nearby ecosystems (Figure 2-12). Among

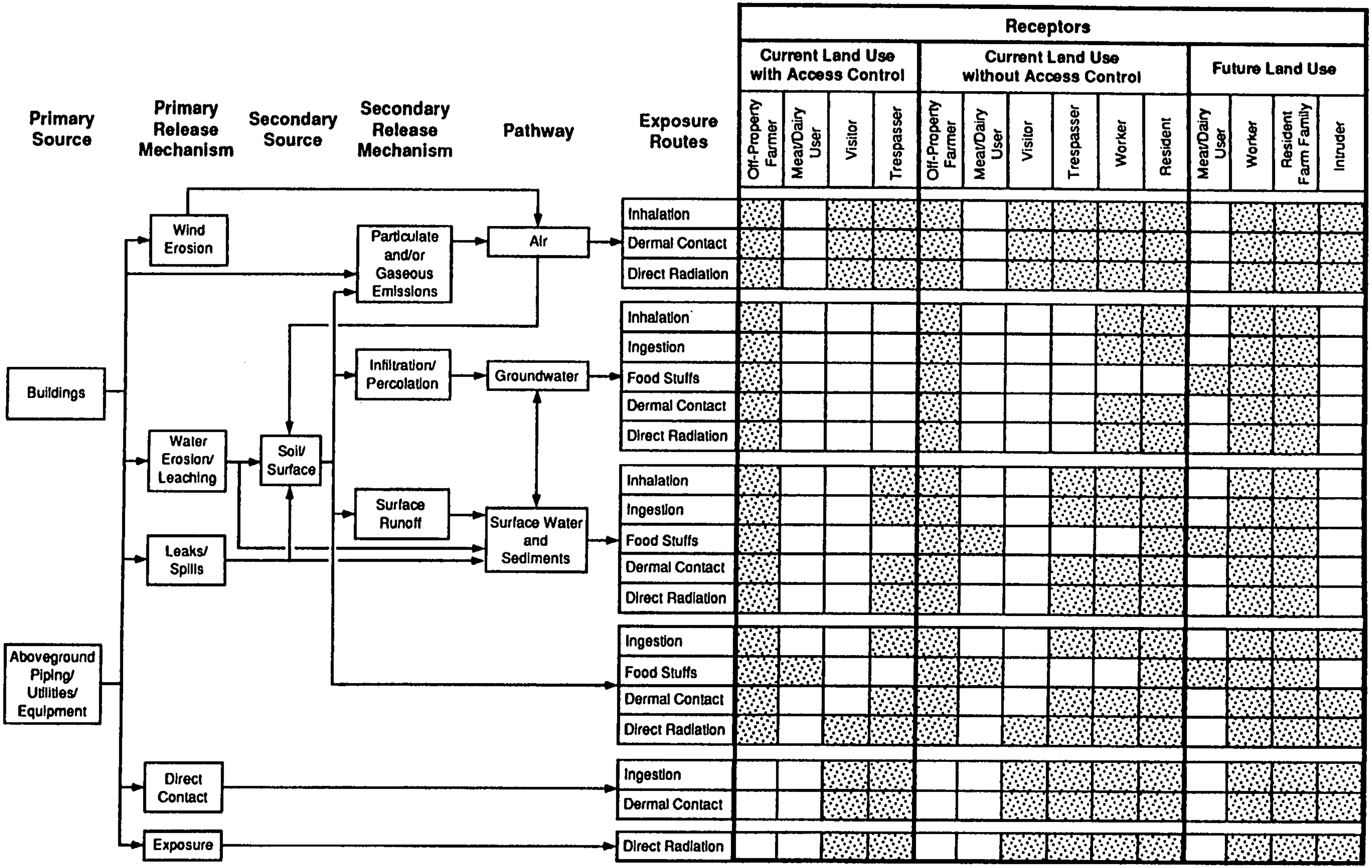

FIGURE 2-12

CONCEPTUAL MODEL OF POTENTIAL RELEASE PATHWAYS the natural release mechanisms are corrosion leaks, erosion, rainwater intrusion, fires, and structural collapse. The potential man-made release mechanisms include inadvertent emissions during onsite activities and/or removal of materials, and spills.

Despite the fact that all of the structures are currently being monitored for structural stability and contaminant releases, all of these release mechanisms could come into play to some extent during the period from the present until the CERCLA RI/FS process is complete.

2.5.2 Potential Health and Safety Risks to Workers

In addition to the potential for releases to the environment, the presence of large amounts of waste products, and other contaminated materials in the structures poses a potential risk to workers on the facility. These workers currently engage in activities which place them in close proximity to waste or to contaminated areas, and the possibility for uncontrolled and potentially harmful exposures exists. In addition, the monitoring and maintenance of such a large number of structures unavoidably involves risk associated with physical hazards, independent of the risks of radiation or chemical exposures. Several of the structures have been classified as currently being of questionable structural integrity.

The nature of some of the health risks faced by workers can be illustrated by the results of the radiological monitoring program for several categories of structures on the site (DOE 1992a). Surface contamination surveys were made in approximately 16 of the 25 structures included in this study. Of these, 5 structures were classified in the "High" category with regard to fixed and/or removable radiological contamination.

Clearly the potential exists for accidental exposures in contaminated areas, and in addition, for the release of contaminants from the contaminated areas into areas frequented by workers. This removal action would address these hazards and reduce potential worker health risks, as well as reducing safety risks posed by deteriorating structures.

2.5.3 Summary

The implementation of a removal action for management of contaminated structures is justified by the associated reduction in the risk of releases of radiological and chemical contaminants to the environment, the acceleration of the CERCLA cleanup process, and by the reduction in health and safety risks to workers. In addition, these reductions in risk would be accompanied by savings in the resources needed to monitor, maintain, and secure these structures until the RI/FS is completed and action is taken on the final remedy for the Operable Unit. These cost savings would be consistent with good management practices and the bias in CERCLA and SARA toward selecting cost-effective remedies.

As will be discussed in more detail in the following sections, removal actions can be accomplished in a manner so as to comply with all Applicable or Relevant and Appropriate Requirements (ARARs), to the extent that this is required for interim remedies. Carefully planned and appropriate removal actions would be consistent with the overall objectives of site cleanup, and would be consistent with the final remedy for OU3 as well as the requirements of NEPA.

3.0 REMOVAL ACTION OBJECTIVES

The general objectives of Removal Action No. 27 are to (1) eliminate, reduce, or otherwise mitigate the potential for release of radioactive and chemical contaminants from the contaminated structures; (2) minimize potential threats to human health and the environment resulting from exposure to these contaminants; (3) reduce or eliminate the safety hazards associated with the deteriorating structures; and (4) support comprehensive site remediation. The specific objectives are addressed in Sections 3.1 through 3.4 in terms of response authority, scope and purpose of the proposed action, schedule, and compliance with applicable or relevant and appropriate requirements (ARARs) and other criteria or guidelines to be considered (TBCs). RCRA land disposal restrictions (LDR) are addressed in Section 3.5. The objectives of this removal action are consistent with overall FEMP site response activities and are discussed in Section 3.6.

3.1 Response Authority

Authority for responding to releases or threats of releases from a hazardous waste site is addressed in Sections 104 and 106 of CERCLA. Executive Order 12580 delegates to DOE the response authority for DOE sites. Under CERCLA Section 104(b), DOE is authorized to undertake planning, engineering, and other studies or investigations appropriate for directing response actions to prevent, limit, or mitigate potential risks associated with the FEMP site.

The 1991 Amended Consent Agreement provides the framework, under Section IX F.3, for implementing on an annual basis, Removal Actions in a phased approach. Each year, DOE will update its priorities for removal actions and submit them to EPA. CERCLA removal authorities are contained in 40 CFR 300.415.

3.2 Scope and Purpose

The scope of the proposed removal action can be defined as management of 25 contaminated structures at the FEMP (see Table 1-1). The primary purposes of the action are to accelerate the cleanup process and to limit potential contaminant releases into the environment from the contaminated structures. This will reduce the potential risks at the site while the RI/FS process is proceeding over the next seven years. The specific objectives of this action are listed as follows.

- Reduce the potential health and environmental hazards of radiation and chemical exposure associated with structures including equipment, asbestos-containing material, dust, slabs and roofing, and insulation and wrappings;

- Minimize the potential health and safety hazards to on-site personnel from deteriorating contaminated structures; and

- Minimize potential health and environmental hazards associated with releases from related structures.

3.3 Schedule

Response actions within the framework of Removal Action No. 27 will typically be initiated as part of the annual DOE submittal to EPA of proposed specific response actions consistent with Section IX F.3 of the 1991 Amended Consent Agreement. It is anticipated that these specific response actions will be implemented beginning with FY 1993, and will continue up to, and possibly two years beyond the issuance of the ROD for OU3. Currently response actions for Plant 7 and the Fire Training Area (73A-E) are being planned and could be initiated during FY 1993. Implementation will be based on programmatic funding received through the congressional budget process.

3.4 Compliance with Applicable or Relevant and Appropriate Requirements and Other Criteria To Be Considered

CERCLA requires that remedial actions obtain a level or standard of control which is applicable or relevant and appropriate to any hazardous substances, pollutants, or contaminants that will remain on site. Although Section 121 does not require that removal actions attain all ARARs and TBCs, EPA policy on removal actions is that ARARs and TBCs will be identified and attained to the extent practicable. As described in EPA guidance, ARARs and TBCs can be divided into three categories: (1) location-specific,

(2) chemical-specific, and (3) action-specific. Location-specific ARARs and TBCs are based on the specific setting and nature of a site, e.g., location in a floodplain and proximity to wetlands or the presence of archeological resources and historic properties. Chemical-specific ARARs and TBCs address certain chemical species or a class of contaminants (e.g., uranium or PCBs, respectively) and relate to the level of contamination allowed for a specific pollutant in a specific medium (e.g., soil, water, or air). Action-specific ARARs and TBCs relate to specific response actions (removal or remedial actions) that are proposed for implementation at a site, e.g., incineration standards for organically contaminated soil. Thus, potential ARARs and TBCs for action(s) proposed at a site are determined on the basis of factors specific to that site and the individual action(s).

The preliminary identification of potential ARARs for the proposed removal action is based on the nature of the contamination (radioactively and chemically contaminated structures and equipment), the location of the structures (in a previously disturbed area not within a floodplain), and the specific scope of the preferred alternative (see Section 6). In addition to ARARs, other requirements that may play a role in the selection and implementation of a preferred alternative are "to-be-considered" (TBC) requirements. These TBC requirements, e.g., individual agency or departmental standards (such as DOE Orders), are not promulgated by law, but may have direct bearing on the proposed action. Potential requirements for the removal action proposed in this EE/CA are identified in Appendix B. An overview of the major ARARs and TBCs as they apply to Removal Action No. 27 is presented in Section 5.6.

3.5 RCRA Land Disposal Restrictions

RCRA land disposal restrictions (LDR) restrict the land disposal of most RCRA wastes, unless certain treatment standards are met. Several waste streams are expected to be generated as a result of this removal action. Based on the data contained in the OU3 RI/FS Work Plan Addendum, the RCRA land disposal restrictions would apply to some of the waste removed from the contaminated structures as part of Removal Action No. 27. Additional analyses will be required to determine the appropriate management procedures for the hazardous and/or mixed wastes that will result from this removal action. These determinations will be factored into the Removal Action No. 27 Work Plans. When hazardous or mixed waste is generated, these wastes will be appropriately containerized and labeled in accordance with 40 CFR 262, Subpart C. The containerized waste will be handled as required by 40 CFR 264, Subpart

I and placed in an existing on-site RCRA storage facility. These stored wastes will be processed along with all of the other stored wastes in accordance with the remedial solution chosen for these wastes and consistent with the requirements of 40 CFR Part 268 and FEMP waste management procedures. The stored wastes will also be in accord with Removal Action No. 17, Improved Storage of Soil and Debris Work Plan.

3.6 Consistency with Other FEMP Response Actions

Activities associated with Removal Action No. 27, the "Management of Contaminated Structures," are affected by several major factors related to environmental compliance at the FEMP including: agreements between DOE and other agencies, active regulatory programs that are in place such as RCRA and NEPA (including DOE Order 5440.1D which establishes internal DOE responsibilities and procedures to implement NEPA). The work plans developed to implement Removal Action No. 27 will comply with the requirements of these environmental programs and agreements.

CERCLA/SARA activities for the FEMP and OU3 are affected by several agreements, including the following:

- In 1986, DOE entered into a Federal Facilities Compliance Agreement (FFCA) with the U.S. Environmental Protection Agency (EPA) that provided for a remedial investigation feasibility study and remedial action at the site.

- In 1988, DOE entered into a Consent Decree with the State of Ohio that provided for management of water pollution and hazardous wastes.

- IN 1990, DOE and EPA entered into a Consent Agreement that amended the 1986 FFCA.

- In 1991, the 1990 Consent Agreement also was amended. The Amended Consent Agreement redefined five separate operable units at the site. In addition, the Amended

Consent Agreement defined a potential Comprehensive Site-Wide Operable Unit for post remedy evaluation.

In addition to the documents presented above, DOE has prepared several planning documents for activities for the FEMP. Some of the significant documents include the RI/FS work plan, the risk assessment work plan addendum, and the RI/FS work plan addendum for OU3 (DOE, 1992a). Several forthcoming reports from the DOE associated with the FEMP are anticipated to include an initial screening of alternatives (draft due March 28, 1995), an RI/baseline risk assessment (draft due March 13, 1996), an FS/comprehensive response action risk evaluation (draft due August 7, 1996), a proposed plan (draft due August 7, 1996), and a proposed draft Record of Decision (due May 2, 1997) for OU3 (the 25 contaminated structures addressed by Removal Action No. 27 are included within OU3). Those documents will be prepared in accordance with the Amended Consent Agreement and the requirements of CERCLA, as amended. Removal Action No. 27 will not interfere with the scheduled OU3 milestones, and will be consistent with the anticipated final remedy for the FEMP.

3.6.1 Relationship to Ongoing Interim Activities

Removal Action No. 27, will establish a broad based removal action to support the implementation of cleanup actions on the 25 contaminated structures pursuant to Section IX.F.2 of the Amended Consent Agreement between the U.S. Department of Energy and the U.S. Environmental Protection Agency. In addition to this broad-based effort, there are other on-going and planned activities taking place at the FEMP consistent with agreements between DOE and EPA. Removal Action No. 27 activities will proceed consistent with the approach and purpose of these agreements. Response action work plans will be developed and coordinated with results of the "Facility Utilization Study" prepared for the FEMP.

CERCLA activities are being conducted in parallel for the five separate operable units at the FEMP. Interaction among the participants in the CERCLA activities at the operable units is essential, and DOE will coordinate the activities to ensure consistency of approach. This will be handled through programs such as the Fernald Remediation Integration Plan (FRIP). For OU3, the relationship and interaction with OU5 activities are particularly important. The OU5 activities address contaminated environmental media, including media located around and under the 25 contaminated structures. Removal Action No. 27

activities will generate large quantities of contaminated debris during remediation. These media are expected to be handled by Removal Action No. 17 -- Improved Storage of Soil and Debris. Also, consistent with other FEMP response actions, waste minimization and recycle/reuse will be optimized as part of these waste management efforts. The final remedy selected for contaminated environmental media at the FEMP will be specified in the Record of Decision for OU5.

The planning and development of work plans for Removal Action No. 27 will be coordinated with OU3 RI activities including field sampling. Overall OU3 RI field sampling is scheduled to occur between December 1992 and December 1994. Except for Plant 7 and the Fire Training Facilities (73A through E) analytical results from the OU3 RI program are expected to be available to support preparation of work plans to implement the response actions associated with Removal Action No. 27. For Plant 7 and the Fire Training Facilities (73A through E), field sampling will be undertaken as part of the removal actions addressing these structures. The work plans for these structures will include directions for sampling and characterization consistent with the Data Quality Objectives (DQOs) and QA/QC in the OU3 RI/FS Sampling and Analysis Plan. Also, available site characterization and existing radiological survey data will be considered in Removal Action No. 27 work plan development.

Cumulative long-term residual risks associated with implementation of alternatives for the various operable units, including OU3, will be evaluated as part of the FS developed for each operable unit and as part of the analysis done for the Site-Wide Operable Unit, as provided in the 1991 Amended Consent Agreement. In addition, DOE is integrating requirements of NEPA with the CERCLA process at the FEMP.

Various active regulatory programs still apply to the FEMP and OU3. Because the FEMP was recently an active production facility, the site continues to seek a permit for the storage of hazardous wastes under the terms of Ohio hazardous waste regulations. Requirements of the Resource Conservation and Recovery Act (RCRA) will continue to be met. Six (6) RCRA hazardous waste management units (HWMUs) are located within the 25 contaminated structures, and efforts will be made to close these units in accordance with RCRA requirements. Final closure may be through implementation of response actions under Removal Action No. 27. Material remaining on the FEMP site will be inventoried under the terms of proposed amendments to the 1988 Consent Decree and in accordance with Ohio hazardous waste regulations to identify RCRA-regulated wastes. An active program also exists for storage and disposal of polychlorinated biphenyls (PCBs) at the FEMP in accordance with the requirements of the Toxic Substances Control Act (TSCA).

Active programs related to the Clean Air Act and the Clean Water Act also are in place. An active National Pollutant Discharge Elimination System (NPDES) permit covers discharges from the site to the Great Miami River and is expected to remain in place as long as activity continues at the site. An application will also be filed for a permit to discharge stormwater runoff to Paddys Run. The DOE is also identifying any sources that may require additional permits.

The DOE will comply with the requirements of NEPA during the RI/FS planning process at the FEMP and while implementing this removal action. Compliance will be consistent with 10 CFR1021, April 1992 which presents DOE's Final Rule on "National Environmental Policy Act; Implementing Procedures and Guidelines Revocation." According to the order, integration is to be accomplished by conducting the NEPA and CERCLA environmental planning and review procedures concurrently. Integration is intended to (1) avoid duplicate effort and the commitment of resources that would be needed to implement NEPA and CERCLA separately, (2) avoid conflicts in analysis and the choice of a remedial alternative, and (3) minimize the risk of delaying remedial actions on procedural grounds. The primary instrument for DOE's NEPA-CERCLA integration is to be the RI/FS process, supplemented as needed to m t the procedural and documentation requirements of NEPA. Thus, all FEMP CERCLA documents including this EE/CA will contain information tailored to address NEPA concerns.

3.6.2 Consistency with Other Removal Actions

The selection of the preferred alternative for Removal Action No. 27 considers the various removal actions currently underway and/or planned at the FEMP. Some of the other key Removal Actions to be considered during Implementation of this removal action include:

Removal Action No. 9 -- Removal of Waste Inventories

Removal Action No. 12 -- Safe Shutdown

Removal Action No. 17 -- Improved Storage of Soil and Debris

Removal Action No. 26 -- Asbestos Abatement Program

Removal Action No. 27 Waste Inventories Removal and Safe Shutdown activities will be coordinated utilizing existing FEMP scheduling and integration plans. Prior to implementation of the alternative selected in this EE/CA, waste inventories stored in a structure will be removed. It is expected that Safe Shutdown activities will be completed under Removal Action No. 12 for the 25 contaminated structures addressed. Safe Shutdown is required as the first step in the remedial action process.

The Safe Shutdown activities will ensure that process equipment has been isolated from all energy sources, that hazardous materials have been removed from process equipment, and that loose, gross radiological contamination has been removed from the production facilities. These steps and others outlined in the proposed action must be completed to ensure that potential hazards relative to worker health and safety and the potential for releases to the environment are minimized. These activities will be consistent with the final remedy and must be implemented in advance of the proposed action selected by the EE/CA. Work plan development for the 25 structures addressed by Removal Action No. 27 will be scheduled with completion of Safe Shutdown activities as a prerequisite.

3.7 Waste Disposition

Several waste streams are expected to be generated as a result of this removal action. The handling and transportation of waste will be in accordance with established FEMP procedures and objectives. On-site handling of waste materials would be handled consistent with the waste disposition measures available as part of Removal Action No. 17, "Improved Storage of Soil and Debris" and other FEMP waste management practices. Waste materials such as mixed waste, for which adequate treatment/disposal capacity is currently not available will be temporarily stored on-site until adequate treatment/disposal capabilities are developed in accordance with the approved Records of Decision. Low-level waste would also be placed in approved on-site interim storage and ultimately transported to approved off-site facilities, such as the Nevada Test Site (NTS) for proper disposition.

The transportation of waste to off-site facilities would be performed in a controlled manner consistent with DOT and DOE requirements. An Environmental Assessment has already been prepared by DOE which considers the potential impacts associated with the FEMP low-level waste processing and shipment system, including off-site transportation. In this EA, no significant impacts were identified from the normal transportation of LLW to off-site facilities. Section 6.4.8 addresses the waste transportation aspects associated with Removal Action No. 27.

4.0 REMOVAL ACTION ALTERNATIVES

Alternatives for the proposed action were developed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA's guidance on removal actions. As stated in the NCP, it is the intent that removal actions, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release or potential releases of contaminants. In addition, alternatives for interim actions must remain within the constraints of the Council on Environmental Quality's regulations for NEPA compliance for interim actions while an EIS is in progress. The two requirements to be satisfied, are (1) that the action be justified independently of the RI/FS-EIS and (2) that the action not prejudice the ultimate decision to be made in the RI/FS-EIS.

4.1 Identification and Description of Initial Alternatives

Seven graded initial alternatives are considered for the management of the 25 contaminated structures at the FEMP addressed by this document. They are listed as follows:

- No Action;
- Drain Systems;
- Enhance Containment;
- Decontaminate Surfaces;
- Remove Equipment and Materials;
- Remove Equipment and Materials and Clean Surfaces; and
- Decontamination and Dismantling.

4.1.1 Alternative 1 -- No Action

Under the No Action Alternative, routine monitoring, maintenance and security activities would continue to occur at the FEMP in accordance with DOE operational requirements. Safe Shutdown activities (Removal Action No. 12) and Waste Inventory Removal (Removal Action No. 9) would also be completed. However, no additional remediation, monitoring, or security activities, in advance of the final remedy, would be provided in the vicinity of the contaminated structures to further minimize risk to public health or the environment. Any changes to the existing site environment are assumed to develop only as a result of natural occurrences. This alternative is being considered as a baseline for comparison with the other alternatives.

4.1.2 Alternative 2 -- Drain Systems

The greatest potential for the release of hazardous and/or radioactive materials to the environs is through leakage of liquids in tanks and systems associated with the contaminated structures. This scenario has a high potential risk because the liquid is mobile, and usually large quantities are present. Draining the systems involves the collection of the liquid in appropriate containers and treating it for disposal as required for the specific chemicals and radionuclides present. Recycling of chemicals is a preferred option if it is available for the material of interest.

4.1.3 Alternative 3 -- Enhance Containment

A second method to protect the environment from chemical and radioactive materials associated with the structures is to improve their containment. There are two general ways that this can be done. One is by upgrading or remediating systems that contain liquids to prevent or contain leakage, e.g., tanks could be patched, or secondary containments installed to catch leaks. Another approach, that is applicable to surface contamination, would be to fix surface contamination, usually by painting or in-situ encapsulation. This would decrease the amount of this material that could be resuspended (by air currents or activity in the contaminated area) and released to the environment as an airborne dust. Asbestos containing material (ACM) could be encapsulated as part of this alternative.

4.1.4 Alternative 4 -- Decontaminate Surfaces

Decontamination of surfaces would involve the removal of the contamination on accessible surfaces of contaminated structures and associated equipment. This would serve to prevent the resuspension of the material and distribution through movements and diffusion in air. It also would prevent the contamination of occupants, or animals indigenous to the area. Decontamination could be done by washing, steam cleaning, vacuuming, blasting or scabbling. The vigorousness of the technique chosen depends on the nature of the surface involved, and on the nature of the contamination, i.e., wood surfaces ordinarily require the removal of substantial amounts of material by methods such as planing.

4.1.5 Alternative 5 -- Remove Equipment and Materials

The removal of equipment and materials would involve the disassembly as necessary and removal of equipment in the contaminated structures. Material that is removed would be sized and/or cleaned to make it suitable for release according to DOE Order 5400.5 or for disposition as low level waste (LLW). A third option would be to smelt and slag the metal parts, reusing the partially purified metal under the auspices of the DOE or an NRC licensee. If hazardous materials were also present the equipment would have to be disposed as mixed waste or treated to remove either the radioactive or hazardous component. Materials contaminated by chemicals only can be cleaned and released in accord with the plans and procedures of the FEMP waste management program and consistent with RCRA. Measures would be taken during removal to minimize the spread of contamination from the equipment to the surrounding structural surfaces.

A typical sequence of activities for Alternative 5 follows:

The first step would be to remove all loose equipment. The removed equipment could potentially be reused in subsequent FEMP site activities if applicable (and serviceable). Otherwise it could be sized and disposed. It is reasonable to assume that the equipment is contaminated but can be decontaminated and free released. An alternative to disposal is to package and send the equipment to a smelter for recycling. Any oil or gasoline in the equipment is drained and incinerated leaving LLW residue, which will be shipped to an approved off-site LLW facility.

After removal of all loose equipment, the openings in the building would be marginally sealed, and HEPA ventilators would be installed. Several could be required when dealing with the larger structures.

Following overall building containment, if applicable, remove asbestos from lines and vessels in the building. Use glove bags for lines and greenhouses/tents for large vessels. Assume most of the asbestos will be disposed to an approved off-site Landfill. No volume reduction will be attempted, to avoid the release of asbestos fibers. Asbestos will be double bagged and put in 7A boxes.

Following asbestos removal, remove process equipment starting with that used to treat thorium first and then equipment with expected concentrations of mercury. Penetrate the system to be removed and install HEPA ventilator, spark arrester, and chemical trap if mercury is expected. Cut out sections of pipe starting from the far end of the system. Cover the ends of pipe, and put in 7A boxes. Exhaust HEPA to interior of the building. For tanks and vessels use an elephant trunk and hood with HEPA to collect air emissions. Size equipment for packaging and/or disposal if convenient during removal. If not, install greenhouses in the building for further cutting and possible grit blasting. Grit blast steel with thickness of 0.5 inches or more, then survey and release. Package other steel, i.e., thinner, or complex shapes, for disposal as LLW or recycle by smelting. If chemical residue is found, treat it to remove undesirable characteristics. Neutralize residues containing NH_4OH and other chemicals. Residue containing HF should be pacified using calcium salts. Solidify the treated residues and dispose as LLW.

4.1.6 Alternative 6 -- Remove Equipment and Materials and Clean Surfaces

This alternative is the combination of the previous two alternatives (4 and 5). The removal of equipment and materials would be followed by the cleaning (washing, steam cleaning, vacuuming, blasting or scabbling) of the floors, walls and ceilings of the structure. Surfaces of structural members would also be cleaned. Wastes generated during cleaning would be treated, packaged, and disposed as part of the FEMP waste management program.

4.1.7 Alternative 7 -- Decontamination and Decommissioning

Decontamination and decommissioning (D&D) includes the removal of equipment and materials and the cleaning of surfaces (Alternative 6) plus one additional activity, the removal of the structure itself. It involves the handling of much larger volumes than the other alternatives, but achieves the greatest reduction in risk, and accelerates the CERCLA remediation process, because all of the contaminants are removed, treated and disposed. The underlying soils are considered to be part of OU5 and hence not addressed in this EE/CA. However, some soil is expected to be removed as part of this action. If soil is removed it will be dispositioned consistent with Removal Action No. 17 -- Improved Storage of Soil and Debris. Depending on the nature of the contamination within a given structure and provisions for its control, removal of structures including buildings can be done without cleaning as thoroughly as required in alternatives 4 and 6. The major advantage of decontamination and decommissioning over equipment removal and cleaning is that D&D provides for the removal of residual or trapped contamination in inaccessible areas.

A typical sequence for implementing this alternative follows:

Remove equipment from structures, as outlined in Alternative 5, then clean surfaces by first washing/wiping the surface and vacuuming to remove any remaining loose contamination. Used rags would be packaged and disposed as LLW or mixed waste as appropriate. Following this cleaning of surfaces, commencing on the top-most floor, the surface block and/or concrete walls would be scabbled using HEPA ventilators to minimize the generation of airborne contaminants. Based upon chemical analysis, the resulting fines would be drummed and disposed as either LLW or mixed waste at approved off-site facilities.

Following scabbling of all wall surfaces, the remaining concrete and/or block walls would be sampled to ensure freedom from contamination, rescabbled as necessary and retested, demolished, and disposed ultimately as debris in a sanitary landfill.

Upon removal of all walls on a given elevated floor, the floor slab would be scabbled (top and bottom), utilizing a similar procedure, demolished, and likewise disposed as debris.

Upon successful demolition of upper floors, remove sludges from any sumps using wet vacuum, or pump out as slurry. Test the residue. Expect mixed waste, and handle in accordance with FEMP waste management procedures.

Scabble concrete surfaces, such as the slab and sump surfaces using HEPA ventilator to prevent the generation of airborne activity. Test for chemical contamination, but expect the waste to be LLW, requiring disposal at an approved LLW off-site facility. In general, removal of the foundation and slab on grade, is not part of this alternative.

Remove roof hardware, i.e., stacks and ventilators. Survey and characterize, and dispose accordingly as LLW, free release or package for smelting.

For transite buildings, remove asbestos siding one sheet at a time by unbolting. Dispose of the lead bolt covers as mixed waste. Most of the sheets and intermediate insulation are expected to be disposed at approved off-site landfill; however, invariably some will be LLW. Pack siding in a waste box directly. Repeat for the roof panels.

Cut windows free with a torch after deconning the area to be cut using a HEPA ventilator, or cut with hydraulic cutter. Break glass and dispose as debris. Remove lead sill moldings and dispose as mixed waste. Characterize steel frames and dispose accordingly as free release, LLW or package for smelting and recycle.

Identify areas of structural members to be cut, and decontaminate using a hood and HEPA ventilator. Attach crane, and cut structural member loose. Lower to the ground, and transfer to the greenhouse for excision and decon. Grit blast simple sections greater than 0.5 inches thick. Complex and thinner sections should be packaged for disposal as LLW or recycling by smelting. Most structural steel is expected to be decontaminated to levels allowing for free release.

4.2 Screening of Alternatives

The seven alternatives were reviewed against the requirements in Section 4.0, the objectives outlined in Section 3.0, and, for consistency, with activities currently in progress at the FEMP including the Safe Shutdown program (Removal Action No. 12) and removal of waste inventories (Removal Action No. 9). As a result, five of the alternatives were removed from further consideration as part of this EE/CA. They are the following:

- Alternative No. 2 -- Drain Systems;
- Alternative No. 3 -- Enhance Containment;
- Alternative No. 4 -- Decontaminate Surfaces;
- Alternative No. 5 -- Remove Equipment and Materials; and
- Alternative No. 6 -- Remove Equipment and Materials and Clean Surfaces.

Alternative No. 2 -- Drain Systems was dropped from the list of alternatives because it is presently being performed under the Safe Shutdown program. No further system draining activity under this Removal Action would result in (significant) risk reduction or acceleration of CERCLA remediation.

Alternative No. 3 -- Enhance Containment was also dropped, in part because the draining of the systems as part of Safe Shutdown would make repairs or the installation of secondary containment unnecessary, and the in-situ encapsulation of ACM is expected to be performed as part of Removal Action No. 26 "Asbestos Removal". Secondly, painting of surfaces would not be consistent with the overall long-term objective for reducing risk. Painting is a short term solution that is effective only as long as the paint integrity is maintained. Painting is inadequate for protection from radionuclides like uranium and thorium with half lives on the order of billions of years. Painting is effective in containing the contamination for short periods of time to allow work to proceed in a contaminated area with less than the usual personnel protective equipment. However, painting has two disadvantages which weigh against it in the long run. It absorbs radiation from alpha emitters and some beta emitting radionuclides so that they cannot be detected under the paint, and the paint interferes with decontamination efforts if they should be desired at a later time. Therefore, painting and encapsulation will not likely be consistent with the final remedy to the extent required by CERCLA.

Alternative No. 4 -- Decontaminate Surfaces, (without equipment removal) was the third action dropped. It was not supportive to the eventual reduction in risk because equipment removal would eventually have to be done and recontamination of already cleaned and surveyed surfaces would undoubtedly occur. This would require surfaces to be cleaned a second time, or extensive actions taken to protect them. Either of these activities will result in additional schedule time and cost compared with D&D.

Alternative No. 5 -- Remove Equipment and Materials and Alternative No. 6 -- Remove Equipment and Materials and Clean Surfaces, were also dropped. These alternatives fail to address all the potential risks represented by the 25 contaminated structures, in particular those hazards associated with the integrity of the structures themselves. Both of these alternatives also represent interim steps taken toward ultimate "Decontaminate and Decommissioning" of a structure and therefore represent only a partial remediation as opposed to the more comprehensive D&D alternative. In addition, the D&D alternative already encompasses these two alternatives.

The remaining two (2) alternatives are renumbered and undergo the final evaluation. They are the following:

- Alternative 1 -- No Action
- Alternative 2 -- Decontaminate and Decommission

Potential technology types and process options that could be implemented to achieve the objectives of the remaining alternatives are presented in Table 4-1. The overview is based on current understanding of site contamination. The term *technology type* refers to general categories of technologies, such as mechanical cleaning or dismantlement. The term *process option* refers to specific processes within each technology type. For example, within the mechanical cleaning technology type process options would include vacuuming and scarification. It is assumed that physical, chemical and biological treatment of the waste streams generated by the alternatives would be handled consistent with FEMP waste management practices.

TABLE 4-1

TECHNOLOGY TYPES AND PROCESS OPTIONS FOR REMOVAL ACTION ALTERNATIVES

Removal Action Alternatives	Remedial Technology Types	Process and Waste Disposal Options
Alternative 1 - No action	No action: Fencing, guards, signs Routine environmental monitoring	Proprietary ownership and care with differing levels of access control, security and monitoring.
Alternative 2 - Decontaminate and Decommission	Removal options: Demolition Dismantlement	Scabbling, mechanical cutting, sawing, excavation, containment, and barriers.
	Decontamination technologies:	Mechanical cleaning, steam cleaning, vacuuming, scarification, washing/brushing.
	Thermal treatment	Melting/smelting, incineration (off-site)
	Physical Treatment	Solidification, macroencapsulation (for lead), separation/crushing.
	Abatement Technologies	HEPA filtered ventilation, vacuum cleaners (HEPA), containment/glove bags, greenhouses, exhaust hoods, spark arrestors with HEPA ventilators, effluent sampling and analysis, painting.
	Disposal technologies:	
	On-Site	Engineered disposal cell, vault, interim storage (central storage facility)
	Off-Site	Off-site landfill, off-site hazardous waste treatment/disposal facility, approved low-level waste facility, mixed waste disposal facility
	Material recycle/reuse	Free release, released to other DOE facilities

5.0 EVALUATION OF ALTERNATIVES

The evaluation of the removal action alternatives is presented in this chapter. Section 5.1 describes the evaluation criteria. The evaluations of the individual alternatives are presented in Sections 5.2 and 5.3, respectively, and a separate discussion of the ARARs and TBCs is presented in Section 5.4. The time frame over which these alternatives were evaluated is confined to the period between initiation and two years beyond the issuance of the Record of Decision (ROD) for OU3.

5.1 Evaluation Criteria

The two alternatives remaining after screening in Sections 4.0 are each evaluated according to the following criteria:

- Effectiveness -- Public Health;
- Effectiveness -- Environmental;
- Implementability; and
- Cost.

5.1.1 Effectiveness -- Public Health

The effectiveness of an alternative is judged by its ability to ensure the protection of the public and the environment. The evaluation of this criterion will focus on the extent to which the completed action reduces the potential harm should the contaminant be released to the environment. Alternatives will be regarded as most effective if they result in the destruction of the contaminant. High scores will be given if the alternative results in efficient isolation of the contaminant. An alternative will be considered effective if it minimizes the release of the contaminant or converts it to a form which is less harmful.

5.1.1.1 Exposure Pathways

There are two major pathways through which the public could potentially be exposed to contaminants at the FEMP including the release of airborne particulates or vapors and spillage. Spilled material can then be leached or carried outright into surface waters, or leached into the groundwater. Two additional pathways are of potential concern to workers. The first is the potential for skin contact with either chemicals or radionuclides. The second is direct exposure to radiation, particularly from some of the gamma emitting radionuclides present.

5.1.2 Effectiveness -- Environmental

Another criterion in assessing effectiveness of an alternative is its ability to meet the requirements of NEPA. Each of the two alternatives will be evaluated with respect to the potential environmental impact of its implementation as well as its effectiveness in meeting larger environmental objectives. The term "environment" in this context is not limited to the natural environment associated with the FEMP but also considers related socioeconomic and cultural aspects. Particular attention is directed to those resources identified as being significant and possibly protected under some other existing legislation such as wetlands, endangered species, or heritage structures. Each alternative is considered from three perspectives 1) how effective it is in reducing/limiting actual or potential environmental degradation through reduction or elimination of contaminant sources 2) how well it supports environmental enhancement and/restoration and 3) the environmental impact of its implementation.

5.1.3 Implementability

The implementability of an alternative is defined by its technical feasibility. Technical feasibility is determined by prior success of the alternative being considered. An alternative that has been proven reliable in the field under similar conditions when used on the same waste material is the most feasible one. Other factors affecting feasibility are the permanency of the action (action which requires little follow-up), the environmental effects of implementation, and the safety risks associated with the alternative under normal and accident conditions.

5.1.4 Cost

The cost analysis of an alternative is the final factor considered and includes the direct and indirect capital costs, and waste disposal costs which must be incurred for implementation. The purpose for including the cost analysis is to eliminate removal action alternatives whose cost greatly exceeds that of other alternatives but which does not provide more than a marginal improvement in pursuit of the removal action objectives. The cost analysis includes such items as management, engineering, characterization, mobilization and demobilization, and dispositioning of the various kind of materials to be encountered.

5.2 Alternative 1: No Action

The No Action Alternative does not include any activity designed to destroy, isolate, or reduce the toxicity of any of the contaminants in the contaminated structures in advance of the remedy selected in the Record of Decision (ROD). During this period, the structures are left to take the natural course of further deterioration. Since many chemicals and the radionuclides involved, i.e., thorium and thorium daughters, and uranium and uranium daughters, remain environmentally significant during this period. The choice of this alternative allows for the potential release of any of the radioactive and hazardous materials present in the structures.

5.2.1 Effectiveness -- Public Health

The No Action Alternative is not effective because the risks posed by the contaminated structures would remain unmitigated under this alternative. The existing threat of environmental releases would continue due to the potential release of particulate material to the air and/or material spilled on the ground that could subsequently leach into surface and groundwaters. The No Action Alternative does not reduce the safety hazards posed to on-site personnel. These hazards are exposure to radionuclides, potential internal exposure from radioactive material found on surfaces, and the potential for direct contact with hazardous materials. In addition, the potential biohazard presented by the growth of Histoplasmosis-causing fungus on pigeon feces in Building 7A would continue.

5.2.2 Effectiveness -- Environmental

The effectiveness of the No Action Alternative in reducing environmental risk and in enhancing environmental restoration, and the impacts to the environment of taking No Action, are described under four categories - air quality, aquatic resources, terrestrial resources and socioeconomics. In the NEPA context, effects are normally considered from both the short term and long term perspectives, however, as described earlier, this assessment is limited to the short term -- approximately seven years (the interval between now and the commencement of remedial efforts anticipated for OU3. Long term No Action impacts are described in Chapter 7.0 of the Sitewide Characterization Report (SWCR) (DOE, 1992c). Overall, in the short term, not implementing Removal Action No. 27 would relieve none of the environmental risk inherent in the Removal Action No. 27 components and would impede restoration and environmental enhancement at the site.

5.2.2.1 Air Resources

Air quality in the vicinity of the FEMP is generally regarded as "good" with respect to National Ambient Air Quality Standards (NAAQS) for the six pollutants regulated under the Clean Air Act (inhalable [PM10] particulates, carbon monoxide, sulfur dioxide,nitrogen dioxide, ozone and lead). The standards for toxic compounds are not regulated under the Clean Air Act, but by the individual states. Although toxics such as ammonia, hydrogen fluoride, and nitric acid have all been released from the FEMP in small amounts in the past, modelling of these releases indicated that concentrations remained well within the limits set by the state of Ohio. Uranium and radon are the principal airborne radionuclides of interest at the FEMP and historically, there have been no violations of the air quality standards mandated for these pollutants by the DOE and EPA.

Under the No Action Alternative, there would be no additional emissions of any of the pollutants described above because production activities at the FEMP have ceased. Therefore, no deterioration of air quality over the short term. However, there is potential for emissions due to a gradual deterioration of the waste containment systems or accidental release of already accumulated contaminants. The primary source of airborne contaminants would likely be resuspension of particles from contaminated areas, distributed by wind to receptors downwind. Models conducted for the SWCR indicate that the only instance of concern pertains to future on-property concentrations of radon which exceeded the DCG's (derived concentration guide) specified by DOE.

5.2.2.2 Aquatic Resources

Surface Water -- Under the No Action Alternative, impacts to surface waters on the site resulting from the 25 Removal Action No. 27 components would continue, although at the present time, there is no evidence of surface water degradation or negative biological response from the Production Area. Historically, natural surface drainage from this area was via Paddys Run. That is no longer the case. Currently a storm water collection system delivers runoff to the Great Miami River via a NPDES permitted effluent line from Manhole 175, following sedimentation and treatment. Low levels of inorganic constituents of concern have been detected in water samples from the Great Miami River, but no organic constituents have been found. Current impacts from inorganic chemicals appear to be minimal and the only effect attributable to the FEMP was possible organic enrichment, which was minor and restricted to the immediate vicinity of the discharge.

The risk of accidental release of contaminants to the aquatic environment during very high runoff events (stormwater overflow to Paddys Run) could occur however, with the greatest potential risk attributable to Structures 18K and 18L (nitrate tanks) which contain residual nitrate waste and are the closest structures upstream to Paddys Run.

Groundwater -- Evidence currently exists that shallow groundwater beneath some of the OU3 buildings is contaminated. However, contaminated perched groundwater is currently being pumped, treated and recharged under Removal Action No. 1 (an OU5 activity). This activity is expected to continue . Of the structures included in Removal Action 27, only the uranium contamination identified in the soils in the Fire Training Area have the potential to contribute to groundwater contamination. This risk continues with the No Action scenario.

Wetlands -- Wetlands would not be impacted by the No Action Alternative as there are none within, or downgradient of Removal Action No. 27 structures which would receive contaminated drainage. Exterior structures are dyked or curbed and runoff is collected for treatment prior to discharge.

Aquatic Biota -- As there is no aquatic habitat within the areas occupied by the Removal Action No. 27 structures, there is no aquatic biota to be affected directly by non-action. There is also no evidence that either Paddys Run or the Great Miami River aquatic systems are currently being impacted by runoff or discharges from the FEMP. With No Action however, the potential risk of harmful releases remains.

5.2.2.3 Terrestrial Resources

The terrestrial resources discussed in this section, include soils, vegetation, and terrestrial wildlife, including threatened and endangered species. The No Action Alternative would have minimal impact on terrestrial resources.

Soils -- Although soils, as environmental media are specifically allocated to OU5 for detailed consideration and mitigation, they are addressed here because they represent contaminant pathways and therefore potential exposure routes, leading to impacts on other components of the terrestrial ecosystem.

The data base describing the contamination of FEMP soils is complete but available information indicates that some soils in the former Production Area contain above-background concentrations of the isotopes of uranium, thorium, radium, cesium, strontium and technetium. Arsenic, barium, cadmium, cobalt, lead, mercury and silver are the major non-radioactive metals of potential concern and among the organic contaminants, PCBs, monocyclic aromatics and phthalate esters are also present. Removal Action No. 17 provides for the improved storage of soil and debris and should result in reduction of the soil piles found at locations throughout the site.

As pointed out in previous sections, the buildings and structures incorporated within Removal Action No. 27 are surrounded by pavement or gravel and nominal areas of maintained grass. There is actually little exposed soil in the current condition which is susceptible to wind or water erosion. Indeed, small piles of soil are covered with plastic and will be the subject of Removal Action No. 17 actions. This will remain the case if the No Action Alternative is implemented. With the No Action Alternative, there will be no additional sources of contamination to soils except through the gradual leakage from failed containment systems. These are unlikely to occur within the short time frame of this Removal Action No. 27 No Action scenario.

Vegetation -- The terrestrial habitat available within OU3 is very limited, consisting of minor and largely maintained (mowed) grassed areas. The use of herbicides to control vegetation is an ongoing maintenance activity which would continue under the No Action Alternative. Habitat regeneration with the No Action Alternative is therefore impeded.

Wildlife -- Wildlife within the former Production Area has not been quantitatively assessed but the limitations in habitat would imply that wildlife within this area are also very limited. Under the No Action Alternative, this will remain the case.

Estimated ecological risks associated with exposure to FEMP constituents of concern were calculated for the SWCR and were found to be primarily due to nonradioactive inorganic chemicals in soils. Estimated intakes of arsenic, cobalt, lead and silver originating from FEMP soils were all higher than No Observable Effect Levels (NOELs) for six of the seven indicator species used in the assessment. These hazards were not confirmed in field studies however, except for above-background levels of arsenic and mercury recorded in some plant samples. The assumptions made in conducting the assessment were very conservative and the suggestion overall is that ecological risks are low at the present time. In the No Action scenario, these risks would not likely increase.

Threatened and Endangered Species

There have been no threatened or endangered species observed within the FEMP and those that have been observed in the region (Cave Salamander, Northern Harrier, Indiana Bat) could not be supported in the habitat available in the vicinity of the Removal Action No. 27 structures. There will therefore be no direct impact to threatened and endangered species resulting from the No Action Alternative.

5.2.2.4 Socioeconomic/Cultural Resources

Land Use -- Under the No Action Alternative, there would likely be no change in land use either on, or adjacent to the FEMP, except that the area near the FEMP could have development delays if the No Action Alternative resulted in an overall protraction of the removal schedule for the OU3 components.

After the 1986 announcement of uranium releases to the atmosphere from the FEMP and the ensuing debate on public health and safety, the Great Rivers Girl Scout Council of Cincinnati closed Camp Ross Trails, located just over one mile northeast of the FEMP. Losses of this type might continue if positive action to deal with contaminated OU3 structures were not seen to be occurring.

Transportation -- The No Action Alternative would lead to no increase in truck and other vehicular traffic within the FEMP or along site access roads as no additional manpower, materials handling or waste disposal requirements would be generated.

Recreation -- As impacts to the Great Miami River water quality are not expected, there should be no impact to recreational pursuits in this river. Land based recreation likewise, would not be affected by non-action.

Aesthetics -- Visual aesthetics of the area would continue to be negatively affected in the No Action Alternative.

Cultural -- No direct impacts to historic or archaeological resources will result from the implementation of the No Action Alternative as there are no sites on or adjacent to the Removal Action No. 27 structures.

5.2.3 Implementability

No impediments stand in the way of implementing this alternative. The No Action Alternative is highly implementable.

5.2.4 Cost

The No Action Alternative has no cost figured by the cost analysis methods chosen for use in this EE/CA, since there are no additional response actions (i.e., cleaning or disposal activities) for which costs have been assigned, so the sum of the products of material quantities and unit costs is zero. However, it should be noted that there would be costs associated with the No Action Alternative to maintain site security and conduct regular monitoring activities. These baseline costs for controlling and maintaining the structures are common to both alternatives and are therefore not carried through in this evaluation.

5.3 Alternative 2: Decontaminate and Decommission D&D)

Alternative 2, decontaminate and decommission (D&D) of the contaminated structures would include:

- the disassembly as necessary and removal of equipment associated with a structure and the packaging of bulk materials present;
- surface decontamination measures as necessary to clean contaminants off surfaces, i.e., floors, walls, ceilings, and structural members; and
- the removal of the structure itself.

Alternative 2 involves the management of large quantities of materials most with low levels of surface contamination. The possibility exists for the recycle of some of this material and this option can be pursued through FEMP waste management programs.

5.3.1 Effectiveness -- Public Health

The entire inventory of hazardous and radioactive materials associated with the contaminated structures is removed by implementation of Alternative 2. The materials are subsequently treated as appropriate, and the contaminants isolated from the environs through the auspices of FEMP Waste Management Plan procedures and consistent with the ARARs. This alternative would therefore yield a substantial reduction in the potential risk of environmental release of contaminants, and would eliminate potential long term health and safety risks to workers associated with the contaminated structures.

Implementation of the D&D alternative may itself result in potential health risk to the general public. In the process of decontamination and demolition, it is possible that radioactive and/or toxic particulates may be released to the air or soils. It is expected that these risks will be strongly mitigated through the use of appropriate engineered controls, D&D procedures, containment measures, and radiation and contaminant monitoring during all site activities. Heavily contaminated structures and equipment will be appropriately contained at all times. Negative pressure ventilation and HEPA filters, as well as other containment measures will be employed to reduce contaminant releases from work areas and contaminated components during demolition activities. Contaminated materials and other wastes will be placed in appropriate containers prior to waste disposition. Radiation monitoring at the site perimeter will detect any increase in potential airborne exposures to the public as soon as they occur so that activities can be stopped or other measures taken to reduce releases.

Implementation of the D&D alternative is not expected to result in any releases of contaminants to other environmental media at the site. Control of potential runoff to surface water bodies will be prevented by proper runoff controls, and the D&D process itself is not likely to result in significant releases of contaminants to groundwater. Appropriate measures (site security and radiation safety) will be taken to prevent direct contact exposures to any members of the general public during the D&D activities.

5.3.2 Effectiveness -- Environmental

The decontamination and decommissioning of the structures identified in Removal Action No. 27 would be effective in reducing the above grade sources of ecological risk associated with the contaminants in these structures and would also be effective in supporting aesthetic rehabilitation and expanded land use at the site. The environmental impacts associated with implementation of the D&D alternative are largely mitigable using proven technologies and ultimately contribute to environmental enhancement at the site. These are described briefly below and in more detail in Section 6.4.

5.3.2.1 Air Resources

Implementation of the D&D alternative will be effective in reducing the sources of airborne contamination currently present at the site. The activities proposed for each of the structure types are such that the D&D implementation itself will not result in measurable deterioration in air quality or risk of exposure to onsite workers or offsite residents. The structures will be kept intact during the interior cleaning and dismantling of equipment, the structure thus acting as containment. As required, air will be exhausted through HEPA filters sized to ensure that the quality of the ejected air is within limits set by the ARARs. When necessary, activated charcoal filters will be used to remove chemical vapors from the ventilation exhaust air. Negative pressure will be maintained within the buildings at all times. All interior workers will operate in accordance with DOE Orders and OSHA regulations governing health and safety. Modelling using worst case assumptions (see Section 6) indicates that workers outside the buildings being dismantled will not be exposed to levels of contaminants to which a health risk can be attributed. Similarly, no offsite exposure to airborne contaminants of health significance is anticipated based on the results of ISCLT2 modelling. The airborne transmission of Histoplasmosis-causing fungal spores during the dismantling of Building 7A would be prevented through the controlled removal of the supporting fecal matrix, as a primary action in the D&D scenario.

The use of diesel and gasoline driven vehicles and construction equipment during implementation of D&D activities will not result in significant contributions of contaminants through exhaust emissions.

Movement of dismantled equipment and contaminated materials within the site will be done using containerized transport or coverings to limit the escape of fugitive contaminants.

5.3.2.2 Aquatic Resources

The D&D alternative would be effective in reducing the risk of exposure of aquatic resources, to contaminant sources associated with the Removal Action No. 27 structures, would be consistent with environmental rehabilitation objectives for the site, and could be executed without causing negative impacts to the aquatic environment during its implementation.

Surface Water - None of the structures incorporated within Removal Action No. 27 are in proximity to the natural drainages on the FEMP site. Runoff around the various buildings is collected in the peripheral drainage system. Pads and unconfined structures are curbed and have drainage sumps. Drainage collected from either types, is transferred to settling basins prior to offsite delivery through MH 175 and its NPDES permitted outfall to the Great Miami River. During implementation of the D&D action, activities involving the cleaning of surfaces and equipment, would be confined within the structures themselves or within secondary containment structures and any water used and consequently contaminated would be collected for treatment before storage or discharge. During dismantling of exterior walls and other outside activities, runoff and erosion control measures would be implemented as per applicable FEMP SOP's. Impacts to surface water from implementation of the D&D alternative will be negligible.

Groundwater - Both radiological and nonradiological constituents have been detected in perched and regional aquifer groundwater. Total uranium above background concentrations was found in perched groundwater in the vicinity of the fire training area, but not reported for any of the other structures designated as part of Removal Action No. 27. There are three primary pathways by which contaminants could migrate into perched groundwater and the regional aquifer: subsurface leachate releases from waste storage units; infiltration of contaminated storm water runoff; and episodic releases (spills) that infiltrate. By reducing the sources of contaminants, the D&D alternative would be effective in reducing risk of contamination to groundwater. Implementation of the D&D actions would not increase contamination pathways since runoff would be controlled as described previously.

Floodplains and Wetlands - Wetlands on the FEMP site are limited to a north-south corridor along Paddy's Run and none of the D&D activities proposed for Removal Action No. 27 would be undertaken within or adjacent to these wetlands. Similarly, none of the structures or activities are located within the 1 in 100 year floodplains of either Paddy's Run or the Great Miami River. There will be no impacts therefore to wetlands or floodplains in the implementation of the D&D alternative.

Aquatic Biota - Since there will be either no negative impacts to either surface waters or wetlands from the implementation of the D&D alternative, there can be no negative effects expected to accrue to the biota dependent upon these habitats.

5.3.2.3 Terrestrial Resources

Implementation of the D&D alternative will be effective in reducing the potential risk to the terrestrial environment, will contribute to the rehabilitation objectives for the site and can be implemented without adverse environmental impact.

Soils - Of the Removal Actions related to Removal Action No. 27, only the Fire Training area will involve the excavation of soils. These will be transported to the onsite storage area designated by Removal Action No. 17 (Management of Soils and Debris) for classification and subsequent treatment and/or disposal. Implementation of the D&D alternative will support the protection of soils resources, through the removal of potential contaminant sources which could reach the soils of the site if containment systems failed. During the implementation of the D&D alternative, few opportunities will arise for soils to be directly impacted. The majority of actions will take place within the building structures or other enclosures. During the dismantling of exterior structures, erosion protection measures will be in place. Minor disturbance of soils in the immediate vicinity of the structures could occur as a result of equipment movements.

Vegetation - There is very little vegetation in the vicinity of the structures included in Removal Action No. 27, and what there is consists largely of maintained grasses. Removal of the high and low nitrate tanks (18K and 18L) and of the structures in the Fire Training Area could affect the most vegetation since these are currently surrounded by mown grass. The loss of grass is easily mitigated with planting following the removal action.

Wildlife - Implementation of the D&D alternative would contribute to the rehabilitation of the wildlife habitat at the site, would reduce the risk of exposure to contaminants and would not significantly affect wildlife during execution. The single exception would be the pigeons which currently roost in building 7A. These birds, suspected to number several dozens, would be displaced with the dismantling of the building. Since pigeons prefer manmade structures as habitat, they would be forced to relocate either to other buildings on the FEMP, from which they would eventually also be displaced, or to buildings offsite. This is not considered to be a significant impact to this population as the species is extremely abundant and adaptable.

Threatened and Endangered Species - There will be no impact to threatened and endangered species arising from implementation of the D&D alternative since there are no susceptible species within the FEMP site and there will be no transport of contaminants offsite which could result in negative impacts.

5.3.2.4 Socioeconomics

Implementation of the D&D alternative will result in positive impacts to the local and regional socioeconomic climate, resulting in additional employment, improved aesthetics, and reduced health risk while not affecting transportation or cultural resources.

Land Use - The 25 structures comprising Removal Action No. 27 cover an area of about 3.5 acres. Even with the above ground structures removed, this land area will not be available for conversion to alternate land uses until all other structures within the Production Area are finally removed. The activities of Removal Action No. 27 contribute to the eventual recovery of these lands for alternate use for agriculture, recreation or terrestrial habitat.

Employment - At its peak, implementation of the D&D action could require an additional 200 workers at the FEMP. It is expected that the majority of these could be drawn from the regional labor pool and would not require immigration. The additional employment, over the 6.8 year life of the activity, would yield both direct labor and secondary benefits to the local economy.

Transportation - Implementation of the D&D action would increase local traffic movements. To accommodate the additional workforce, about 160 additional passenger vehicles would enter and leave the FEMP on a daily basis during the peak construction period. This represents a 7% increase over the present levels and can be accommodated by the level of road service available to the site. Also, the waste and other materials requiring offsite disposition, would result in an average of only two additional truck movements from the site to one of the interstate highways each day.

Cultural Resources - There are no sites of archaeological or historical importance either on or adjacent to the FEMP that could be impacted by implementation of the D&D action on Removal Action No. 27 structures.

5.3.3 Implementability

The decontamination and decommissioning of contaminated structures will use commonly practiced engineering and de-construction techniques and pose no unusual technical difficulties. The necessary materials, equipment and services are readily available. Decontamination and dismantlement is being done on a similar scale at a similar site in Weldon Springs, Missouri, and has been completed on large projects like the decommissioning of the Shippingport Atomic Power Station and the Apollo, Pennsylvania remediation project. D&D has also been implemented on projects involving significant alpha contamination, i.e., the Radium Chemical Company facility in Queens, New York. Equipment and systems needed to prevent the spread of contamination and monitor containment during D&D are also readily available.

5.3.4 Cost

The cost analysis performed for Alternative 2 resulted in a cost determination of $147 million in 1995 dollars. The cost analysis, which includes D&D costs, waste processing, and waste disposition, is presented in Table 5-1, along with cost determinations for each of the 25 contaminated structures. Additional cost analysis details and backup is provided in Appendix C. Cost values reported in this EE/CA should not be regarded as estimates since they were developed without the benefit of detailed material takeoffs and studies which are usually part of a decommissioning plan.

5.4 Potentially Applicable or Relevant and Appropriate Requirements and Other Criteria or Guidelines to be Considered for the Proposed Actions

Pursuant to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300), remedial actions are required to meet all federal and state Applicable or Relevant and Appropriate Requirements (ARARs) to the extent practicable considering the exigencies of the situation (see 40 CFR 300.415 (i)). In determining whether compliance with ARARs is practicable, the DOE may consider the urgency of the situation and the scope of the removal action to be conducted. Section 300.430(b)8 of the NCP provides that the identification of ARARs and other "to-be-considered" (TBC) criteria be initiated during the scoping phase. The ARARs are identified during the scoping phase so as to support the development of preliminary remedial action objectives, goals, and alternatives.

TABLE 5-1
COST ANALYSIS BY STRUCTURE
ALTERNATIVE #2: D & D

STRUCTURES	PRIME COSTS SUBTOTAL	ADDED FACTORS, ENGINEERING, AND MANAGEMENT	ON SITE WASTE PROCESSING	OFF SITE WASTE DISPOSITION FREE RELEASE	LAND FILL	LLW	MIXED WASTE	RCRA	TSCA	'92 DOLLARS TOTAL COST	'95 DOLLARS TOTAL COST ESCALATED
3F Harshaw System	303,380	2,001,564	909,160		1,353	442,027	23,672			3,681,156	4,140,564
3G Refrigeration Building	93,198	374,560	133,804		1,002	90,165	634			693,364	779,895
4A Plant 4, Green Salt Plant & Misc. Tank	5,482,875	65,631,955	2,942,412		31,910	1,386,866	80,240			75,556,257	84,985,678
4C Plant 4, Maintenance Building	222,437	775,716	74,907		2,897	41,598	813			1,118,367	1,257,940
7A Plant 7 Building	2,290,435	16,751,567	1,118,052		16,816	486,209	34,953			20,698,033	23,281,148
10D. Graphite/Oil Burner	173,867	612,886	133,562		7,560	34,818	5,609			968,301	1,089,145
13B Pilot Plant Maintenance	135,084	457,785	128,242		4,824	54,671	3,355			783,961	881,799
13C Pilot Plant Sump House & Tanks	90,691	521,170	194,345		48,669	29,106	736			884,717	995,129
13D West Tank Farm	392,885	2,039,752	1,014,059		2,160	410,678	39,582			3,899,117	4,385,727
18K Temp. Lagoon Low Nitrate Tank	48,688	234,066	46,582		54	9,768	2,933			342,092	384,785
18L Temp. Lagoon High Nitrate Tank	63,812	343,489	61,155		81	13,789	3,728			486,054	546,714
32A Magnesium Storage Building	304,089	1,062,177	565,565		10,097	362,617	3,561			2,308,108	2,596,160
32B Covered Loading Deck	21,514	118,792	7,984		38	5,016	80			153,423	172,570
39A Incinerator Bluilding	474,171	2,589,457	315,920		5,669	104,547	13,739			3,503,504	3,940,742
39D Incinerator - Sewage Treatment Plan	49,294	281,679	15,452			7,055	475			353,955	398,129
65 Plant 5 Whse (Thorium Warehouse)	459,371	2,034,906	199,857		1,200	99,120	5,222			2,799,676	3,149,076
67 Thorium Warehouse	138,609	649,964	43,763		89	26,959	522			859,907	967,223
68 Thorium Warehouse	348,567	1,352,439	82,494		7,224	37,014	863			1,828,601	2,056,810
69 Old D & D Building	653,330	3,223,289	789,335		7,663	231,067	39,712			4,944,396	5,561,457
72 Warehouse for Integrated Demo	131,559	605,561	44,134		544	28,895	261			810,954	912,161
73A Fire Brigade Training Center	41,915	163,575	15,316		2,085	5,573	131			228,594	257,123
73B Fire Training Pond	47,160	296,605	2,237,461			1,069	197,817	647,827		3,427,939	3,855,746
73C Fire Training Tank	7,089	74,664	18,219		27	1,539	1,405	11,923		114,867	129,202
73D Fire Training Burn Trough	7,821	75,419	3,788			2,763				89,792	100,998
73E Combined Space Burn Plant	16,412	100,228	810			486				117,936	132,655
TOTAL	11,998,254	102,373,267	11,096,377		151,962	3,913,416	460,045	659,750		130,653,071	146,958,575

EXPLANATION OF COLUMN FIELDS
COST ANALYSIS TABLES

1. Structures	-	Number and description of structure (or building) being costed.
2. Prime Costs Subtotal	-	Raw material, labor and construction equipment costs.
3. Added Factors, Engineering and Management	-	Additional costs above raw material, labor and construction equipment costs necessary for actual D&D completion which are associated with that particular structure. These factors are D&D environmental monitoring, hazardous material productivity, job condition factors, indirects, health physics, CERCLA costs, bond, general contractor mark-up on subcontractors, and general contractor's overhead and profit. Also included are all construction management, project management and engineering fees.
4. Onsite Waste Processing	-	A unit cost per cubic foot of waste materials to be processed onsite as either an intermediate step to final processing or as an interim storage cost until final disposition of waste.
5. Offsite Waste Disposition	-	A unit cost per cubic foot of waste material to be processed at final disposition
A. Free Release	-	Dollar costs for releasing "clean" salvageable material to the public.
B. Landfill	-	Dollar costs for burial of "clean" waste to a local registered landfill.
C. LLW	-	Dollar costs for final disposition to a low-level radiation dump site.
D. Mixed Waste	-	Dollar costs for final disposition of possible mixed (LLW & RCRA) wastes.
E. RCRA	-	Dollar costs for final disposition of only RCRA wastes.
F. TSCA	-	Dollar costs for incineration at an authorized TSCA incineration site.
6. '92 Dollars Total Cost	-	All costs included in Columns 1 through 6 listed above.
7. '95 Dollars Total Cost Escalated	-	1992 dollars total costs escalated to midpoint of project - 1995 - 12.48% escalation.

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ARARs are divided into three categories: (1) chemical-specific ARARs address certain contaminants or classes of contaminants and relate to the level of contamination allowed for a specific pollutant in various environmental media (e.g., soil, water, and air); (2) location-specific ARARs are based on the specific setting and nature of the site; and (3) action-specific ARARs are related to specific technology or activity-based requirements for response actions proposed for implementation at the site. The preliminary identification of potential ARARs for the proposed alternatives at OU3 is based on the location of OU3, the nature of the contamination, and the proposed response actions. Table 5-2 provides a general listing of environmental statutes, executive orders, DOE orders, and other potentially applicable guidance pertinent to the proposed action. The potential ARARs and TBCs potentially applicable for the proposed actions for the Management of Contaminated Structures are listed in Appendix B and are discussed below under the three EPA-recommended classifications mentioned above.

5.4.1 Chemical-Specific Requirements

The major concerns associated with implementing the alternatives are those related to protecting workers and minimizing airborne emissions to control off-site releases. All activities would be conducted in accordance with pertinent worker-protection requirements of the Occupational Safety and Health Administration Standards for Hazardous Waste Operations and Emergency Response (29 CFR Part 1910). These requirements are not considered in the formal ARAR evaluation process because they are part of an employee protection law with which CERCLA response actions must comply, as specified in the NCP. Worker exposure to airborne asbestos fibers would also be maintained within the permissible limits promulgated under the Toxic Substances Control Act.

The proposed action would be conducted in accordance with DOE Orders and all pertinent ARARs for protecting human health and the environment. The DOE Orders most significant to implementing the alternatives are listed in Table 5-3.

Potential chemical-specific requirements considered for the proposed action include those promulgated under the Clean Air Act, such as the National Emission Standards for Hazardous Air Pollutants (NESHAPs) and the National Ambient Air Quality Standards (NAAQS). The NESHAPs requirements are codified in 40 CFR Part 61, and the NAAQS requirements are codified in 40 CFR Part 50. The

TABLE 5-2

FEDERAL AND STATE STATUTES, EXECUTIVE ORDERS, DOE ORDERS, AND NUCLEAR REGULATORY COMMISSION GUIDANCE POTENTIALLY PERTINENT TO THE PROPOSED REMOVAL ACTION AT THE FEMP

Federal Laws

Antiquity Act/Historic Sites Act
Archeological and Historic Preservation Act of 1974
Archeological Resources Protection Act of 1979
Atomic Energy Act of 1963, as amended
Clean Air Act of 1963, as amended
Clean Water Act, as amended (also referred to as Federal Water Pollution Control Act of 1972, as amended)
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986.
Department of Energy Organization Act of 1977
Endangered Species Act of 1973, as amended
Fish and Wildlife Coordination Act of 1934, as amended
Hazardous Materials Transportation Act of 1974, as amended
National Historic Preservation Act of 1966, as amended
Noise Control Act of 1972
Noise Pollution and Abatement Act of 1970
Occupational Safety and Health Act of 1970
Safe Drinking Water Act of 1974, as amended
Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984
Toxic Substances Control Act of 1976
Uranium Mill Tailings Radiation Control Act of 1978, as amended

State Statutes

Ohio Air Pollution Control Law, Ohio Revised Code, Title 37 - Health-Safety-Morals, Chapter 3704
Ohio Air Pollution Control Regulations, Ohio Administrative Code, Title 3745, - Environmental Protection Agency, Chapters 3745-15, -16, -19, -20, -21, -25, -26, -31, -35, -45, -49, -73, -74
Ohio Ambient Air Quality Standards, Ohio Administrative Code, Title 3745 - Environmental Protection Agency, Chapters 3745-17, -18, -23, -71
Ohio Water Pollution Control Law, Ohio Revised Code, Title 61, Water Supply-Sanitation-Ditches, Chapter 6111
Ohio Safe Drinking Water Act, Ohio Revised Code, Title 61, Water Supply-Sanitation-Ditches, Chapter 6109
Ohio Revised Code, 3710, Dept of Health Asbestos Abatement Law (effective 10/8/92).

TABLE 5-2 (Cont'd)

State Statutes (Cont'd)

Ohio Wastewater Treatment Regulations, Ohio Administrative Code, Title 3745 - Environmental Protection Agency, Chapter 36 - Regulation of Discharge of Nondomestic Wastewater into a POTW
Ohio Non-Point Source Regulations, Ohio Administrative Code, Title 1501 - Department of Natural Resources, Chapter 1501:15-1, -3, -5
Ohio NPDES Permit Regulations, Ohio Administrative Code, Title 3745 - Environmental Protection Agency, Chapters 3745-33-01 through 3745-33-10
Ohio Drinking Water Regulations, Ohio Administrative Code, Title 3745 - Environmental Protection Agency, Chapter 81 - Public Water System Primary Contaminant Control
Ohio Water Quality Regulations, Ohio Administrative Code, Title 3745 - Environmental Protection Agency, Chapter 1
Ohio Effluent Guidelines and Standards, Ohio Administrative Code, Title 3745 - Environmental Protection Agency, Chapter 3 - Pretreatment Requirements and Standards
Ohio Solid and Hazardous Waste Disposal Law, Ohio Revised Code, Title 37, Health-Safety-Morals, Chapter 3734
Ohio Solid Waste Disposal Regulations, Ohio Administrative Code, Title 37, Health-Safety-Morals, Chapter 27
Ohio Conservation of Natural Resources, Ohio Revised Statutes, Title 15 - Division of Wildlife
Ohio Department of Natural Resources Regulations, Chapters 1501:18 - Endangered Species and 1501:31 - Division of Wildlife

Executive Orders

Executive Order 11490, Assigning Emergency Preparedness Functions to Federal Departments and Agencies
Executive Order 11514, Protection and Enhancement of Environmental Quality
Executive Order 11593, Protection and Enhancement of the Cultural Environment
Executive Order 11738, Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans
Executive Order 11807, Occupational Safety and Health Programs for Federal Employees
Executive Order 11988, Floodplain Management
Executive Order 11990, Protection of Wetlands
Executive Order 11991, Relating to the Protection and Enhancement of Environmental Quality
Executive Order 12088, Federal Compliance and Pollution Control Standards
Executive Order 12146, Management of Federal Legal Resources
Executive Order 12580, Superfund Implementation

TABLE 5-2 (Cont'd)

Department of Energy Orders

Order 1540.1 Materials Transportation and Traffic Management
Order 4240.1H Designation of Major System Acquisition and Major Projects
Order 4320.1A Site Development and Facility Utilization Planning
Order 4700.1 Project Management System
Order 5000.3 Unusual Occurrence Reporting System
Order 5400.1 General Environmental Protection Program
Order 5400.3 Hazardous and Radioactive Mixed Waste Management (was Chapter II of 5480.1A)
Order 5400.4 Comprehensive Environmental Response, Compensation and Liability Act Program
Order 5400.5 Radiation Protection of the Public and the Environment
Order 5440.1D Implementation of the National Environmental Policy Act
Order 5480.1B Environment, Safety and Health Program for Department of Energy Operations
Order 5480.3 Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes (was Chapter III of 5480.1A)
Order 5480.4 Environmental Protection, Safety and Health Protection Standards
Order 5480.11 Radiation Protection for Occupational Workers
Order 5481.1B Safety Analysis Review System
Order 5482.1B Environmental Protection, Safety and Health Protection Appraisal Program
Order 5483.1A Occupational Safety and Health Program for DOE Employees at Government-Owned, Contractor-Operated Facilities
Order 5484.1 Environmental Protection, Safety and Health Protection Information Reporting Requirements
Order 5500.2 Emergency Planning, Preparedness, and Response for Operations
Order 5700.6B Quality Assurance
Order 5820.2 Radioactive Waste Management

Nuclear Regulatory Commission Guidance

NRC Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors
NRC Branch Technical Position Paper, 46 FR 52061, Disposal or On-Site Storage of Residual Thorium or Uranium from Past Operations

TABLE 5-3

MAJOR DOE ORDERS PERTINENT TO IMPLEMENTING THE PROPOSED ACTION

DOE Order	Title
5400.1	General Environmental Protection Program
5400.3	Hazardous and Radioactive Mixed Waste Management
5400.4	Comprehensive Environmental Response, Compensation, and Liability Act Requirements
5400.5	Radiation Protection of the Public and the Environment
5440.1D	National Environmental Policy Act Compliance Program
5480.1B	Environment, Safety, and Health Program for Department of Energy Operations
5480.4	Environmental Protection, Safety, and Health Protection Standards
5480.8	Contractor Occupational Medical Program
5480.9	Construction Safety and Health Program
5480.10	Contractor Industrial Hygiene Program
5480.11	Radiation Protection for Occupational Workers
5481.1B	Safety Analysis Review System
5482.1B	Environmental Protection, Safety, and Health Protection Appraisal Program
5483.1A	Occupational Safety and Health Program for DOE Employees at Government-Owned Contractor-Operated Facilities
5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
5000.3	Unusual Occurrence Reporting System
5500.2	Emergency Planning, Preparedness, and Response for Operations
5820.2A	Radioactive Waste Management

NESHAPs requirements for radionuclides (given in 40 CFR Part 61, Subparts H and Q) and those for asbestos (given in Subpart M) are considered ARARs for this action.

The NAAQS are not considered ARARs because they do not apply directly to source-specific emissions; rather they are national limitations on ambient air concentrations (see Table B.1 of Appendix B). Requirements promulgated under Ohio air pollution control regulations include those in Ohio Administrative Code (OAC) 3745-17-02, which pertain to the control of airborne particulate emissions, and those in OAC 3745-20-04 and -05, which pertain to the control of asbestos emissions and OAC 3745-71-02 which sets emissions levels for lead. These requirements are considered ARARs for the proposed action.

Additional chemical-specific requirements considered for the proposed action include those for radon-222, as promulgated under the Uranium Mill Tailings Radiation Control Act (UMTRCA). In accordance with these requirements, radium-contaminated material that would result from implementing this action would be stored in a manner such that radon-222 releases would not (1) exceed an average release rate of 20 pCi/m^2-s or (2) increase the annual average concentration of radon-222 in air at or above any location outside the site perimeter by more than 0.5 pCi/L.

5.4.2 Location-Specific ARARs and TBCs

Potential location-specific requirements considered for the proposed action include those promulgated under 10CFR1022 such as Protection of Wetlands and Floodplain Management. However, the proposed actions for Management of Contaminated Structures at the FEMP is not expected to impact floodplains, wetlands, cultural resources or wildlife.

5.4.3 Action-Specific ARARs and TBCs

Action-specific ARARs and TBCs regulate the process and operation of response actions. Executive Order 12088 defines the authority and scope of DOE compliance with environmental statutes. DOE programs of compliance with specific environmental statutes are defined in DOE5400.4 (CERCLA), Executive Order 12580 (Superfund), and 42USC4341 (NEPA). DOE Orders 5400.5 and 5480.11 set the radiation protection requirements for the public, the environment, and workers.

Monitoring and reporting requirements for DOE operations (including releases) are governed by DOE Order 5484.1 and by NRC requirements listed in 10CFR61.80 and 40CFR300. Management of residuals from the treatment and disposal actions will be regulated under the NRC land disposal rules (10CFR61) and DOE Order 5820.2A. Decontamination levels are specified in USNRC Regulatory Guide 1.86 and DOE Order 5400.5.

Packaging and control of hazardous material transport offsite will potentially be subject to the requirements of the Hazardous Material Transportation Act (49 USC1801-1812), Solid Wastes (40CFR263) and the Hazardous Materials Regulations General Requirements for Shipments and Packaging (49CFR173).

6.0 SELECTION OF PREFERRED ALTERNATIVE

In Section 5.0, the Removal Action Alternatives were evaluated on an individual basis against four identified criteria: effectiveness in protecting public health; effectiveness in meeting environmental objectives; ease of implementation; and cost. This section presents a comparative evaluation of the alternatives to support the selection of a preferred alternative. It also provides a description of the proposed action, and proceeds to assess the environmental impacts associated with that selection.

6.1 Comparative Evaluation

This evaluation compares the remaining alternatives (No Action and D&D) on the basis of five factors. These factors are the four addressed in Section 5, effectiveness in protecting human health; the environment; implementability; and cost. In addition, the potential consistency between the Removal Action No. 27 Alternatives and the potential range of remedial alternatives to be developed and evaluated in the OU3 RI/FS is also evaluated.

Effectiveness - Human Health and Environment: The relative effectiveness ranking of the alternatives is based on the degree of removal of contaminants. The No Action Alternative would relieve none of the potential environmental and public health risk associated with the 25 contaminated structures. In contrast, the D&D alternative would be totally effective in eliminating the above-grade source of risk to public health and the environment associated with the 25 contaminated structures. The benefits from the D&D alternative will accrue more quickly to the extent that the structures can be remediated in advance of the completion of the RI/FS process.

Implementability: The D&D and No Action Alternatives have been established to be equally implementable from both a technical and administrative perspective.

Cost: The difference in costs between the two alternatives is dramatic. This is because D&D includes the removal, treatment and disposal of materials and the structures. The No Action Alternative would only require costs to provide site security and routine maintenance/monitoring which is currently being conducted for the 25 structures. A separate cost analysis for No Action was not developed as the relative magnitude of these costs is well below the costs for D&D.

Consistency: The No Action Alternative and Decontamination and Decommissioning are both wholly consistent with the alternatives to be addressed in the RI/FS because they do not deviate from the path leading to complete D&D, the anticipated final remedy.

Based on the comparison of alternatives against the identified criteria, the No Action Alternative will not provide protection of public health and the environment. In light of the inevitable D&D of these structures, either as part of an OU3 ROD, or after their structural integrity has been compromised, the No Action Alternative is eliminated from further consideration.

Implementation of the D&D alternative will reduce potential future on-site and off-site risks associated with the potential exposures of the general public to contaminants and radiation from the contaminated structures. As discussed in Section 5.1, decontamination and decommissioning of the structures will essentially eliminate exposures through the air pathway (the principal reservoirs of contamination will be removed) as well through direct contact with contaminated structures and equipment, in the event of the future loss of institutional control. The safety threat posed by unstable and deteriorating structures (which would remain under the No Action Alternative) will also be eliminated. All of the benefits will accrue more quickly if the structures are removed as part of Removal Action No. 27 than if they are not addressed until after the OU3 RI/FS is complete. The D&D alternative also provides opportunity for environmental restoration and enhancement as the removal of these structures will facilitate future remedial decisions for soil and groundwater cleanup as their continued presence presents concerns relative to the potential effectiveness and implementability of remedial alternatives developed for OU3.

6.2 Identification of the Preferred Alternative (Proposed Action)

Based on the considerations presented in Section 6.1, Alternative 2, Decontamination and Decommissioning is selected as the preferred alternative for the proposed removal action. This alternative would reduce potential adverse impacts to worker safety and would minimize potential risks to human health and the environment that would be associated with both imminent and eventual contaminant releases from these structures. This alternative can be implemented by means of standard engineering practices and equipment, and it is cost-effective. In addition, the D&D Alternative is consistent with the range of remedial actions envisioned for consideration in the upcoming RI/FS and would accelerate the CERCLA remediation. Under this alternative, contaminated material associated with the contaminated structures would be transported to the facilities operated by the FEMP; consistent with site waste management plans and regulations. Additional characterization of this material could be performed, if needed, to support waste management decisions about treatment and disposition. D&D also satisfies the justification criteria for interim actions in anticipation of a RI/FS because the 25 structures being considered currently present safety hazards to on-site personnel and represent potential hazards to both on-site and off-site individuals. Finally, this action does not prejudice future decisions or limit the choice of reasonable alternatives because (1) the alternative can be pursued in a phased approach and (2) the management of the material associated with these structures is open to the full range of treatment and disposal options.

6.3 Description of Proposed Action

The proposed action is described as the decontamination and decommissioning (D&D) of the 25 contaminated structures addressed by this EE/CA. This would include:

- the disassembly as necessary and removal of equipment in a structure and the packaging of bulk materials present;

- surface decontamination measures as necessary to clean contaminants from surfaces, i.e., floors, walls, ceilings, and structural members;

- the removal of the structure itself; and

- the proper disposition of materials and wastes consistent with prevailing regulations, and transportation to approved storage locations.

The proposed action will be implemented in a phased approach with discrete work plans developed for the group of contaminated structures included in each phase. The schedules for implementation will be prepared by DOE as part of the annual selection of removal action responses in accordance with the Amended Consent Agreement. Appendix D contains data sheets along with detailed site maps for each of the contaminated structures comprising the proposed action. Included on these data sheets is pertinent chemical and radiological contaminant characterization information, description and construction type, expected waste stream volumes by type, as well as off-site waste containerization determinations and weight, cost, and job difficulty factors. These data sheets are expected to be updated as more detailed information becomes available and will form a basis for work plan development.

An observational approach will be used to implement the proposed action, under which, the exact sequence of procedures used to decontaminate and dismantle the structures will be dictated by field conditions and other pertinent FEMP objectives. Accordingly, work plans will be prepared prior to initiating activities, and the detailed procedures identified in these plans will be adjusted in response to changing conditions as the work proceeded. This approach will allow for waste segregation during implementation and for interactive use of engineering controls to minimize airborne releases, e.g., by implementing activity-specific controls as indicated by monitoring results. The use of this approach will also reduce the likelihood for occupational injuries through its progressive responsiveness to ongoing health and safety concerns.

In general, the removal of subsurface structures, such as foundations, is not part of the proposed action. This will be addressed in the RI/FS-EIS. Floor slabs remaining after building dismantlement would be decontaminated and scabbled to remove contamination. This operation will be accomplished using equipment outfitted with a self-contained vacuum and filtration unit to minimize potential airborne releases. For certain buildings, if necessary to support response objectives, belowground structures would be removed either in sections or intact. Work plans will be developed during the detailed engineering phase of this action to address specific conditions of each structure.

Some areas of soil adjacent to certain structures (i.e., 73A through E Fire Training facilities) are radioactively contaminated as a result of prior plant activities. These areas may be dewatered and excavated concurrently with structure dismantlement, and tracking or other dispersal of soil contaminants potentially caused by response action activities, will be mitigated through proper controls. The excavated soil would be controlled and stored on-site pending ultimate disposal decisions in accordance with the plan contained in Removal Action No. 17 -- Improved Storage of Soil and Debris.

Generally accepted engineering practices and mitigative measures will be implemented to minimize erosion and transport of soil from exposed work areas. These include limiting the size of the work area and using silt fences, straw bales, and sediment traps. Surface runon and runoff controls would be implemented to control both the amount of water that could contact contaminated material as well as management of offsite discharge in accordance with the site's National Pollutant Discharge Elimination System (NPDES) permit established with the State of Ohio. Water meeting the discharge requirements of the permit would be released through a permitted outfall. Water not meeting permit requirements would be treated as appropriate.

Implementation of the proposed action will generally follow the sequence of fourteen standard steps (A through O) as outlined in Table 6-1. Prior to initiating any of these steps, activities implemented as part of Safe Shutdown and Waste Removal Actions at the FEMP (Removal Action No. 12 and No. 9 respectively) are anticipated to be completed. These prerequisites to the D&D process are:

1. All existing stored and containerized material have been removed from the structure.
2. All liquids have been removed from the structure and its associated equipment.
3. Reactive chemicals have been pacified in place, particularly concentrated acid, UF_6 and HF.
4. All bulk solids have been removed.
5. Smearable contamination removed to 10X DOE Order 5400.5.
6. Safe Shutdown activities have been completed.

The 25 contaminated structures associated with the proposed action represent a variety of different construction types and materials. The applicability of each of the 14 standard D&D steps outlined in Table 6-2 will therefore vary from structure to structure. Table 6-2 demonstrates how the standard D&D steps would be applied to each of the 25 contaminated structures. Explanatory notes are provided when a variation to a standard step is required to accommodate the uniqueness of a structure.

TABLE 6-1

STANDARD D&D STEPS FOR THE PROPOSED ACTION

Step	Description	Type of Structure		
		Transite	Block	Pre-Engineered
A	Remove all loose equipment: 1) Except for motor oil, test all oil for PCBs. If PCB present, drain and flush according to 40CFR761. Expect liquid PCB waste to be toxic and radioactive (mixed waste). 2) Dry or drained and flushed equipment will be reused, sent to smelter, or discarded as LLW. 3) Gasoline, oil and grease are removed and incinerated, leaving LLW residue. Grease in a gearbox can be mixed with lighter hydrocarbon for removal.	0	0	0
B	Provide containment as necessary and seal openings in the buildings as needed. Install HEPA filtration units. Test filters in place. The use of additional filters in series can reduce the risk of release.	0	0	0
C	Clean surfaces: Material decontamination (vacuuming and wiping) will be sufficiently provided to support each step as required.	0	0	0
D	Remove asbestos (except transite) from lines and vessels. Use glove bags and greenhouses. No volume reduction will be attempted to avoid release of asbestos fibers. Asbestos double-bagged and put in 7A boxes.	0	0	0
E	Remove process equipment: Work with equipment contaminated with mercury, if any, first. Then remove the less contaminated equipment. Save highly contaminated equipment, especially thorium-contaminated equipment, for last. Provide secondary containment, depending on the contamination present and the kind of activity. Principal cutting technology anticipated is torch cutting, but also some mechanical means, i.e., hydraulic cutter. One method is to penetrate the system to be removed and install HEPA ventilator, spark arrestor, and chemical trap if mercury is expected. For equipment (as opposed to pipes) that is too big to conveniently cut, bag ends and move to a central decontamination area. For externally contaminated equipment, bag or fix contamination with strippable paint. A centralized decontamination facility is expected to be established in or near the structure. Consider fixing contamination in ducts with water-base paint before disassembly. Cut out sections of pipe from the far end of the system. Cover ends of pipe, and put in 7A boxes. Exhaust HEPA to interior of the building. For tanks and vessels use an elephant trunk and hood with HEPA to collect fumes. Size equipment and piping for packaging and/or disposal if convenient during removal. If not, install greenhouses in the building for further cutting and possible grit blasting. Take steel to Decontamination facility and cut or sandblast or scabble. Thick, simple steel goes to scrap (free release) others to smelter or LLW. Size as necessary to package.	0	0	0
F	Remove sludges from sumps using wet vacuum or pump out as slurry. Test the residue. Expect mercury. Waste will be mixed waste.	0	0	0
G	Scabble or sandblast block walls. Use vacuum pickup. Outside and inside if painted, inside only if not. Assume contamination on unpainted outside block will meet limits. Probably true of painted blocks too, but can not be conveniently verified for block walls.	X	0	X
H	Scabble floors and poured concrete internal walls, including sumps. Use a vacuum pickup. Test the fines, but assume that they will be LLW.	0	0	0
I	Remove roof hardware (i.e., stacks and ventilators). Dispose as LLW or package for smelting. Provide containment where applicable.	0	0	0

TABLE 6-1 (Cont'd)

STANDARD D&D STEPS FOR THE PROPOSED ACTION

Step	Description	Type of Structure		
		Transite	Block	Pre-Engineered
J	Remove transite siding one sheet at a time by unbolting. Dispose of the lead bolt covers as mixed waste. If the insulation is friable asbestos, a containment will be required. Spray insulation with encapsulant before removing. Prefer to remove from the inside out on walls, outside in on roof.	0	X	X
K	Remove steel roofing and siding from the top down. This step applicable to pre-engineered structures only. Dispose by smelting or free-release.	X	X	0
L	Remove built-up roofing from building. This step only applicable to block buildings. Test to see if it is hazardous. Assume most is LLW. use clamshell or industrial method for removal, package in sea-land and dispose.	X	0	X
M	Remove structural members: Begin with steel roof supports or trusses from block building (if any) and structural steel from pre-engineered buildings and transite buildings. Include metal windows. Lead window sills should be separated out and disposed as mixed waste. Break glass, treat (wash), and dispose in sanitary landfill. Steel should be (A) cleaned and released -- by taking it down and transporting to the decon facility. What can't be adequately deconned and free released should be smelted or disposed as LLW, based on cost effectiveness.	0	0	0
N	Break up block walls and other masonry walls to grade. Dispose of rubble at sanitary landfill.	X	0	X
O	Core the floor slab to allow drainage of water in preference to puddling. Survey and characterize and apply coatings, where applicable.	0	0	0

X = Step is not applicable.

0 = Step is applicable.

TABLE 6-2

APPLICABILITY OF STANDARD D&D STEPS AND WASTE DISPOSITION FOR EACH CONTAMINATED STRUCTURE

Typical D&D Steps	Contaminated Structures																								
	3F	3G	4A	4C	7A	10D	13B	13C	13D	18K	18L	32A	32B	39A	39D	65	67	68	69	72	73A	73B	73C	73D	73E
A: Remove Loose Equipment		○	○	○	○	○	○					○	○	○	○				○						
B: Containment/Seal Openings	1	○	○	○	○	8	○		22			○	○	○	○	○	○	○	○	○					
C: Clean Surfaces	○	○	○	○	○	○	○	○	○			○	○	○	○	○	○	○	○	○					
D: Remove Asbestos	○	4	○	○	○		○	17	○			○		○					○						
E: Remove Process Equipment	○	○	○		○	9	○	18	18			○		31	○				○			43	○	○	○
F: Remove Sludges	○		○		○	10	○	19	19	24	24			○					○					○	○
G: Scabble Walls		○					13	○											○						
H: Scabble Floors	2	○	○	○	○	11	○	○	2			○	○	2	○	○	○	○	2	○	○				
I: Remove Roof Hardware			○		○		○					○		○	○				○						
J: Remove Transite		5	○	○	○							28	○	32				○		○					
K: Remove Steel Siding															○	○	○								
L: Remove Built-up Roofing							○	○		○		○			○				○		○				
M: Remove Structural Members	○	○	○	○	○		14	○	○	25	25	○	○	○	○	○	○	○	○	○	40				
N: Block Walls							15	20				29							37		41				
O: Core Slab		○	○	○	○	○	○	○	○	26	26	○	○	○	34	○	○	○	○	○	○				
Waste Disposition	3	6		7		12	16	21	23	27	27	30	30	33	34	35	35	36	38	39	42	44	45	46	47

Legend:

○ - Indicates applicability of Standard Step in D&D procedure.

A number (x) indicates applicability of Standard Step as modified by Note. No. *x*. For notes see page 2 of Table 6-2.

▒ - Indicates Standard Step in D&D procedure is not applicable.

TABLE 6-2 Cont.
Explanatory notes for variations to Standard D&D Steps:

1) Contain entire outdoor structure to facilitate asbestos removal.
2) Remove acid resistant bricks, dispose as LLW, or mixed waste, remove or scabble pad underneath.
3) Wastes: Asbestos as LLW, most steel cleaned, remainder LLW; material removed from steel may be mixed (Pb-based paint), rubbled pad LLW.
4) After scabbling floor, remove asbestos siding, two layers, and asbestos insulation in between. Is insulation friable? If so, contain whole building. Remove from outside in or vice versa, depending on construction details.
5) Transite panels and roof also.
6) May justify inside layer of siding as suitable for sanitary landfill. Remainder of transite LLW, steel cleaned and free released; remainder LLW; bolt covers, material from steel may be mixed.
7) Scabbling fines expected to be mixed waste. Most steel cleaned and released. Remainder LLW. Asbestos siding and insulation to LLW disposal site.
8) Put tent over pad, to break up concrete.
9) Move directly to decon facility and treat; some steel can be cleaned.
10) Clean bulk material before breaking up concrete.
11) Break up concrete in entirety.
12) Equipment, 50% released steel, 50% mixed waste, all concrete mixed, must be treated or disposed.
13) Metal frames removed with blocks.
14) Roof supports, if any,
15) Scabble or vacuum-blast walls where necessary. Built-up roofing removed.
16) Blocks to sanitary landfill. Roofing to LLW, steel (not large) to LLW, scabbled floor material mixed.
17) On vessel, may be moved intact after wrapping to clean-up area.
18) Only tanks and bins.
19) Sumps filled with soil, save for RI/FS.
20) Clean blocks as necessary/vacuum-blast.
21) Asbestos as LLW or Landfill. Most steel released, remainder LLW. Scabble fines LLW, shingle roof LLW or mixed.
22) Contain major parts of the facility in total to decon as necessary before moving.
23) Most steel released, remainder LLW, material removed from steel is mixed (Pb-based paint). Scabbled material mixed/organics.
24) Any sludge assumed removed.
25) Steel sides and framing.
26) Polymer lining.
27) Steel cleaned and released, lining possibly mixed because of 1,1,1 - Trichloroethane. Material removed from steel, mixed (Pb).
28) A small amount.
29) Vacuum-blast block walls as necessary, remove built-up roofing.
30) Block to sanitary landfill, most steel cleaned and released. Remainder LLW and material removed - mixed (Pb). Scabbling fines LLW, vacuum-blasting fines LLW, roofing to LLW.
31) Some equipment may require decontamination in place before movement to central facility.
32) Two layers of transite siding with asbestos insulation in between.
33) Asbestos to Landfill or LLW, most structural steel cleaned and released, remainder LLW, material removed - mixed, scabble fines - mixed.
34) Scabbling fines expected to be mixed waste.
35) Most steel cleaned and released. Remainder LLW, material removed LLW, scabbling fines mixed.
36) Most steel cleaned and released, scabbling fines mixed; transite to LLW.
37) 100% brick floor to be removed. Block walls vacuum-blasted as necessary, built-up roofing removed.
38) Bricks and scabbling fines mixed. Most steel cleaned and released. Remainder LLW. Material removed--mixed. Roofing to LLW. Wall fines - LLW.
39) Transite to LLW. Asbestos sandwich to LLW, most steel released, remainder and scabbling fines to LLW. Material removed off of steel, mixed (Pb).
40) Wood truss.
41) Vacuum-blast block walls as needed.
42) Released to LLW, except material taken off of steel - mixed.
43) Dewater, excavate and contain.
44) Expect mixed waste.
45) Tank to LLW.
46) Most steel released after cleaning, remainder LLW. Material removed from steel - mixed.
47) Most steel cleaned and released. Remainder, and material removed, to LLW.

The proposed action incorporates specific measures designed to reduce potential adverse effects on human health and the environment during its implementation as shown in Table 6-3 and would be conducted in accordance with health and safety plans developed to ensure worker protection. Additional plans including requirements for expected conditions and for anticipated responses to abnormal situations (e.g., increased levels of airborne emissions) or emergency situations (e.g., accidents), would be prepared as required during the engineering phase.

Appropriate measures would be employed to keep these risks to an acceptable level during the implementation of the preferred alternative. Exposures of workers to radiologic and chemical hazards would be reduced through the use of appropriate D&D techniques, engineering controls, personal protective equipment, and workplace monitoring. ALARA principals would be used to reduce exposures to radioactivity by following standard health physics and industrial hygiene practices, and all appropriate OSHA, and DOE exposures limits could be observed. It is not expected that implementation of the preferred alternative would result in any appreciable adverse health effects in the D&D workers.
Safety hazards could be minimized through the use of appropriate engineering practices, and through compliance with all appropriate OSHA standards for heavy construction and demolition activities. Proper adherence to these procedures and standards could be expected to reduce the probability of occupational injuries during D&D to the same as that associated with any similar construction or demolition activity.

The proposed action will generate large volumes and different types of waste which are expected to be handled consistent with overall FEMP waste management objectives. Table 6-4 identifies for each contaminated structure the volumes and types of waste anticipated to be generated by implementation of the proposed action. Table 6-5 identifies the total volumes of waste by type, for the 25 contaminated structures combined. Additional details and volumes by type of waste for each of the 25 structures is provided in Appendix E.

6.4 Potential Environmental Impacts of the Proposed Action

Decontamination and decommissioning was selected as the preferred alternative for dealing with the Removal Action No. 27 structures because it was shown to be the most effective in meeting the overall objectives of 1) reducing environmental risk and 2) providing opportunity for environmental restoration

TABLE 6-3

MAJOR MITIGATIVE MEASURES FOR THE PROPOSED ACTION

Factor	Features
Dust Control	Openings in floors, walls, ceilings, and roofs would be sealed to the extent feasible to prevent airborne releases outside of structures during decontamination activities. Localized ventilation would be used in heavily contaminated buildings, as needed, to minimize contaminant releases to the environment. Contaminated equipment and vessels would be sealed prior to removal and dispositioned consistent with FEMP waste management plans and procedures to eliminate airborne releases from any residual contamination. Dust would be controlled primarily with wet methods (e.g., water sprays) during dismantlement activities. Material that is subject to airborne emissions, such as friable asbestos-containing material, would be packaged prior to placement in temporary storage. Material that is subject to wind erosion would be containerized and/or covered in suitable on-site disposal facility or stored within an existing building, in accordance with the FEMP waste management plans and procedures.
Decontamination	Activities would be sequenced to minimize worker exposure and potential environmental releases. Industry-proven techniques would be used to ensure efficient utilization of time and resources. These techniques include vacuuming and wet wiping of accessible surfaces containing dust and loose contamination. Vacuum exhaust would be discharged through a HEPA filter to minimize airborne emissions.
Dismantlement	Activities would be sequenced and an observational approach would be followed to minimize the physical hazards associated with dismantlement activities. Heavy equipment would be used to the maximum extent possible to reduce the likelihood of accidents that could result in personal injury.
Temporary storage	Waste resulting from implementation of the preferred alternative could be stored on-site in an EWMF or other acceptable location until off-site disposal occurs later on. Off-site disposal will occur as necessary. The EWMF has been designed and would be operated to minimize the likelihood of environmental releases. (See also the discussion for dust control and erosion control in this table.)
Equipment inspection	Equipment would be routinely inspected during operations. Equipment would not be allowed to leave the controlled area without being checked for contamination and would be decontaminated if necessary.
Noise control	Vehicle mufflers and other equipment would be checked periodically and maintained in good condition.

TABLE 6-3 (Cont'd)

Factor	Features
Surface water management	Surface water would be managed to minimize contaminant releases to nearby areas. Runon and runoff control systems would be constructed to minimize water contact with contaminated material.
Erosion Control	Good management practices and engineering controls -- such as silt fences, straw bales, and sediment traps -- would be used to minimize erosion, e.g., during soil excavation activities.
Environmental monitoring	Air would be monitored for particulates in the work area, as appropriate; radionuclides in the work area and at the site perimeter during the entire action period; asbestos in the work area and site perimeter during asbestos removal activities; and other contaminants (e.g., volatile organic compounds, PCBs, and welding fumes) in the work area as required. Appropriate responses, such as increasing engineering controls, would be implemented as indicated by monitoring results. In addition, collected surface water would be monitored to ensure compliance with the NPDES permit for the site. Appropriate responses, such as treating collected water in the site water treatment plant prior to release off-site, would be implemented as indicated by monitoring results.
Protection of workers	The work environment would be continually monitored, and protective equipment such as coveralls, gloves, and respirators would be used as needed. Plans for the use of personal protective equipment would be detailed in health and safety plans prepared specifically for this proposed action.
Protection of the general public	Air would be monitored in the general work area and at the site perimeter, and appropriate responses such as increasing engineering controls would be taken if measured contaminant levels at the site perimeter increased above current levels. Access to work areas would be restricted. Contaminant releases to air and surface water off-site would be minimized by implementing appropriate engineering controls to minimize contaminant releases to the environment.
Emergency preparedness	An emergency preparedness plan is currently in place for the project. This plan includes provisions for responding to emergency situations such as spills, tornadoes, earthquakes, fires, explosions, and accidents with injuries. The project maintains a trained emergency response team that is responsible for minimizing potential adverse impacts on human health and the environment that could result from emergency situations. This team would be available during the proposed action.

TABLE 6-4
VOLUMES AND TYPES OF WASTE RESULTING FROM THE PROPOSED ACTION BY STRUCTURE

STRUCTURES	WEIGHT (TONS)	VOLUME IN CUBIC FEET						# OF SEA LAND (8X8X20) BOXES				# OF B25 (4X4X6) BOXES				# OF 7A (4.3X3X4.3) BOXES				# OF 55 GALLON DRUM			
		FREE RELEASE	SANITARY LAND FILL	LLW	MIXED WASTE	RCRA	TSCA	LLW	MIX	RCRA	TSCA	LLW	MIX	RCRA	TSCA	LLW	MIX	RCRA	TSCA	LLW	MIX	RCRA	TSCA
3F Harshaw System	3341.46	12176.43	1353.06	5525.34	295.90			12.54	0.56							20.65	9.48			11.79	0.02		
3G Refrigeration Building	79.68	269.91	1001.94	1127.07	7.93			1.26	0.04							1.85	0.07			1.65	0.85		
4A Plant 4, Green Salt Plant & Misc. Tan	4289.78	18126.66	31910.42	17335.82	1003.00			27.38	6.92							87.93	8.37			453.51	15.01		
4C Plant 4, Maintenance Building	189.41	130.14	2896.50	519.97	10.17			0.61								7.43	0.18			3.66	0.85		
7A Plant 7 Building	1892.96	3973.62	16815.72	6077.62	436.92			7.29	1.95							61.31	5.13			208.08	10.44		
10D Graphite/Oil Burner	619.89	114.58	7560.00	435.23	70.11			0.01	0.04							7.55				2.77	9.57		
13B Pilot Plant Maintenance	494.55	513.26	4823.86	683.38	41.94			0.55	0.26							11.49	0.28			1.65	1.81		
13C Pilot Plant Sump House & Tanks	3706.36	134.74	48668.60	363.82	9.20			0.03	0.09							6.62	0.03			2.69	0.19		
13D West Tank Farm	596.36	909.57	2160.30	5133.47	494.78			3.37	0.17							44.62	7.14			6.23	19.15		
18K Temp. Lagoon Low Nitrate Tank	21.93	36.58	54.00	122.10	36.67			0.01	0.04							6.28	0.13			1.81	3.83		
18L Temp. Lagoon High Nitrate Tank	28.13	61.58	81.00	172.37	46.60			0.03	0.09							7.08	0.26			3.27	3.83		
32A Magnesium Storage Building	1148.01	380.56	10097.32	4532.72	44.52			0.55	0.26							79.58	0.40			4.58	3.41		
32B Covered Loading Deck	15.91	45.88	37.50	62.70	1.00			0.04								1.20				0.27	0.85		
39A Incinerator Bluilding	522.44	633.10	5669.49	1306.84	171.74			1.35	0.17							19.99	1.46			13.94	2.66		
39D Incinerator - Sewage Treatment Pla	34.79	165.29		88.19	5.94			0.28	0.04							1.25				1.24	0.38		
65 Plant 5 Whse (Thorium Warehouse)	460.66	817.45	1200.20	1239.01	65.28			0.83	0.86							31.79				10.46			
67 Thorium Warehouse (Plant 1)	107.21	295.82	89.46	336.99	6.53			0.34	0.09							6.58				2.93			
68 Thorium Warehouse (Pilot Plant)	505.68	225.91	7223.85	462.67	10.79			0.69	0.13							4.71				7.17	0.85		
69 Old D & D Building	1139.51	1586.56	7663.26	2888.34	496.40			0.66	1.30							53.02	6.87			17.61	8.51		
72 Warehouse for Integrated Demo	79.17	65.07	544.20	361.18	3.26			0.17	0.04							7.24				2.84			
73A Fire Brigade Training Center	163.56		2084.80	69.66	1.63			0.01	0.02							1.45				0.93			
73B Fire Training Pond	248.36			13.36	2472.71	3520.80										0.11	14.25	57.02		1.11	228.07		
73C Fire Training Tank	9.36	12.04	27.00	19.24	17.57	64.80		0.00								0.36	0.86	0.84		0.14			
73D Fire Training Burn Trough	6.39	7.75		34.54				0.01								1.39				0.14			
73E Confined Space Burn Plant	13.09	48.96		6.08												0.29				0.27			
TOTAL	19714.65	40731.45	151962.49	48917.70	5750.56	3585.60		58.02	13.08							471.77	54.90	57.86		760.76	310.30		

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TABLE 6-5
VOLUMES AND TYPES OF WASTE RESULTING FROM THE PROPOSED ACTION BY WASTE TYPE

08-Dec-92

DESCRIPTION OF WASTE	WEIGHT (TONS)	VOLUME IN CUBIC FEET						# OF SEA / LAND (8X8X20) BOXES				# OF B25 (4X4X6) BOXES				# OF 7A (4.3X3X4.3) BOXES				# OF 55 GALLON DRUM			
		FREE RELEAS	SANITAR LAND FILL	LLW	MIXED WASTE	RCRA	TSCA	LLW	MIX	RC RA	O	LLW	MIX	RC RA	O	LLW	MIX	RC RA	O	LLW	MIX	RC RA	O
ASBESTOS TRANSITE SIDING	444.14		7994.48	888.28				2.40															
ASBESTOS TRANSITE ROOF	265.40		4777.13	530.79				1.43															
INTERIOR 1/4" TRANSITE	59.07		1063.33	118.15				0.32															
MARINITE WALL PANEL	306.97		5525.48	613.94				1.66															
CEMESTOS ROOFING PANEL	413.63		7445.30	827.26				2.24															
ASBESTOS (BAGGED) PIPE	54.76			4380.67	1095.17											84.24	21.06						
RIGID BOARD INSULATION	234.15		23415.00																				
ROOF MATERIAL (ASBESTOS)	315.36			5256.00												90.10							
PCB (MIXED WASTE)	11.15				371.79																53.25		
LEAD MATERIAL	12.07				34.00																28.98		
DEBRIS (GLASS/HRD.)	1102.50		5880.00	1470.00												63.00							
MISC. FABRICATE. STEEL	178.63			729.10												51.04							
STRUCTURAL STEEL	898.64	3484.52		183.40				2.43															
FLOOR PLATE	4336.26	16814.09		884.95				11.72															
SCABBLED CONCRETE	226.05			4521.00												77.28							
CONCRETE RUBBLE	2045.25		27270.00																				
CONCRETE BLOCK	5139.45		68526.00																				
ACID BRICK	232.00			3093.33	773.33											63.45	18.76						
SOIL (CONTAMINATED)	201.69				896.40	3585.60											15.09	57.86					
PROCESS VESSEL (TANK)	191.92	783.36																					
STAINLESS STEEL (TANK)																							
PROCESS EQUIPMENT	770.69	3145.68																					
PROCESS PIPING	302.38			246.84	987.36			3.27	13.08														
ELEVATOR	29.99	122.40																					
HVAC DUCT (SHEET METAL)	201.67			823.14				10.90															
PLUMBING (PIPE/FIXTURES)	21.49		65.79	21.93				0.29															
STACKS	24.99	51.00		51.00				0.68															
ELECTRICAL GALV. CONDUIT	126.40	5056.00																					
ELECTRICAL COPPER WIRE	551.21	2004.40																					
ELECTRICAL EQUIPMENT	463.50	9270.00		9270.00				12.53															
WOOD (TEMP.STRUCTURE)	150.87			7543.33				8.15															
POLYETHELENE	77.60			1724.41												39.60							
P.P.E.	268.39			5591.56																760.76			
SUMP WATER	49.69				1592.51																228.07		
RAGS, ETC.	6.69			148.64												3.05							
SUBTOTAL	19714.65	40731.45	151962.49	48917.70	5750.56	3585.60		58.02	13.08							471.77	54.90	57.86		760.76	310.30		

and enhancement, and because these objectives could be met without significant environmental disturbance during the implementation. These were described in a general way in Section 5.

Having made this overall choice, Section 6.3 then described the specific actions proposed to be taken at each of the 25 structures comprising Removal Action No. 27. These proposed actions use proven technologies with built-in environmental control and protection measures (see Table 6-3) and respond to all prevailing human health and safety requirements. The philosophy of maximizing reuse of dismantled materials and the minimization of wastes is also consistent with broader national and state objectives for environmental protection and enhancement. The overall impact to the human and natural environment, of implementing the proposed actions, is considered to be positive. The following sections discuss by resource, the sources of potential impact and the mitigation or control measures that will be applied to minimize negative effects.

6.4.1 Air Quality Impacts

Dust released during decontamination, dismantlement, or temporary storage activities could affect air quality in the immediate vicinity of the work area during the short term. The potential for dust generation would be minimized by limiting on-site vehicular traffic and by implementing mitigative engineering practices such as wetting and/or covering exposed surfaces. The use of the structure itself would act as a release control mechanism by sealing of wall openings prior to the initiation of in-building activities. All equipment used for decontamination would contain appropriate emission control devices and would be exhausted through filters. Materials transported around the site to temporary storage locations, would be covered or contained during transport. Monitors would be used to determine airborne contaminant concentrations in the work areas to evaluate compliance with worker protection requirements as well as to confirm the effectiveness of control measures. A response plan would be put in place for each component prior to the commencement of remedial actions, which would specify corrective actions to be taken in the event of spontaneous or unplanned releases.

A quantitative air quality impact assessment was conducted for the proposed action of decontamination and decommissioning structures at FEMP. The radioactive air contaminant releases from building air handling systems were considered the only sources to have potentially significant impacts requiring quantification.

The ISCLT2 model was used to quantify air quality impacts. This model is recommended in EPA's Guideline on Air Quality Models, for use at industrial complexes located in simple terrain, such as the FEMP site. The default options were selected for plume rise and buoyancy-induced dispersion consistent with USEPA guidance. The ISCLT2 model requires the following inputs:

1. Air contaminant release parameters
2. Meteorological data
3. Receptors

6.4.1.1 Quantitative Air Quality Impact Assessment

The source of airborne contamination is regarded to be the resuspension of loose contamination present on building and equipment surfaces. The first estimate of the amount of resuspended material was based on average concentrations of alpha emitting radionuclides in air reported in the OU3/RI/FS Draft Work Plan. Average values were available for Buildings 4A and 69. Where averages of measured air concentrations were not available the air concentration in Building 4A was adjusted by comparing the average level of contamination (loose, alpha) in the building of interest with that in Building 4A. This gave predicted concentrations for nine additional buildings/structures. For the six other buildings/structures no data was available, so concentrations were assigned that had been developed for buildings having a similar use. No source was identified for facilities that are already exposed to the environment such as the canopy and loading dock by the Magnesium Warehouse (32B), and equipment in the fire training areas (73B through E). Table 6.6 gives the measured air and surface contaminant concentrations and develops the predicted alpha air concentrations as described in this paragraph.

The mechanism for release of this material during the D&D process is through the air filtration systems (HEPA plus carbon filters) used for controlling airborne concentrations in the workplace. The number of these units and the airflow (4000 ft^3/min each) is provided in Table 6.6, and is based on the current FEMP D&D approach contained in the latest OU3 cost estimates.

To quantify the amount of material released the predicted alpha concentrations were multiplied by a factor of 10 and the expected flow rate. The flow rates are provided in Column #7 on Table 6.6.

TABLE 6-6
Source Release Rates

BUILDING NAME	BUILDING ID	MEASURED AVE ALPHA AIR CONC (UCI/ML)	AVERAGE ALPHA CONTAMINATION (DPM/100 CM**2)	PREDICTED ALPHA AIR CONC. (6) (UCI/ML)	NUMBER OF HEPA FILTERS	FLOW RATE (CFM)	UNCONTROLLED EMISSION RATE (UCI/SEC)	CONTROLLED EMISSION RATE (PICI/SEC)
HARSHAW TOWER	3F		106	4.98E-14 (2)	2	8000	1.88E-07	5.65E-05
REFRIGERATION BUILDING	3G		26	1.22E-14 (2)	1	4000	2.31E-08	6.92E-06
PLANT 4, MISC TANKS	4A	1.120E-13 (1)	2382	1.12E-12	10	40000	2.11E-05	6.34E-03
PLANT 4 MAINT	4C		54	2.54E-14 (2)	1	4000	4.79E-08	1.44E-05
PLANT 7 MAIN BUILDING	7A		544	2.56E-13 (2)	10	40000	4.83E-06	1.45E-03
GRAPHITE/OIL BURNER	10D							
PP MAINT	13B		31	1.46E-14 (2)	2	8000	5.50E-08	1.65E-05
PP SUMP HOUSE	13C		541	2.54E-13 (2)	1	4000	4.80E-07	1.44E-04
WEST TANK FARM	13D		150	7.05E-14 (2)	1	4000	1.33E-07	3.99E-05
TEMPORARY SURGE LAGOON TANKS	18K,18L							
MAGNESIUM WHSE	32A			9.54E-14 (3)	2	8000	3.60E-07	1.08E-04
COVERED LOADING DOCK	32B							
INCINERATOR BLDG	39A		65	3.06E-14 (2)	2	8000	1.15E-07	3.46E-05
INCINERATOR AT STP	39D			3.06E-14 (4)	1	4000	5.77E-08	1.73E-05
PLANT 5 WHSE(THORIUM WHSE)	65			9.54E-14 (3)	8	32000	1.44E-06	4.32E-04
THORIUM WHSE	67			9.54E-14 (3)	1	4000	1.80E-07	5.41E-05
THORIUM WHSE	68		203	9.54E-14 (2)	2	8000	3.60E-07	1.08E-04
OLD D&D BLDG	69	3.900E-13 (1)		3.90E-12	2	8000	1.47E-05	4.42E-03
WHSE FOR INTEGRATED DEMO	72			9.54E-14 (3)	1	4000	1.80E-07	5.41E-05
FIRE TRAINING AREA	73A			3.06E-14 (4)	1	4000	5.77E-08	1.73E-05
FIRE TRAINING AREA	73B-E							

NOTES:

(1) Concentration In Air To Be Discharged
Average alpha concentration given in OU3 Work Plan Addendum (Rev. 1), Table A.4-3, "Operable Unit 3 Air Quality Data".

Building Number	Alpha Concentration (uCi/ml)	Average
4A	8.42E-14	
4A	1.30E-13	1.12E-13
4A	1.23E-13	
69	2.87E-13	3.90E-13
69	4.92E-13	

(2) Building 4A average alpha concentration in "(1)" adjusted by the ratio of the average alpha contamination in the building of interest to Building 4A contamination. Reference OU3 Work Plan Addendum (Rev. 1) Table A.4-1, "Operable Unit 3 Structures / Equipment Radiological Surveys".

(3) From Building 68 as similar use

(4) From Building 39A as similar use

(5) The Enhanced Cost Estimate for D&D of OU3, Parsons Project Order #51

(6) All predicted alpha concentrations include a factor of ten increase to account for removal activities.

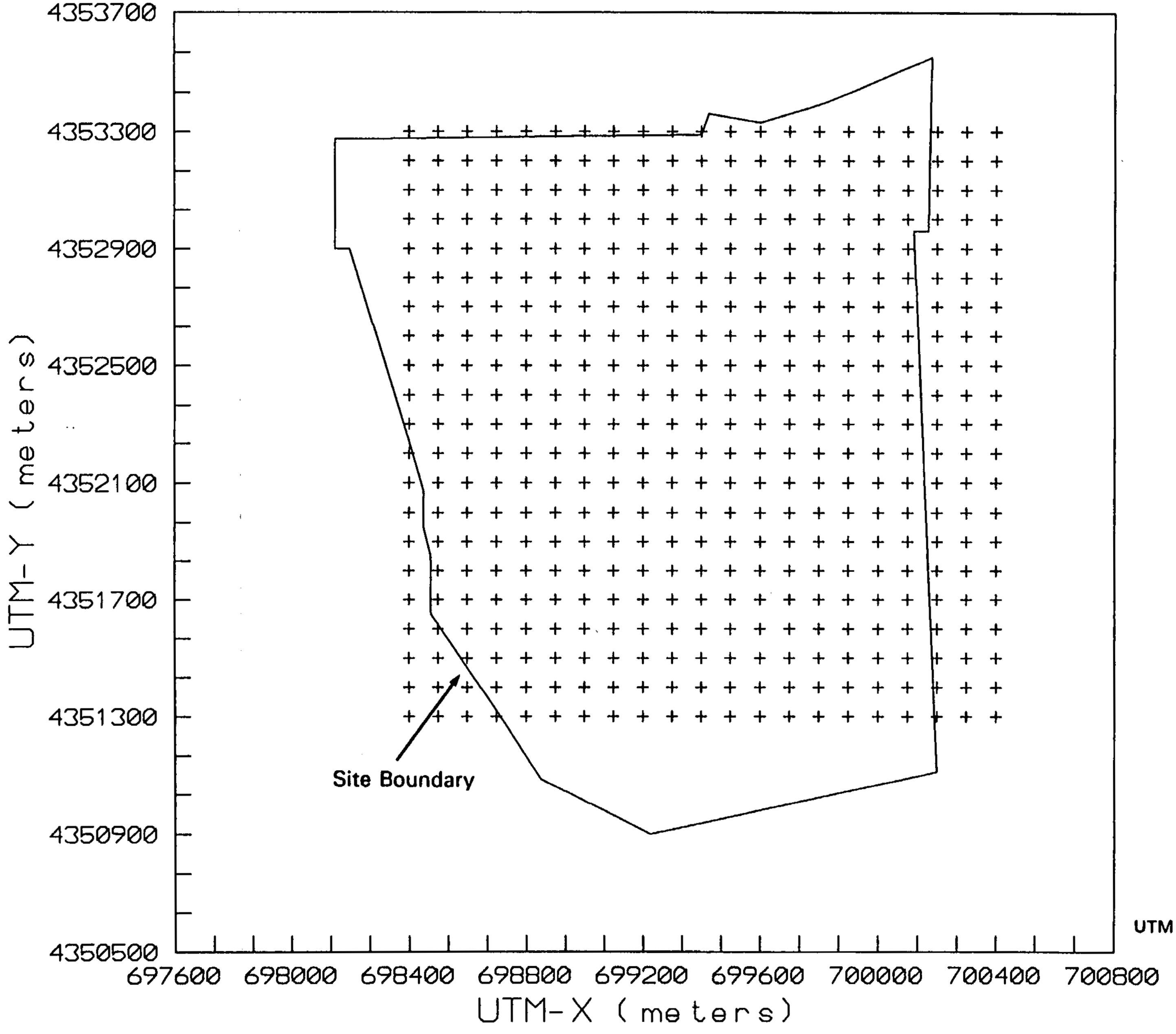
The factor 10 accounts for the general increase in the amount of resuspension that occurs when D&D work is performed in contamination areas. Converting CFM to ml/sec provides the emission rates (Uncontrolled Emission Rate), which are those that would occur if the HEPA filter elements were not present. With the filter media in place the release rates are reduced by a factor of 0.0003. This fraction is the required performance criteria for HEPA filters specified in ANSI/ASME N 510-1980, "Testing of Nuclear Air Cleaning Systems" and the DOE Air Cleaning Handbook. HEPA filter must be tested in place, and shown to reduce concentrations of airborne particulates by at least this fraction before they can be used. Column #8 values times 0.0003 give the actual release rates in Column #9. Note that the units of activity have been changed from μci to pci (10^6 pci = 1 μci). These actual release rates are termed "Controlled Emission Rates" because they are based on the controls afforded through the use of the HEPA filters.

The emission rates in Column #9 were input into the ISCLT2 model to calculate the concentrations to which other workers and members of the public would be exposed. The ISCLT2 model also requires wind speed, wind direction, and stability data inputs in the form of a joint frequency distribution. The distribution used was generated by DOE over a four year period from the 10 meter level of the on-site meteorological tower. The joint frequency distribution is based on 29,257 hours of data (83.5 percent data recovery) collected from October 1987 through December 1990. These meteorological data have received approval from the USEPA Region V as of February 1992. Average mixing heights and temperatures, also required as inputs to ISCLT2, were developed by DOE for use with the joint frequency distribution.

The air contaminants were conservatively assumed to be released at a height of two meters above the ground with no momentum or buoyancy effects. The release points were located at the center of the buildings. Additional conservatism was incorporated into the assessment by assuming that all buildings would undergo D&D simultaneously.

The locations of receptors at which ISCLT2 predicted air concentrations were chosen to be the intersections of a 20 x 20 square grid with spacing of 100 meters, centered on the FEMP. The receptor network is shown in Figure 6-1.

Figure 6-1 : ISCLT2 Receptors



UTM = Universal Transverse Mercator Grid

Terrain elevations were not considered given the relatively flat nature of the FEMP site and the conservatively low effective height of the source plume.

The maximum concentration calculated by the ISCLT2 code for the inputs provided was 4.0 attocuries per cubic meter. (One attocurie = 10^{-18} curies.)

This concentration occurs on the FEMP site near the center of Figure 6.2. The maximum off-site concentration was found to be 0.2 attocuries per cubic meter.

The committed effective dose equivalents (CEDE) which would occur from exposure to these concentrations are given by the following expression:

$$CEDE(mrem) = (C)(V)(T)(F)$$

where,

C is the ISCLT2 predicted value (attocurie/liter),

V is the volume of air breathed by an active adult in one day, 22,800 liters/day,

T is the exposure duration (days), and

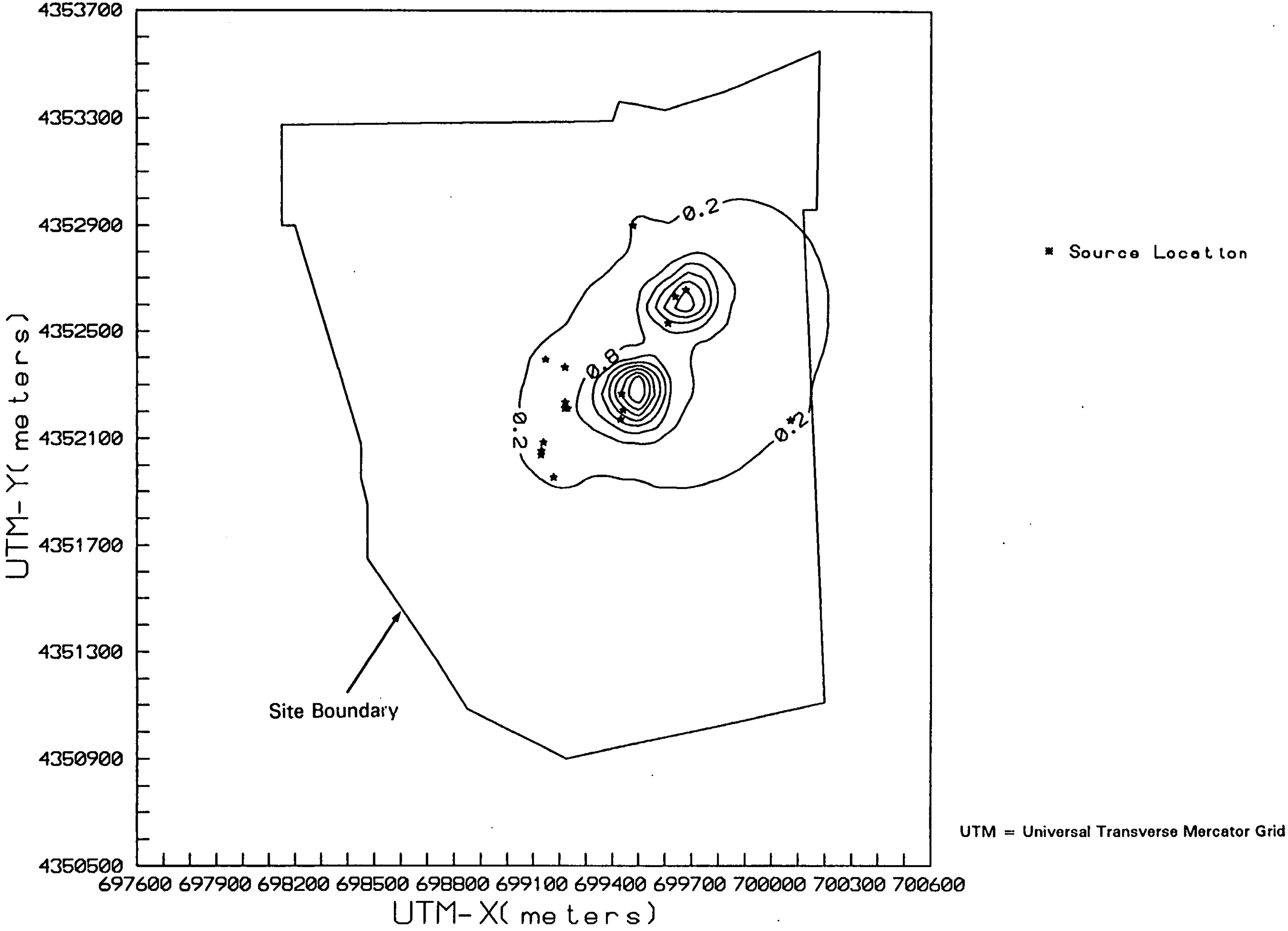
F is the 50-year Committed Dose Equivalent Factor given in DOE/EH-0071 "Internal Dose Conversion Factors for Calculation of Dose to the Public," July 1988."

The following radionuclides and their daughters were considered in determining the CEDEs resulting from D&D activities:

U-238, U-235, U-234, Th-230 and Th-232

For buildings where significant amounts of natural thorium were used or stored Th-232 was considered to be the controlling radionuclide and "F" was assigned a value of 1100 rem/μci. Where the contaminant was refined uranium, F was assigned a value of 120 rem/μci. This is the most conservative value given in DOE/EH-0071 for U-238. It equals the value given for U-235 and is within 10% of the value given

Figure 6-2: ISCLT Concentrations (Attocuries/m^3)



for U-234. The internal dose conversion factors for thorium-230 (320 and 260 rem/μci) were not used for one of the two reasons that follow. First, a majority of the buildings considered for D&D in this EE/CA were used to process refined uranium, and thorium-230 is not present. Secondly, where thorium-230 was considered to be present it was accompanied by thorium-232. In this case the more conservative factor for thorium-232 was used.

The maximum annual dose (CEDE) to a worker on the FEMP site from the D&D activity was determined to be 1.1 x 10-2 mrem/year. This was calculated based on a worker occupying the area of maximum concentration (4.0 attocuries per cubic meter) for 250, 8-hour days per year. The contamination was conservatively assumed to be all thorium-232.

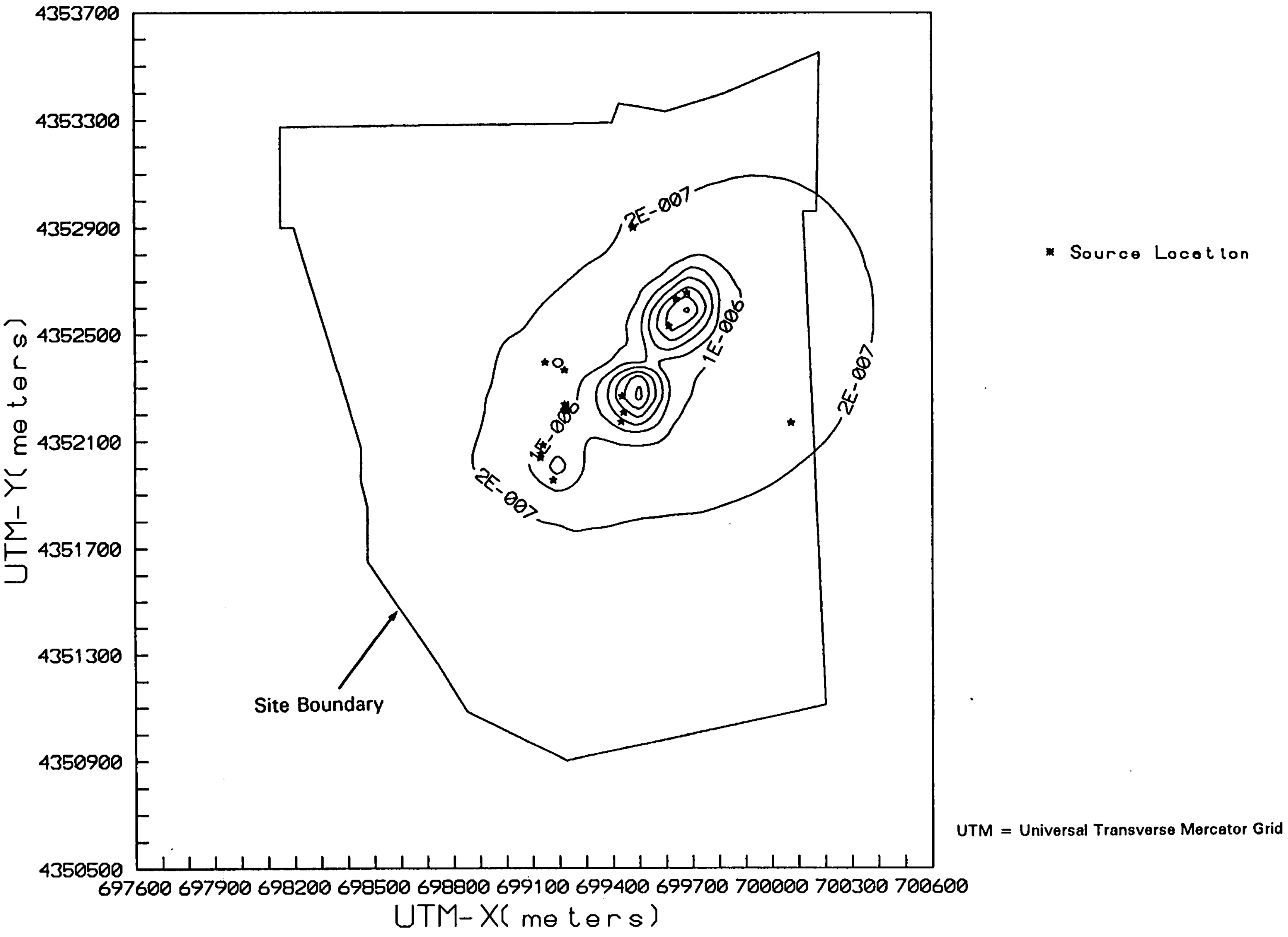
The maximum annual dose to a member of the public was determined to be 3 x 10^{-4} mrem/year. This was based on a person living on the site boundary at the worst location for 365 days per year. The contribution of each building to contamination levels was converted to dose using the internal dose conversion factor for uranium or thorium as appropriate. Figure 6.3 plots isopleths of the annual dose to members of the public.

The maximum annual doses from the cumulative impacts of the D&D activity for both coworkers and members of the public range from 900 to 30,000 times lower than the DOE guidelines of 10 mrem/year for the annual allowable dose via the inhalation pathway. Accordingly, the impacts to on or offsite personnel from D&D activities are considered to be insignificant.

Doses to workers from other means than inhalation were not considered because they are several orders of magnitude less than the inhalation doses. External exposure from airborne activity is unimportant because the predominant radiation is alpha radiation. Exposure through ingestion of water or foodstuff is also inconsequential, since the dose per μci ingested is typically 500 times lower than if that material were inhaled.

Histoplasmosis - The D&D action at building 7A will have a positive public health impact through the removal of the potential risk imposed by the presence of accumulated pigeon droppings in the building. The spores of the fungus, Histoplasmodium sp., induce a serious respiratory illness, if inhaled. This fungus uses aged bird droppings as a growth medium. An early action during the D&D will be the removal of the fecal medium, by workers outfitted with suitable respiratory protection. Since the removal

Figure 6-3: Inhalation Dose(rem)



will take place within the double containment provided by the building itself as well as the additional containment being proposed, and the exhaust from the building will be HEPA filtered, there will be no release of the spores to the outside environment.

6.4.2 Topographical Impacts

The proposed action does not involve the excavation of any rock or soils to recontour land or to construct roads or other structures and will not result in changes in the local topography at the site.

6.4.3 Soil Impacts

The opportunities for disturbance to soils during the D&D activities are limited. All of the structures included in Removal Action No. 27 are located within the former Production Area and as described in Section 2, little exposed soil exists in this paved industrial complex. The majority of the D&D activities will take place within the buildings or enclosures erected around the structures. Very local disturbance to soils could be expected during the dismantling of external cladding and underlying superstructures resulting from the use of moving equipment.

Soil excavation is not proposed except in support of D&D for some of the Fire Training structures (73A to E). Prior to excavation, the contaminated soils will be dampened to reduce wind dispersion. Once removed, they will be transferred to the Central Storage Facility being constructed under Removal Action No. 17 to deal with soils and debris. Subsequent to removal of the contaminated material, the area could be regraded for eventual rehabilitation.

The proposed D&D actions are not expected to contribute to the release of contaminants to otherwise clean soils since cleaning processes will be contained, erosion will be controlled during outdoor operations, and air exhausted from buildings or other work areas, will be released through HEPA filters thereby removing any potential airborne contaminants.

6.4.4 Groundwater Impacts

Implementation of the D&D actions is expected to reduce the risk of groundwater contamination at the site. Both radiological and nonradiological constituents have been detected in the groundwater at the

FEMP. Specifically, uranium was found above background concentrations in perched groundwater in the vicinity of the fire training area (structures 73A-E). As mentioned earlier, "hot spots" of soil contamination have also been identified in this area and will be removed as part of the D&D action. This will reduce the source term for groundwater contamination in this area.

At the completion of the D&D actions for each structure, there will be no above ground facilities remaining. It is the intention however, to leave pads and floors, in place, with subsequent decontamination. To protect the groundwater from contamination from runoff from these surfaces, they will be scabbled or sealed, as required and then tested to ensure that all contaminant sources have been removed. In particular situations such as the Harshaw Tower (3F), it will be necessary to remove multiple layers of material (acid bricks and concrete scabbling) to achieve this objective.

6.4.5 Surface Water and Aquatic Ecology Impacts

Implementation of the proposed D&D actions is not expected to adversely affect local water resources as there are no natural surface drainages within the area of activity and none of the proposed actions will occur within wetlands or floodplains.

Surface Water - The quality of surface waters in the vicinity of the FEMP will not be adversely affected by the proposed D&D operations. Although erosion control measures will be rigorously applied during the course of exterior D&D activities, some increases in suspended solids in runoff waters can be expected to occur episodically. This is not expected to result in negative water quality impacts in local surface waters however, as all such runoff will be collected by the existing drainage system. Historically, natural surface drainage from the FEMP was primarily via Paddys Run. This is no longer the case. In efforts to control the quality of water discharged from the site, the stormwater collection system was upgraded in the late 1980's to include a series of retention basins and settling ponds into which collected runoff is directed. The eventual outfall to the Great Miami River operates under a NPDES Permit and is monitored. Although a few minor exceedances have been reported in the past few years, the quality of water leaving the site through this discharge generally meets EPA surface water criteria, indicating that the collection system is effective. This, with the addition of local collection and erosion control measures specific to individual D&D sites and actions, will ensure the protection of surface water quality. In addition, most D&D activities will be undertaken within enclosed buildings or in equipment surrounded by a curbed concrete pad which will control surface runoff.

Floodplains and Wetlands - The 1 in 100 year floodplains of the Great Miami River and of Paddys Run were mapped in Figure 2-6 and none of the activities proposed for the D&D operations will occur within these areas. Similarly, Jurisdictional Wetlands at the FEMP are restricted to a small forested wetland in the northwestern corner of the facility and to emergent wetlands associated with tributary ditches draining to Paddys Run. Both are well outside of the area of influence of the proposed actions.

Aquatic Ecology - There is no aquatic habitat within the Production Area and the aquatic habitats of Paddys Run and the Great Miami River are not expected to be negatively influenced by the D&D actions as described above. Impacts to aquatic ecosystems are predicted to be positive inasmuch as potential sources of environmental contamination will be reduced.

6.4.6 Vegetation and Wildlife Impacts

Impacts to vegetation and wildlife during the implementation of the D&D actions are expected to be very minor. Following completion of the D&D, the risks of exposure to contaminants will be reduced.

Vegetation - As described in Section 2, there is virtually no natural vegetation within the former Production Area. The only two of the Removal Action No. 27 structures which are adjacent to vegetated areas large enough to be considered terrestrial habitat, are the nitrate tanks (18K and 18L) and the Fire Training Area (73A-E). These locations support cultivated (mowed) grass. The remaining structures are surrounded with gravel or asphalt and control measures (mowing and herbicides) limit the encroachment of vegetation. As a consequence, impacts to vegetation in the short term, are negligible and in the longer term will be positive with prospects for rehabilitation improved through the removal of manmade structures.

Wildlife - Wildlife in the Production Area is limited by the lack of suitable habitat. Meadows peripheral to the primary industrial center, offer better potential to support wildlife and these will remain unaffected by the proposed actions. The only wildlife identified with any of the structures within Removal Action No. 27, are the pigeons which occupy building 7A. The actual number of birds is not known but is likely to be several dozen (rather than hundreds). This building has been abandoned since the early 70's and the lack of human interference may account for its attraction for the pigeons. The D&D actions proposed for building 7A will displace these birds. This species, originally domestic, has retained its affinity for manmade structures even when feral. It is likely that the pigeons from building 7A will therefore relocate to other buildings in the area, either on the FEMP site, or in nearby farms or towns. The impact to these very adaptable birds is expected to be short term and minor. The impact of their relocation to new buildings could constitute a nuisance.

As discussed in Section 6.4.1, a secondary impact deriving from the long term occupation of building 7A by this population of pigeons, relates to the biohazard presented by the accumulation of droppings. Bird and bat droppings, when aged for three or more years, can provide a substrate suitable for colonization by the fungus responsible for the respiratory illness known as Histoplasmosis, in humans. The presence of the fungus has not been confirmed but the proposed D&D action will include containerizing and removal of the droppings and thus elimination of the potential health risk posed by them.

Threatened and Endangered Species - There are no threatened and endangered species within the FEMP to be impacted directly by the proposed actions and the potential to support such species can only be improved by the removal of the structures and reduction in sources of potential environmental contamination.

6.4.7 Land Use

The total land area occupied by the structures which will be taken down in Removal Action No. 27 is less than four acres and is scattered throughout the 136 acre Production Area. Although the Removal Action will dismantle the above ground structures, the below grade features and base pads will remain until they are dealt with in the final sitewide actions and the whole land area is rehabilitated. Over the short term then, these land areas will not be available to conversion to alternate land uses unless these uses are consistent with remaining remedial activities at the site (equipment laydown or storage for example).

Land uses adjacent to the FEMP will not be altered by the proposed D&D actions since all activities will be restricted to the FEMP property (see Transportation, below). In the longer term, the removal of these structures will contribute positively to the eventual recovery of the FEMP lands for alternate agriculture, recreation or natural habitat uses.

6.4.8 Socioeconomic Impacts

Implementation of the proposed D&D actions will have a positive impact on the socioeconomic status of the area.

Employment - The execution of the D&D activities as proposed, will require an average additional 200 person workforce at the FEMP for the approximately seven year duration of the operation. The labor pool within the region is expected to be able to provide this manpower. Local services will therefore not be impacted by immigration. A large number of the service companies located in the region, and consequently a large number of area jobs, are already directly involved with providing engineering, consulting, or other services to the FEMP. Any increases in employment opportunities at the facility will therefore also have secondary benefits to the community. The labor costs alone, for implementing D&D on the 25 structures of Removal Action No. 27 is estimated to be more than $55 million. Conducting these activities in an advanced time frame, has the added advantage of expediting the introduction of these economic benefits to the area.

Transportation - The transportation network serving the FEMP site and the region, is highly developed. Three interstate highways (I-71, I-74 and I-75) provide interregional access to locations within the Cincinnati area and two interstate connectors (I-275 and I-471) provide intraregional highway access. The activities associated with the D&D operations as proposed, will generate additional traffic movements. The additional workforce will require an additional 160 passenger vehicles to enter and leave the site each day (assuming 1.25 workers per vehicle). This additional traffic will not negatively affect local traffic.

A 1985 traffic count showed Willey Road carrying 2200 daily movements for example; the volume represented by the additional worker traffic, will represent a 7% increase over this level.

The D&D actions will generate large volumes of materials requiring offsite disposition. Tables 6-4 and 6-5 break these down by category. Assuming a relatively steady generation of materials, and standard containerized shipments, these volumes will result in an average requirement of two truckloads per day. It is most likely that these trucks will be destined for one of the several interstate highways. This level of traffic increase will be unnoticed on the regional roads. There are no weight restrictions in place at the present time that will constitute a limitation to truck traffic and with the very small increase in numbers of movements expected, even the poorly rated bridge on Willey Road west of the FEMP entrance will not likely require upgrade.

The most highly affected receptors of radiation exposure from transportation of the waste from FEMP to the Nevada Test Site for disposal are the truck drivers. The maximum possible annual exposure was determined by assuming that a driver worked that route continuously. As a result he was assumed to occupy the cab of the loaded vehicle (tractor trailer) for 40 hours per trip. The driver was assumed to be exposed to a radiation dose rate of 0.5 mrem/hour. This value has been reported as typical for shipments of U_3O_8, and is expected to be higher than that from shipments of miscellaneous waste. The annual dose to the driver was calculated to be about 0.9 rem per year. Appendix F gives the details of this calculation. This value is conservative because of the nature of the underlying assumptions, yet it is still more than 5 times lower than the annual exposure limit for radiation workers.

The exposure to persons along the route is insignificant in comparison, because they are typically not as close to the cargo as the driver, and because the time of exposure is thousands of times less.

An alternate transportation mode for on- and offsite movement of equipment and materials, is the rail service. There are two rail lines operated by Conrail and one operated by CSX Transportation in the area. The latter has a spur extending onto the FEMP property. The choice of transportation service will be dependent on the offsite destination. As mentioned above, Tables 6-4 and 6-5 indicates the volumes and characteristics of materials expected to be generated from the D&D of each of the structures.

6.4.9 Cultural Impacts

Historical and Archaeological - Although there are three properties listed in the National Register of Historic Places and a number of additional structures that have been judged to be eligible for inclusion in the listing within the vicinity of the FEMP, none are on the site, or could be impacted by the D&D actions. Similarly there will be no impact to the six major archaeological sites that lie within five miles of the FEMP.

Aesthetics - Visual impacts from the D&D action can be considered to be positive in that two of the largest structures on-site, 4 and 7A will be removed. However, until the whole complex is D&D and reclaimed, the area will still maintain its industrial characteristics. Noise impacts during implementation are expected to be minor since the majority of activities will be contained within buildings or other containment systems and the exterior dismantling will be done systematically (as compared with wrecking procedures).

6.4.10 Potential Cumulative Impact

The potential cumulative impacts associated with Removal Action No. 27 were assessed on a qualitative basis to evaluate that the sum of the impacts associated with each individual action will not result in an unacceptable overall threat to human health and the environment.

It should be noted that quantitative environmental and health impact risk estimates have not yet been developed for the proposed action. However, the proposed action is not expected to result in adverse impacts.

Cumulative Health Impacts

The air pathway is considered the major pathway for potential exposure of the general public during implementation of the proposed action. However, this action is not expected to result in significant airborne releases because the structures will be decontaminated prior to dismantlement and extensive engineering controls, including containment measures, will be used. If however, elevated levels of radioactive and chemical contaminants were to be detected at the site perimeter, more stringent engineering controls will be applied to ensure that off-site releases were negligible. Of the other major OU3 actions planned, only the Plant 1 Ore Silos (Removal Action No. 13) is expected to result in airborne releases of radioactive and possibly chemical contaminants that could potentially impact off-site areas. As demonstrated in the Work Plan and Health and Safety Plan for this action, potential health impacts are expected to be managed to limit risk to workers to within acceptable standards. The proposed action, which is similar to the Plant 1 Ore removal action, is not expected to result in significant chemical carcinogenic or noncarcinogenic risks to workers.

The potential for cumulative occupational accidents (with resultant fatalities and injuries) during implementation of the activities currently planned for the 25 contaminated structures, exists. However, all activities associated with the proposed action will be conducted in accordance with health and safety plans for the site and with applicable occupational safety requirements. DOE's commitment to conducting all activities in a safe and protective manner is expected to minimize the likelihood of occupational accidents.

In summary, no significant cumulative health effects to the general public or to workers are expected to result from implementing the proposed action to decontaminate and dismantle the 25 contaminated structures concurrently with other planned activities.

Cumulative Environmental Impacts

Potential adverse environmental impacts associated with the proposed action are expected to be minor. The action is limited to the OU3 Production Area and will not affect off-site areas. Cumulative impacts are limited to those associated with the simultaneous dismantling and decontaminating of the structures. These will be of short duration and will influence only the immediate area of the activities, being controllable with positive engineering measures.

The total area disturbed by the combination of activities planned for OU3 totals approximately 136 acres, all of which has been disturbed by original construction and operation at the site. There is no unique wildlife habitat or species known on the site. In the long term, the cumulative impact of the proposed action is expected to be positive. Removal of contaminated structures and other sources of contamination will reduce the potential for future environmental exposures, and associated restoration activities will facilitate future beneficial use of the site for terrestrial biota and human occupation.

6.5 Risk Assessment and Accident Scenarios

As required by NEPA, an assessment of risk has been performed. Both a qualitative approach and a quantitative approach have been utilized to assess the impacts on the environment from various potential hazards, accidents and failures during implementation of this removal action.

The best engineering judgment of various engineers/scientists involved with this project was utilized to identify potential failures, concerns and/or accidents that could occur during implementation of D&D for the 25 contaminated structures and also to identify the worst possible accident scenario.

Steps taken towards this identification was to first identify the contaminated structure with the greatest level of contamination. Based upon OU3 RI/FS Work Plan data, and assuming all containerized material had been removed, Structure 4A, the Green Salt Plant represents the design basis structure. Accident scenarios were envisioned to determine the one which will release the greatest amount of contamination to the environment.

Structural failure (building collapse) during initial D&D activities was identified as an accident scenario which will cause major loss of containment, causing migration of contamination. However, an accident scenario leading to a much greater release was envisioned, as follows.

D&D activities are envisioned to take place with the entire building under negative pressure utilizing air handling units and four (4) HEPA filters to maximize containment of air borne contaminants. Assuming that the HEPA filters will be replaced every 30 days during these activities, as the HEPA filters reach the thirtieth day (removing and trapping 99.97% of contaminants released), a large concentration of contaminants will be localized at these HEPA filters. An accident causing a fire in the building on this day (through any cause) could result in any one of the four (4) HEPA units catching fire. For conservatism, it was assumed that of all four (4) HEPA filters caught fire simultaneously and that 10%

of the contaminants contained in each HEPA filter is instantaneously released to the outside atmosphere. The resultant release is far worse than the release anticipated from a structural failure of the building.

The impact of this accidental release was quantified using the EPA SCREEN model. The contaminants were conservatively assumed to be released from a single point at a height of two meters with no momentum or buoyancy effects. The total release from Building 4A was conservatively estimated to be 0.55 uci. Assuming a release duration and exposure of one hour, maximum short-term exposure is 7.7 x 10^{-6}uci/M^3 and the resulting dose (assuming contaminant is uranium) is 8.8 x 10^{-1} mrem which is about one tenth of the 10 mrem exposure limit set for the FEMP site. Accordingly, the worst case accident scenario is shown to have an insignificant impact.

6.6 Permitting and Other Regulatory Requirements of the Proposed Action

This section addresses the general federal and major regulatory and permitting provisions considered for the proposed action (D&D).

Because this action is being conducted as a component of CERCLA Removal Action, applicable or relevant and appropriate requirements (ARARs) will be implemented during the undertaking of the proposed action (D&D).

An applicable ARAR is a regulation which applies to site remediation as a matter of law. A relevant and appropriate ARAR is a regulation that does not apply as a matter of law. Under CERCLA, "to be considered" (TBC) documents are non-regulation regulatory agency advisories that pertain to the final site remediation. ARARs are discussed in Section 5.4 and a list of ARARs is included in Appendix B.

For this action, most TBC documents are DOE Orders which contain DOE policy directives. Under CERCLA, on-site removal actions such as this Removal Action No. 27 -- Management of Contaminated Structures are exempt from obtaining Federal, State or local environmental permits [see CERCLA Section 121(e)].

National Environmental Policy Act

This EE/CA addresses the requirements of the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality, Title 40, Code of Federal Regulations (CFR), Parts 1500 through 1508, and the United States Department of Energy (DOE) NEPA Implementation Regulations, Title 10 CFR 1021.

The proposed action is not expected to have a significant effect on the natural and human environments. This EE/CA will be used to determine whether the preparation of an Environmental Impact Statement (EIS) is necessary or whether a Finding of No Significant Impact (FONSI) can be issued.

Clean Air Act

In order for OEPA to control air pollution in the State of Ohio pursuant to the requirements of the Clean Air Act (CAA), Permits To Install (PTI) and Permits to Operate (PTO) must be obtained for new and existing sources of air emissions in the state.

The proposed action will not result in new emission sources that will impact the air quality in Ohio which is regulated by the State Implementation Plan (SIP). In addition, CAA requirements for New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants will not be affected.

Resource Conservation and Recovery Act

Six RCRA HWMUs have been identified that are within the scope of the proposed action. These six HWMUs are but a portion of the HWMUs identified in the FEMP's RCRA Part B Permit. This Removal Action will result in the removal of contamination and the clean closure of the HWMUs. All RCRA material generated from HWMUs will be stored in approved RCRA storage areas on-site until final disposition can be arranged. Final closure of the HWMUs will be carried out pursuant to the requirements of the OEPA.

Clean Water Act

Under Section 404 of the Clean Water Act, dredged or fill material may not be discharged into waters of the United States, including rivers, streams, and wetlands, by any Federal agency other than the U.S. Army Corps of Engineers without a permit issued pursuant to Corps of Engineers rules and regulations.

Section 402 of the CWA requires that an NPDES permit be obtained for any point-source discharge of pollutants to navigable waters of the United States. The proposed action will not result in any discharges or other activities resulting in an impact to a waterway of the United States. Therefore, regulatory concerns associated with either of the aforementioned provisions are non-applicable to this action.

Safe Drinking Water Act

The proposed action will not result in the construction of a new potable water supply system or the modification of any existing drinking water supply system. Therefore, requirements under this regulation will not apply to the proposed action.

Floodplain Management

Concurrent with the NEPA review for a proposed action, the DOE Field Office, Fernald is required to review the applicability of floodplain management requirements outlined in 10 CFR 1022, "Compliance With Floodplain/Wetlands Environmental Review Requirements." This regulation contains specific steps to be taken by the DOE to comply with Executive Order 11988, "Floodplain Management." The proposed action will not result in any development within the floodplain of the GMR.

Wetlands Protection

The environmental review requirements outlined in 10 CFR 1022 also require that DOE evaluate any potential impacts to wetlands that may result from proposed actions as required by Executive Order 11990, "Protection of Wetlands." No wetlands are present in the FEMP Plant Area; therefore, there will be on impact to wetlands resulting from the proposed action.

Heritage Conservation

The proposed action will not result in any excavation or disturbance of the FEMP site in areas not previously disturbed for construction and operation of the facility. Furthermore, the Ohio State Historic Preservation Officer (SHPO) has stated that remedial activity within the boundaries of the FEMP will not adversely affect any properties listed on or eligible for the National Register of Historic Places.

Endangered and Threatened Species and Critical Habitat

The Endangered Species Act (16 USC 1531 et seq.) is intended to prevent the further decline of listed endangered and threatened species of animals. A Biological and Ecological Characterization study done at the FEMP in 1986 and 1987 did not identify any federally listed endangered or threatened species residing on the FEMP site.

There have been several sightings of birds (e.g., Cooper's Hawk and Red-Shillered Hawk) at the FEMP that do appear on the "Rare Species of Nature Ohio Wild Animals" list (DNAP-ODNR 1982). The proposed action will take place within the FEMP Plant area and therefore will not result in the destruction of any habitat on or adjacent to the FEMP.

Recreational Resources

With the exception of transportation of material, the proposed action will be limited to the FEMP site; therefore, the action will not affect any recreational resources protected by the National Wild and Scenic Rivers System or the National Trails System.

Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)

The proposed action will not result in the use of any substances regulated by FIFRA (7 U.S.C. 135, et seq.).

Farmland Protection

The proposed action will not change any land use patterns (e.g., farmland) on or around the FEMP.

Noise Control Act

The proposed action will not result in any above background noise levels on or adjacent to the FEMP site.

Transportation Regulations

The transportation of the waste streams generated by the proposed action will be governed by the following Regulations/Orders:

1. 49 CFR 100 - 177, "Transportation - Research and Special Programs Administration."

2. DOE Order 1540.1, "Materials Transportation and Traffic Management."

3. DOE Order 1540.2, "Hazardous Material Packaging for Transport - Administrative Procedures."

4. DOE Order 5300.3B, "Telecommunications: Communications Security."

5. DOE Order 5480.1B, "Environmental, Safety, and Health Program for Department of Energy Operations."

6. DOE Order 5480.3, "Safety Requirements for the Packaging and Transportation Of Hazardous Materials, Hazardous Substances, and Hazardous Wastes."

7. DOE Order 5480.4, "Environmental Protection, Safety, and Health Protection Standards."

8. DOE Order 5610.1, "Packaging and Transportation of Nuclear Explosives, Nuclear Components, and Special Assemblies."
9. DOE Order 5632.1A, "Protection Program Operations."

Coastal Zone Management Act

The FEMP is approximately 700 miles from the nearest coastal zone; therefore, any requirements relating to protecting the coastal zone will not be applicable to the proposed action.

Energy Conservation at Federal Facilities

The proposed action will not result in the operation, maintenance, or retrofit of an existing Federal building; the construction or lease of a new Federal building; or any other Federal agency operations other than building operations.

Comprehensive Environmental Response, Compensation, and Liability Act

The proposed action is being performed under the provisions of CERCLA, the NCP, and the Amended Consent Agreement.

Atomic Energy Act

DOE environmental, safety, and health directives (DOE Orders) authorized under the Atomic Energy Act will be followed for this proposed action.

DOE Waste Minimization and Pollution Prevention Policy

The proposed action work plans will support the DOE Waste Minimization Crosscut Plan which establishes the Waste Minimization and Pollution Prevention Executive Board. The following are key elements of the Department's pollution prevention efforts:

1. Avoid or reduce the generation of hazardous substances, pollutants, wastes, and contaminants at the source.

2. Recycle or reuse that which cannot be eliminated.

3. Treat the remaining waste to reduce volume, toxicity, or mobility before storage or disposal.

4. Dispose of residual waste in an environmentally safe manner.

DOE is committed to the inclusion of cost-effective waste minimization and pollution prevention in all of its activities.

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APPENDIX A

Overview of Existing Information on Chemical and Radiological Contamination Associated with Structures

WE-059.345

TABLE A-1 and A-2

POTENTIAL CONTAMINANTS AND CONTAMINANTS DETECTED BY RI/FS MEDIA SAMPLING

Table A-1 lists potential contaminants for each component (building or structure). Where applicable, potential contaminants are listed for each process which existed within a component. For each component or process, the table lists the historical source(s) that indicate possible presence of the contaminant(s). Any component or process that is a Hazardous Waste Management Unit (HWMU) is printed in italic type. Historical information sources are process knowledge, significant quantities of use, spill logs, history of FEMP, incident reports, perched water removal action data, RCRA drummed waste determinations, RCRA reports, and material distribution information. For many of the listed potential contaminants, related by-products, decay products, or breakdown products may also be possible. The listing is presented as a best summary of currently available information.

Table A-2 lists detectable contaminants near listed components as a result of RI/FS media sampling and analysis including subsurface soil data. The processes associated with listed components also are included. The component may or may not be the source of the media contamination. Similar contaminants may be possible for other OU3 components not affected by prior R/FS media sampling activities.

The following legend applies to Tables A-1 and A-2:

Uranium	=	U-235/236, U-234, U-238, + Daughters (where it is known, the maximum enrichment is given in parenthesis as %E). This designation refers to purified process material.
Ore	=	Pitchblende, Q11, or other unrefined uranium-bearing ores.

Ore concentrates	=	Uranium ore material which was refined somewhat at the mine site (i.e., Kerr McGee, Australian, Colorado, Canadian ore feed materials).
Ore raffinate	=	Material stripped from uranium ores by the FEMP refinery extraction process (including but not limited to: radium, thorium, protactinium, and a variety of other radionuclides and metals).
Thorium or thorium compounds	=	Material which originated as thorium 232. May include metal or any or all of the following compounds: thorium tetrafluoride, thorium hydroxide, thorium oxalate, thorium oxide, or thorium nitrate.
Uranium compounds	=	Any or all of the following compounds: U_3O_8, UO_3, UF_4, UO_2, UNH (where possible, the specific compound is identified).
Solvent residues	=	The residual material from solvents used at the FEMP (primarily 1,1,1, trichloroethane, trichloroethylene, and perchloroethylene).
Sump cake	=	Precipitants from the filtration of uranium or thorium solutions.
High grade residues	=	UF_4, U_3O_8, UO_3, UO_2, uranyl ammonium phosphate (UAP), ammonium diuranate (ADU).
Low grade residues	=	Residual material from magnesium fluoride (MgF_2), sump cakes, heat treating salts.

Prill	=	Metallic beads and blobs of uranium, and magnesium from FEMP reduction process.
Metals	=	Aluminum, arsenic, barium, cadmium, calcium, chromium, cobalt, copper, cyanide, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, silver, sodium, thallium, vanadium, zinc.
*	=	For eery structure/facility within the uncontrolled nonprocess side of the FEMP, potential contaminants of concern include uranium, asbestos, lead (in paints and building structure) PCBs, and mercury. These contaminants are in addition to any potential contaminates listed in this table.
**	=	For every structure/facility within the controlled process area of the FEMP, potential contaminants of concern include uranium, asbestos, lead (in paints and building structure), PCBs, diuron (herbicide), and mercury. These contaminants are in addition to any listed in this table.
Italic type	=	Identifies Hazardous Waste Management Unit (HWMU).

TABLE A-1 Potential Contaminants

Structure/Facility	Potential Contaminants	Associated Process	Reference Source/Comments
Harshaw digestion fume recovery (3F)**	Ammonia	Harshaw fume recovery	Process knowledge/significant quantities, spill log
Refrigeration building (3G) **	Refrigerant	Refrigeration	Process knowledge/significant quantities
Green salt plant (4A) **	Anhydrous ammonia, catalyst	Ammonia dissociation	Process knowledge/significant quantities, spill log
	UF_4, U_3O_8, UO_3, UO_2, anhydrous HF, mercury	Hydrofluorination	Process knowledge/significant quantities, incident reports, spill log, history of FEMP
	Anhydrous HF, mercury, ammonia	AHF vaporization	Process knowledge/significant quantities, incident reports, spill log
	UF_4, HF (up to 30 wt%), KOH, KF	HF recovery	Process knowledge/significant quantities, incident reports, spill log, history of FEMP
	UF_4 (depleted and enriched up to 1.25%E)	UF_4 repackaging	Process knowledge/significant quantities, incident reports
	UO_3, UF_4	Moving bed experimental reactor (Never in production use)	Process knowledge/significant quantities. The reactor was tested experimentally, but never placed into product use.
	Ammonia	Nitrogen generation	Process knowledge/significant quantities
	HF (anhydrous and aqueous)	HF refrigeration	Process knowledge/significant quantities. Refrigerants were also used in this process. Refrigeration system operated from 1954-1956, then was removed.
	Thorium oxide, HF, thorium tetrafluoride	Thorium tetrafluoride	Process knowledge/significant quantities. Process only operated in 1954.

TABLE A-1 Potential Contaminants

Structure/Facility	Potential Contaminants	Associated Process	Reference Source/Comments
	UF_4, UO_3, UO_2, HF	Water treatment	Process knowledge/significant quantities, incident reports, history of FEMP
	UF_4, UO_3, depleted UF_4, U_3O_8	Storage	Process knowledge/significant quantities, incident reports, history of FEMP
Plant 4 maintenance building (4C) **	UF_4, trichloroethylene, 1,1,1-trichloroethane, hydraulic oil	Maintenance	Process knowledge/significant quantities, spill log, incident reports
Plant 7 (7A) **	UF_6, UF_4, UO_2, UO_2, F_2HF (aqueous and anhydrous), ammonia	UF_6 to UF_4 reduction	Process knowledge/significant quantities. Plant 7 represents a biohazard due to bird droppings.
	Ammonia, catalyst	N_2 generator	Process knowledge/significant quantities
	UF_4, UO_3, UO_2F_2	Storage	Process knowledge/significant quantities
Oil burner/graphite burner pad (10D) **	Uranium (up to 1.25%E), tributyl phosphate, kerosene, lubricating, hydraulic, machine oils. spent solvents 1,1,1-trichloroethane, perchloroethylene, trichloroethylene	Oil and graphite burner	Process knowledge/significant quantities
Pilot Plant maintenance building (13B) **	Hydraulic, lubricating oils, mercury	Maintenance	Process knowledge/significant quantities. Oils are potentially contaminated with uranium and thorium.
Sump pump house (13C) **	Uranium, thorium, NaOH, magnesium oxide	Sump pump house	Process knowledge/significant quantities
Pilot Plant thorium tank farm (13D) **	Uranyl nitrate, thorium, thorium nitrate, 1,1,1-trichloroethane, mineral spirits, ammonia, NaOH, di amyl amyl phosphonate, tributyl phosphate, kerosene	Thorium tank farm	Process knowledge/significant quantities, RCRA reports
Low nitrate tank (18K) **	Uranium, nitrates, 1,1,1-trichloroethane	Low nitrate tank	Process knowledge/significant quantities, RCRA reports

TABLE A-1 Potential Contaminants

Structure/Facility	Potential Contaminants	Associated Process	Reference Source/Comments
High nitrate tank (18L) **	Uranium, nitrates, 1,1,1-trichloroethane	High nitrate tank	Process knowledge/significant quantities, RCRA reports
Magnesium storage building (32A) **	Magnesium	Magnesium storage	Process knowledge/significant quantities
Magnesium storage covered dock (32B) **	Uranium, thorium, magnesium	Dock	Process knowledge/significant quantities
Incinerator building (39A) **	Uranium	Trash baler operation (Uranium-contaminated trash)	Process knowledge/significant quantities
	Uranium, 1,1,1-trichloroethane, acetone	Solid waste incinerator (Uranium-contaminated paper and wooden pallets)	Process knowledge/significant quantities, RCRA reports
	Uranium, spent solvents, 1,1,1-trichloroethane, trichloroethylene, perchloroethlyene, spent lubricating/hydraulic oils	*Liquid waste incinerator*	Process knowledge/significant quantities, RCRA reports. Uranium- and solvent-contaminated perched groundwater detected by removal action sampling.
	Uranium, UO_3, ammonia, raffinates	Drum dryer (Uranium-contaminated sump cakes)	Process knowledge/significant quantities, spill log
Sewage treatment plant incinerator (39D) **	Uranium, hydraulic and lubricating oil	Waste incineration (Uranium-contaminated trash)	Process knowledge/significant quantities
Old Plant 5 warehouse (65) **	Thorium hydroxide, thorium oxalate	Storage	Process knowledge/significant quantities
Plant 1 thorium warehouse (67) **	Uranium compounds, thorium oxides	Storage	Process knowledge/significant quantities
Pilot Plant Warehouse (68) **	Uranium compounds & metal, thorium compounds & metal	Storage	Process knowledge/significant quantities

TABLE A-1 Potential Contaminants

Structure/Facility	Potential Contaminants	Associated Process	Reference Source/Comments
Decontamination building (69) **	NaOH, ammonia, sodium silicate, lead, methyl ethyl ketone	Decontamination (Sodium silicate cleaners used)	Process knowledge/significant quantities, RCRA reports, spill log
Drum storage building (72) **	Uranium (up to 1.25%E)	Storage	Process knowledge/significant quantities
Fire brigade training center building (73A) **	Uranium	Fire brigade training (Uranium-contaminated wood and tires)	Process knowledge/significant quantities
Fire training pond (73B & 73C) w/tank **	Uranium, used oils (hydraulic, lubricating), toluene, waste paint solvents & thinners	Fire brigade training (Uranium-contaminated oils and solvents)	Process knowledge/significant quantities, RCRA reports
Confined space burn tank (73E) **	HF	Fire brigade training	Process knowledge/significant quantities. This tank was a "cleaned" tank from the old tank farm and was never used in the fire training area (probably an out-of- service HF tank).
Fire training burn trough (73D) **	Uranium, PCB, used oils (hydraulic, lubricating), magnesium	Fire brigade training	Process knowledge/significant quantities, RCRA reports. The burn trough is a reclaimed salt bath trough from Plant 6.

TABLE A-2 Contaminants Detected by RI/FS Media Sampling

Structure/Facility	Potential Contaminants	Associated Process
Refrigeration building (3G)	Uranium, radium	Refrigeration
Oil burner/graphite burner pad (10D)	Benzo [k] fluoranthene, 1,2,-dichloroethene, acetone, beta-BHC, bis [2-ethylhexyl]-phthalate, chloroform, chrysene, di-n-butyl-phthalate, dibenzofuran, ethylbenzene, fluoranthene, methylene chloride, N-nitrosodi-phenylamine, naphthalene, PCB-1254, PCB-1260, phenanthrene, pyrene, toluene, total xylenes, metals, 2-butanone, 2-methylnaphthalene, benzo[a] anthracene	Oil and graphite burner
Magnesium storage building (32A)	Uranium, thorium, strontium-90, cesium-137, technetium-99, methylene chloride, tetrachloroethene, 1,1,1-trichloroethane, 2-butanone, acetone	Magnesium storage
Incinerator building (39A)	Uranium, thorium, methylene chloride, acetone	Drum dryer
Old Plant 5 warehouse (65)	Radium, strontium-90, uranium, thorium	Storage
Plant 1 thorium warehouse (67)	Uranium	Storage
Pilot Plant warehouse (68)	Uranium	Storage
Decontamination building (69)	Uranium, thorium	Decontamination
Fire training pond (73B) w/tank (73C)	1,1,1-Trichloroethane, methylene chloride, PCB-1260, tetrachloroethene, trichloroethene, metals, 2-butanone, 1-2-dichloroethene, 1,1-dichloroethane, acetone	Fire brigade training
Fire training burn trough (73D)	Benzoic acid, chloroform, bis[2-ethylhexyl] phthalate, methylene chloride, N-nitrosodi-phenylamine, pentachlorophenol, metals, 2-butanone, acetone	Fire brigade training

TABLE A-3

OPERABLE UNIT 3 STRUCTURES/EQUIPMENT RADIOLOGICAL SURVEYS

This table details, by component, radiological survey results obtained by the on-site Industrial Radiation Safety and Technicians (IRS&T) Department. Survey results are reported for alpha and combined beta and gamma detection. Two types of contamination are measured:

- Removable: Loose contamination that readily transfers to a smear with moderate pressure, and

- Total: A combination of removable and fixed contamination.

This combination of survey factors leads to the possibility of four reported values for every survey report: alpha removable, alpha total, beta-gamma removable, and beta-gamma total. All removable contamination is collected by swipe samples on a 100-cm^2 area after total contamination levels are measured by a direct frisk of the area with an alpha or beta-gamma instrument. Total contamination values have background subtracted and are normalized to a 100-cm^2 area. Components are surveyed at different frequencies, and not all on-site facilities are monitored, depending on this level of contamination. (See Section 2.4.1 for further discussion.)

For each category of reported data, the average of all values, the maximum value, and the sample size are reported. "NA" represents no available data of that type for the component. All of the data presented in this table were collected throughout 1991 and were compiled as of November 15, 1991. New data are continually gathered and are processed as they become available.

Four categories have been established within each component to differentiate between the sample locations and their impact on risk assessment:

- *Accessible* represents any accessible surface (i.e., equipment, walls, desks, etc.);

- *Floors* represent drain grates, metal platforms, concrete, etc.;

- *Sumps* represent dikes and sumps; and

- *Unaccessible* represents overhead structures or any unaccessible areas.

With survey values separated into these categories, a more detailed assessment can be made of contamination within the components.

TABLE A-3 OPERABLE UNIT 3 STRUCTURES/EQUIPMENT RADIOLOGICAL SURVEYS

Component	Category	Alpha Removable (DPM/100sq. cm)			Alpha Total (DPM/100sq. cm)			Beta-Gamma Removable (DPM/100sq. cm)			Beta-Gamma Total (DPM/100sq. cm)		
		Average Value	Maximu Value	Sample Size	Average Value	Maximum Value	Sample Size	Average Value	Maximum Value	Sample Size	Average Value	Maximum Value	Sample Size
Green Salt Plant (4A)													
First Floor - Elev. 580	Accessible	2,156	18,100	67	NA	NA	NA	13,263	143,000	67	NA	NA	NA
	Floor	779	26,200	91	NA	NA	NA	2,621	89,200	91	NA	NA	NA
	Unaccess.	4,366	16,200	33	NA	NA	NA	13,529	49,500	33	NA	NA	NA
Elev 588	Accessible	4,982	28,200	25	NA	NA	NA	21,662	109,000	25	NA	NA	NA
	Floor	796	3,670	16	NA	NA	NA	3,139	19,800	16	NA	NA	NA
	Unaccess.	2,604	5,520	9	NA	NA	NA	6,253	16,600	9	NA	NA	NA
Second Floor - Elev 597	Accessible	2,965	31,900	95	NA	NA	NA	16,037	176,000	95	NA	NA	NA
	Floor	1,212	11,800	75	NA	NA	NA	6,072	48,800	75	NA	NA	NA
Elev 605	Accessible	1,432	3,440	14	NA	NA	NA	3,590	9,990	14	NA	NA	NA
	Floor	613	2,070	26	NA	NA	NA	1,065	4,790	26	NA	NA	NA
Green Salt Plant (Cont'd) - Elev 610	Accessible	1,429	12,200	27	NA	NA	NA	3,039	26,700	27	NA	NA	NA
	Floor	292	1,070	32	NA	NA	NA	526	1,690	32	NA	NA	NA
	Unaccess.	10,951	10,951	1	NA	NA	NA	28,138	28,138	1	NA	NA	NA
Third Floor - Elev 619	Accessible	624	3,530	54	NA	NA	NA	1,672	17,600	54	NA	NA	NA
	Floor	270	3,330	103	NA	NA	NA	541	9,650	103	NA	NA	NA
	Unaccess.	4,213	9,020	3	NA	NA	NA	9,421	20,000	3	NA	NA	NA
Fourth Floor - Elev 629	Accessible	2,210	8,840	15	NA	NA	NA	6,212	18,400	15	NA	NA	NA
	Floor	985	8,020	125	NA	NA	NA	2,343	26,600	125	NA	NA	NA
Plant 4 Maintenance Building (4C)	Floor	54	54	20	NA	NA	NA	39	69	20	NA	NA	NA
Plant 7 (7A)	Accessible	719	4,780	65	NA	NA	NA	2,499	16,600	65	NA	NA	NA
	Floor	370	26,300	178	NA	NA	NA	864	29,800	178	NA	NA	NA
Pilot Plant Maintenance Building (13B)	Floor	31	58	8	NA	NA	NA	58	118	8	NA	NA	NA
Sump Pump House (13C)	Accessible	1,079	4,640	6	242,000	1,000,000	5	2,575	11,200	6	110,000	250,000	5
	Floor	363	941	19	228,000	1,000,000	6	629	3,360	19	308,000	500,000	6
	Unaccess.	181	257	5	2,000	5,000	5	280	396	5	47,000	100,000	3
Pilot Plant Thorium Tank Farm (13D)	Accessible	32	32	1	NA	NA	NA	20	20	1	NA	NA	NA
	Floor	268	629	13	NA	NA	NA	442	1,660	13	NA	NA	NA
Incinerator Building (39A)	Accessible	76	121	3	9,000	25,000	3	137	265	3	139,000	800,000	6
	Floors	53	53	5	1,000	2,000	26	71	73	5	18,000	80,000	29
Sewage Treatment Plant Incinerator (39D)	Accessible	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000,000	1,000,000	1
	Floor	NA	NA	NA	NA	NA	NA	NA	NA	NA	179,000	800,000	14
	Unaccess.	NA	NA	NA	NA	NA	NA	NA	NA	NA	150,000	150,000	1
Pilot Plant Warehouse (68)	Floor	203	1,100	46	NA	NA	NA	281	922	46	NA	NA	NA

TABLE A-4

SUMMARY TABLE OF SITE-WIDE ASBESTOS SURVEY

Table A-4 summarizes the results of the site-wide asbestos survey performed by Diagnostic Engineering, Incorporated (DEI). The report for this asbestos survey was submitted to Westinghouse Environmental Management Company of Ohio by DEI on February 28, 1992. A total of 74 FEMP components were investigated by this survey. Only components identified as potentially including asbestos-containing material (ACM) were investigated, e.g., newer facilities were not investigated due to the construction ban on ACMs.

Each facility or component was divided into homogeneous areas to facilitate sampling and characterization of the ACM. A homogeneous area is broadly defined as an area of material having similar type, consistency, color, appearance, or composition. Bulk samples were collected for analysis from each homogeneous area except where visual observations determined that there was no potential ACM to sample.

The ACM-positive areas, which were identified by the analysis of the bulk samples, were assigned a numeric hazard ranking by the survey. The hazard ranking range was from 1 (low potential for disturbance, ACM in good condition) to 7 (significant damage to ACM, immediate abatement necessary). Table A-4 identifies components containing homogeneous areas with a hazard ranking of 1 or above in the "Number of Positive Areas for ACM" column.

TABLE A-4 Summary of Site-Wide Asbestos Survey Results

Component	Component	Homogeneous Areas Sampled	Number of Positive Areas for ACM	Number of Bulk Samples
Green salt plant	4A	107	87	187
Plant 4 maintenance building	4C	5	2	4
Plant 7	7A	58	57	108
Pilot Plant maintenance building	13B	5	4	11
Magnesium storage building	32	7	5	9
Incinerator building	39A	6	5	8
(old) Plant 5 warehouse	65	0	0	0
Plant 1 thorium warehouse	67	0	0	0
Pilot Plant warehouse	68	4	4	2
Decontamination building	69	5	5	24

APPENDIX B

Applicable or Relevant and Appropriate Requirements (ARARs) and Other Criteria To Be Considered (TBCs)

WE-059.345

TABLE B.1 Potential Chemical-Specific Requirements

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Standards for Protection Against Radiation, 10 CFR 20, Subpart D - Radiation Dose Limits for Individual Members of the Public	Radiation	Any	The total effective dose equivalent to individual members of the public, in an unrestricted or restricted area, is limited to 0.1 rem. The does in any unrestricted area from external sources is limited to 0.002 rem in any one hour.	Potentially relevant and appropriate	These requirements are not applicable since Fernald OU3 is not a NRC licensed facility; however, they may be relevant and appropriate.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
			The annual average concentrations of radioactive material released in gaseous and liquid effluent at the boundary of the unrestricted area do not exceed:		

Effluent Concentrations

Radionuclide	Air (μCi/mL)	Water (μCi/mL)
Cobalt-60 W[a]	2E-10	3E-6
Y[a]	5E-11	-
Strontium-90 D[a]	-	-
	3E-11	5E-7
Y	6E-12	-
Ruthenium-106 D	1E-10	-
	-	3E-6
W	8E-11	-
Y	2E-11	-
Cesium-137 D	2E-10	1E-6
Technetium-99 D	-	6E5
	8E-9	-
W	9E-10	-
Radon-220 (with daughters removed)	2E-8	-
Radon-220 (with daughters present)	3E-11	-
Radon-222 (with daughters removed)	1E-8	-

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement				Preliminary Determination	Remarks
			Effluent Concentrations					
			Radionuclide		Air (μCi/mL)	Water (μCi/mL)		
			Radon-222 (with daughters present)		1E-10	-		
			Radium-223	W	9E-13	-		
			Radium-224	W	2E-12	-		
			Radium-226	W	9E-13	-		
					-	6E-8		
			Radium-228	W	2E-12	-		
					-	6E-8		
			Protactinium-231	W	6E-15	6E-9		
				Y	8E-15	-		
			Protactinium-234	W	1E-8	3E-5		
				Y	9E-9	-		
			Actinium-227	D	-	-		
					1E-15	5E-9		
				W	-	-		
					4E-15	-		
				Y	6E-15	-		
			Actinium-228	D	-	3E-5		
				Y	6E-11	-		
			Bismuth-210	D	-	1E-5		
				W	4E-11	-		
			Bismuth-212	D	3E-10	7E-5		
				W	5E-11	-		
			Bismuth-214	D	1E-9	-		
				W	1E-9	-		

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement: Radionuclide		Effluent Concentrations: Air (μCi/mL)	Effluent Concentrations: Water (μCi/mL)	Preliminary Determination	Remarks
			Thorium-227	W	5E-13	2E-6		
				Y	5E-13	1E-4		
			Thorium-228	W	-	-		
					3E-14	2E-7		
				Y	2E-14	-		
			Thorium-230	W	-	-		
					2E-14	1E-7		
				Y	-	-		
					3E-14	-		
			Thorium-232	W	-	-		
					4E-15	3E-8		
				Y	-	-		
					6E-15	-		
			Thorium-234	W	3E-10	-		
				Y	2E-10	-		
			Uranium-233	D	-	-		
					3E-12	3E-7		
				W	1E-12	-		
				Y	5E-14	-		
			Uranium-234	D	-	-		
					3E-12	3E-7		
				W	1E-12	-		
				Y	5E-14	-		
			Uranium-235	D	-	-		
					3E-12	3E-7		
				W	1E-12	-		
				Y	6E-14	-		
			Uranium-236	D	-	-		
					3E-12	3E-7		
				W	1E-12	-		

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement			Preliminary Determination	Remarks
			Effluent Concentrations				
			Radionuclide	Air (μCi/mL)	Water (μCi/mL)		
			Uranium-238 D	-	-		
				3E-12	3E-7		
			W	1E-12	-		
			Y	6E-14	-		
			Uranium-natural D	-	-		
				3E-12	3E-7		
			W	9E-13	-		
			Y	9E-14	-		
			Neptunium-237 W	-	-		
				1E-14	2E-8		
			Polonium-210 D	9E-13	4E-8		
			W	9E-13	-		
			Plutonium-238 W	-	-		
				2E-14	2E-8		
			Y	2E-14			
			Plutonium-239 W	-	-		
				2E-14	2E-8		
			Y	-	-		
				2E-14	-		
			Plutonium-240 W	-	-		
				2E-14	2E-8		
			Y	-	-		
				2E-14	-		
			Plutonium-241 W	-	-		
				8E-13	1E-6		
			Y	-	-		
				1E-12	-		
			Plutonium-242 W	-	-		
				2E-14	2E-8		
			Y	-	-		
				2E-14	-		

[a] Daily (D), weekly (W) and yearly (Y) lung retention classifications.

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Radiation Protection Rules, Ohio Administration Code; Chapter 3701-38: General Radiation Protection Standards; Rules 3701-38-13, 3707-38-15 and 3701-38-16	Radiation	Any	No individual in a restricted area shall receive in any one calendar quarter a total occupational dose in excess of: Dose (rem) Whole body; hand and trunk, active blood-forming organs, lens of eyes or gonads: 1-1/4 Hand and forearms, feet and ankles: 18-3/4 Skin of whole body: 7-1/2 Except, exposure to the whole body may exceed the above values provided exposure does not exceed 3 rem/quarter and the dose to the whole body when added to the accumulated dose to the whole body shall not exceed 5(N-18) rem where N = individual's age in years at his last birthday. No person may cause any individual under 18 years of age within a restricted area to receive in any period of one calendar quarter, from all sources of radiation, a dose in excess of 10% of the limits specified above.	Potentially applicable	These requirements may be applicable to the protection of workers at the site during implementation of the corrective action.
			The exposure limit for any member of the public in an unrestricted area is limited to radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 2 mrem in any one hour, or in excess of 100 mrem in any 7 consecutive days. Limits in excess of those specified may be approved by the Ohio Department of Health if the limits are not likely to cause any individual to receive a dose to the whole body in any period of one calendar year in excess of 0.5 rem.	Potentially applicable	These requirements would be applicable for the protection of the general public from radionuclide emissions to uncontrolled areas.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
(Cont'd)			Radioactive material may not be released to an unrestricted area such that concentrations exceed:		

Effluent Concentrations

Radionuclide	Air (μCi/ml)	Water (μCi/mL)
radium-226 s*	3E-12	3E-8
i	2E-12	3E-5
radium-228 s	2E-12	3E-8
i	1E-12	3E-5
radon-220	1E-8	-
radon-222	3E-9	-
beta and/or gamma emitters not listed with half life < 2 h	3E-8	-
beta and/or gamma emitters not listed with half life > 2 h	1E-10	3E-6
alpha emitters not listed above	2E-14	3E-8

Except higher limits may be allowed upon showing reasonable effort has been made to minimize radioactivity discharged. Concentrations apply at the boundary of the restricted area.

*Soluble (s) and insoluble (i).

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, 40 CFR 192	Radiation	Any	After closure of a uranium byproduct material disposal site, releases of radon-222 to the atmosphere shall not exceed an average release rate of 20 pCi/m²/s.	Potentially relevant and appropriate	These standards are not applicable because Fernald is not a disposal site; however, they may be relevant and appropriate to on-site disposal of radionuclide materials.
Disposal or On-Site Storage of Thorium or Uranium Wastes from Past Operations, NRC Branch Technical Position (46 FR 52061, Oct. 23, 1981)	Thorium and uranium	Any	Applications for burial of low-concentration thorium and uranium contaminated wastes or storage thereof will be approved if these guidelines are met, including dose and pCi/gm limits and prescribed depth and titling conditions. Storage on-site pending appropriate disposal requires that radiation doses not exceed those specified in 10 CFR Part 20.	To be considered	These guidelines are for NRC consideration of applications. Other methods of disposal may be proposed but will be evaluated on their own merit.
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Radiation	Air	The basic dose limit for nonoccupationally exposed individuals is 100 mrem/yr above background, committed effective dose equivalent. Further, all radiation exposures must be reduced to levels as low as reasonably achievable.	To be considered	Although not promulgated standards, these requirements are derived from such standards and they constitute require-ments for protection of the public with which the proposed action will comply.
National Emission Standards for Hazardous Air Pollutants (40 CFR 61), Subpart H, National Emission Standards for Emissions of Radio-nuclides Other Than Radon from Department of Energy Facilities	Radionuclides other than radon-220 and radon-222	Air	Emissions of such radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public in any year an effective dose equivalent of 10 mrem/yr.	Potentially applicable	These requirements may be applicable because Fernald OU3 is a DOE facility.
National Emission Standards for Hazardous Air Pollutants (40 CFR 61), Subpart Q, National Emission Standards for Radon Emissions from DOE Facilities	Radon	Air	No source at a DOE facility shall emit more than 20 pCi/m² of radon-222 as an average into the air.	Potentially applicable	These regulations are applicable if storage and disposal facilities for radium-containing material are part of the proposed action.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192)	External gamma radiation	Air	The level of external gamma radiation in any occupied or habitable building must not exceed the background level by more than 20 μR/h.	Potentially relevant and appropriate	Fernald OU3 is not a mill tailings site, so these requirements are not applicable; they may be relevant and appropriate if habitable buildings would be involved in the proposed action.
	Radon	Air	Releases of radon from tailings disposal piles must not exceed an average rate of 20 pCi/m²-s or increase the annual average concentration in air outside the disposal site by more than 0.5 pCi/L.	Potentially relevant and appropriate	Fernald OU3 is not a mill tailings site, so these requirements are not applicable; however, they may be considered relevant and appropriate.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
	Radon decay products	Air	The annual average (or equivalent) radon decay product concentration, including background, in any habitable building must not exceed 0.02 working level (WL) or a maximum of 0.03 WL -- where a WL is any combination of short-lived radon decay products in 1 liter of air, without regard to the degree of equilibrium, that will result in the emission of 1.3×10^5 MeV of alpha energy. (For radon-222 in equilibrium with its decay products, 1 WL = 100 pCi/L.)	Potentially relevant and appropriate	Fernald OU3 is not a mill tailings site, so these requirements are not applicable; they may be relevant and appropriate if habitable buildings are involved in the proposed action.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	See Table	Air	Residual concentrations of radionuclides in air in uncontrolled areas are limited to the following. (For known mixtures of radionuclides, the sum of the ratios of the observed concentration of each radionuclide to its corresponding limit must not exceed 1.0.)	To be considered	Although not promulgated standards, these constitute requirements for protection of the public with which the proposed action will comply.

Isotope	Derived Concentration Guide[a] (μCi/mL) D	W	Y
Actinium-227	4×10^{-15}	1×10^{-15}	1×10^{-14}
Actinium-228	4×10^{-11}	1×10^{-10}	1×10^{-10}
Americium-241	-	2×10^{-12}	-
Bismuth-210	9×10^{-10}	6×10^{-11}	-
Bismuth-212	6×10^{-10}	7×10^{-10}	-
Bismuth-214	2×10^{-9}	2×10^{-9}	-
Cesium-137	4×10^{-10}	-[b]	-
Cobalt-60	-	4×10^{-10}	8×10^{-11}
Europium-152	-	5×10^{-11}	-
Lead-210	9×10^{-13}	-	-
Lead-212	8×10^{-11}	-	-
Lead-214	2×10^{-9}	-	-
Neptunium-237	-	2×10^{-14}	-
Plutonium-238[c]	-	3×10^{-14}	4×10^{-14}
Plutonium-239[c]	-	2×10^{-14}	4×10^{-14}
Plutonium-240[c]	-	2×10^{-14}	4×10^{-14}
Plutonium-241[c]	-	1×10^{-14}	2×10^{-12}

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement				Preliminary Determination	Remarks
Radiation Protection of the Public and the Environment (DOE Order 5400.5) (Cont'd)				Derived Concentration Guide[a] (μCi/mL)				
			Isotope	D	W	Y		
			Plutonium-242[c]	-	1×10^{12}	2×10^{12}		
			Polonium-210	1×10^{-12}	1×10^{12}	-		
			Protactinium-231	-	9×10^{15}	1×10^{14}		
			Protactinium-234	-	-	-		
			Radium-223	-	2×10^{12}	-		
			Radium-224	-	4×10^{12}	-		
			Radium-226	-	1×10^{12}	-		
			Radium-228	-	3×10^{12}	-		
			Radon-220[d]	3×10^{-9}	3×10^{9}	3×10^{9}		
			Radon-222[d]	3×10^{-9}	3×10^{9}	3×10^{9}		
			Technetium-99	1×10^{-8}	2×10^{9}	-		
			Ruthenium-106	2×10^{-10}	1×10^{10}	3×10^{11}		
			Strontium-90[c]	5×10^{-11}	-	9×10^{12}		
			Thorium-227	-	8×10^{15}	7×10^{15}		
			Thorium-228	-	5×10^{14}	4×10^{14}		
			Thorium-229	-	6×10^{15}	7×10^{15}		
			Thorium-230	-	4×10^{14}	5×10^{14}		
			Thorium-232	-	7×10^{15}	1×10^{14}		
			Thorium-natural	-	7×10^{15}	1×10^{14}		

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Radiation Protection of the Public and the Environment (DOE Order 5400.5) (Cont'd)			See Derived Concentration Guide table below		

Isotope	Derived Concentration Guide[a] (μCi/mL) D	W	Y
Thorium-234	-	5×10^{-10}	4×10^{-10}
Uranium-231[c]	2×10^{-8}	1×10^{-8}	1×10^{-8}
Uranium-233[c]	4×10^{-12}	2×10^{-12}	9×10^{-14}
Uranium-234[c]	4×10^{-12}	2×10^{-12}	9×10^{-14}
Uranium-235[c]	5×10^{-12}	2×10^{-12}	1×10^{-13}
Uranium-236[c]	5×10^{-12}	2×10^{-12}	1×10^{-13}
Uranium-238[c]	5×10^{-12}	2×10^{-12}	1×10^{-13}
Uranium-Natural[c]	5×10^{-12}	2×10^{-12}	1×10^{-13}

[a]D, W, and Y represent lung retention classes; removal half-times assigned to the compounds with classes D, W, and Y are 0.5, 50, and 500 days, respectively. Exposure conditions assume an inhalation rate of 8,400 m^3 of air per year (based on an exposure over 24 hours per day, 365 days per year).

[b]A hyphen means no limit has been established.

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Radiation Protection of the Public and the Environment (DOE Order 5400.5) (Cont'd)			[c]The value shown for yearly DCG is for plutonium radionuclides with an absorption factor (f_1) value of 1×10^{-5}. The value shown for weekly DCG is for plutonium radionuclides with a f_1 value of 1×10^{-5}. The value shown for daily and weekly DCG is for Uranium radionuclides with a f_1 value of 5×10^{-2} and for yearly DCG is for uranium radionuclides with a f_1 value of 2×10^{-3}. The value shown for daily DCG is for strontium radionuclides with a f_1 value of 3×10^{-1}. The value shown for yearly DCG is for strontium radionuclides for a f_1 value of 1×10^{-2}. [d]Still being assessed.		
	Radon-222	Air	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. (See also the discussion for DOE Order 5820.2A.)	To be considered	Although not promulgated standards, these constitute requirements for protection of the public with which the proposed action will comply.
	Radon-220 and radon-222	Air	The immersion derived concentration guide for both radon-220 and radon-222 in air in an uncontrolled area is 3 pCi/L.	To be considered	Although not promulgated standards, these constitute requirements for protection of the public with which the proposed action will comply.
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	External gamma radiation	Air	The level of external gamma radiation in any occupied or habitable building must not exceed the background level by more than 20 μR/h.	To be considered	Pertinent to the proposed action if habitable buildings are involved in the proposed action.
	Radon	Air	Releases of radon-222 from residual radioactive material disposal sites should not exceed an annual average release rate of 20 pCi/m^2-s or increase the annual average radon-222 concentration at or above any location outside the boundary of the contaminated area by more than 0.5 pCi/L.	To be considered	Although not promulgated standards, these constitute requirements for protection of the public with which the proposed action will comply.
	Radon decay products	Air	The annual average (or equivalent) radon decay product concentration, including background, in any habitable building must not exceed 0.02 working level (WL) or a maximum of 0.03 WL.	To be considered	Pertinent to the proposed action if habitable buildings are involved in the proposed action.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Clean Air Act, as amended (42 USC 7401-7642); National Primary and Secondary Ambient Air Quality Standards (40 CFR 50)	Particulate matter	Air	For a majority stationary source (see 40 CFR 52.2(b)(1)(i)(a)) that emits >250 tons/year of any regulated pollutant or >100 tons/year of a regulated pollutant for which the area is designated as nonattainment, particulate matter less than 10 μm in diameter (PM-10) should not exceed a 24-hour average concentration of 150 $\mu g/m^3$ or an annual arithmetic mean of 50 $\mu g/m^3$.	Potentially applicable	These requirements do not apply directly to source-specific emissions; rather, they are national limitations on ambient concentrations. However, they will be addressed in controlling particulate emissions that could result from implementation of the remedial action.
	Lead	Air	As for the above conditions, the standard for lead and its compounds, as elemental lead, is 1.5 $\mu g/m^3$ maximum arithmetic mean averaged over one calendar quarter.	Potentially applicable	These requirements do not apply directly to source-specific emissions; rather, they are national limitations on ambient concentrations. However, they will be addressed in controlling lead emissions that could result from implementation of the remedial action.
Ohio Air Pollution Control Regulations, Ohio Administrative Code, 3745-17-02	Particulate matter	Air	For total suspended particulates, the 24-hour primary and secondary ambient air quality standards are identical and the annual primary and secondary ambient air quality standards are identical. Total suspended particulates shall be measured in the ambient air as particles with an aerodynamic diameter less than or equal to a nominal ten micrometers. The level of 24-hour ambient air quality standards for total suspended particulates is 150 micrograms per cubic meter, 24-hour average concentration. The level of the primary and secondary annual standards for total suspended particulates is 50 micrograms per cubic meter, annual arithmetic mean.	Potentially applicable	These regulations do not apply directly to source-specific emissions, rather they are limits on ambient concentrations in the air. However, they would be applicable to controlling particulate emissions during implementation of the remedial action.
Ohio Air Pollution Regulations, Ohio Administrative Code 3745-20-04 and -05 Demolition and Renovation Procedures for Asbestos Emission Control	Asbestos	Air	Remove friable asbestos materials from a facility being demolished or renovated before any wrecking or dismantling that would break up materials or preclude access to the materials for subsequent removal. Wet and encase friable materials with a suitable leak-tight container.	Potentially Applicable	These regulations are applicable to the demolition or renovation of any building in which asbestos is present.
Ohio Air Pollution Lead Control Regulations Ohio Administrative Code, 5745-71-02, Lead Emissions Limits	Lead	Air	Exposure to lead shall not exceed the arithmetic mean of 1.5 $\mu g/m^3$ during any calendar quarter.	Potentially applicable	These regulations would be applicable to any proposed action which would put lead into the air.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Toxic Substances Control Act, as amended (15 USC 2607-2629; PL 94-469 et seq.); Polychlorinated Biphenyls (PCBs) Manufacturing Processing, Distribution in Commerce and Use Prohibitions (40 CFR 761), Subpart A, General;	PCBs	Air	The release of inadvertently generated PCBs at the vent point for emissions must be <10 ppm.	Potentially relevant and appropriate	This requirement is not applicable because no PCBs would be generated and vented from manufacturing/processing activities as part of the proposed action; however, portions of this requirement may be relevant and appropriate because PCB emissions could occur during implementation.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192)	Radium and thorium	Soil	Average concentrations of residual radioactive materials in soil over an area of 100 m^2 may not exceed background by more than 5 pCi/g in the top 15 cm of soil or 15 pCi/g in each 15-cm layer below the top layer.	Potentially relevant and appropriate	Fernald, OU3 is not a mill tailings site, so these requirements are not applicable; however, they may be considered relevant and appropriate to the proposed action.
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Radium and thorium	Soil	Average concentrations of radium-226, radium-228, thorium-230, and thorium-232 averaged over an area of 100 m^2 may not exceed 5 pCi/g in the top 15 cm of soil and 15 pCi/g in each 15-cm layer below the top layer. These guidelines taken into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-230, and assume secular equilibrium. If both thorium-230 and radium-226 or both thorium-232 and radium-228 are present and not in secular equilibrium, the appropriate guideline is applied as a limit for the radionuclide with the higher concentration.	To be considered	Although not promulgated standards, these constitute requirements for protection of the public with which the proposed action will comply.
Toxic Substances Control Act, as amended (15 USC 2607-2629; PL 94-469 et seq.); Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761), Subpart G, PCB Spill Cleanup Policy.	PCBs	Soil	For spills of materials contaminated with >50 ppm PCBs in unrestricted access areas (e.g., residential areas), soil within the spill area must be excavated and backfilled with soil containing <1 ppm PCBs. Contaminated soil may be decontaminated to 10 ppm by weight by excavating a minimum of 10 inches and backfilling with soil containing <1 ppm PCBs. For spills at outdoor electrical substations, the soil must be cleaned to 25 ppm by weight (as for other restricted access areas) or to 50 ppm by weight with posting of a visible notice.	Potentially applicable	If a spill of materials contaminated with PCBs should occur during implementa-tion of the remedial action, these regulations would be applicable.

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Safe Drinking Water Act (42 USC 300G; PL 93-523); National Primary Drinking Water Regulations (40 CFR 141), Subpart B, Maximum Contaminant Levels; Subpart G, National Revised Primary Drinking Water Regulations; Maximum Contaminant Levels; National Secondary Drinking Water Regulations (40 CFR 143), Secondary Maximum Contaminant Levels.	See table	Water	Maximum contaminant levels (MCLs) and secondary maximum contaminant levels (SMCLs) for drinking water delivered directly to the ultimate user of a public water system are as follows:	Potentially relevant and appropriate	These requirements are not applicable because OU3 is not a public water system, however, if water supplies would be impacted by actions at the site, these requirements would be relevant and appropriate to protect drinking water sources from the contamination due to the remedial action.

Parameter	Unit	MCL	SMCL
Aluminum	mg/L	-	0.05 to 0.2
Asbestos	million fibers/L	7.0	-
Arsenic	mg/L	0.05	-
Barium	mg/L	1	-
Lead	μg/L	50	-
Cadmium	mg/L	0.005	
Chromium	mg/L	0.05	
Fluoride	mg/L	4.0	2.0
Mercury	mg/L	0.002	
Silver	mg/L	0.05	0.1
Benzene	mg/L	0.005	-
Trichloroethylene	mg/L	0.005	-
Copper	mg/L	-	1
Manganese	mg/L	-	0.05
Nitrate	mg/L	10	-
Chloroform	mg/L	0.1	-
Ethyl-benzene	mg/L	0.7	-

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks

Parameter	Unit	MCL	SMCL
Selenium	mg/L	0.05	-
Iron	mg/L	-	0.3
Carbon tetrachloride	mg/L	0.005	-
1,2-Dichloroethane	mg/L	0.005	-
1,1-Dichloroethylene	mg/L	0.007	-
1,1,1-Trichloroethane	mg/L	0.2	
Pentachlorophenol	mg/L	0.2	-
PCBs	mg/L	0.0005	-
Toluene	mg/L	1.0	-
Tetrachloroethylene	mg/L	0.005	-
Xylene (total)	mg/L	10.0	-
Radionuclides:			
Gross alpha[a]	pCi/L	15	-
Gross beta[b]	mrem/yr	4	-
Radium-226 and radium-228	pCi/L	5	-
Others:			
pH	units	-	6.5-8.5
TDS	mg/L	-	500

[a]Including radium but excluding radon and uranium.

[b]As mrem/yr, annual dose equivalent; if gross beta activity exceeds 50 pCi/L, isotopic analysis and organ-specific dose calculations should be made to insure that this total dose limit is met. Also, for Strontium-90 the average annual concentration assumed to produce a total body or organ dose of 4 mrem/yr for bone marrow is 8 pCi/L.

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
National Primary and Secondary Drinking Water Regulations (54 FR 97, May 22, 1989, Proposed Rule); Maximum Contaminant Level Goals and National Primary Drinking Water Regulations for Lead and Copper (53 FR 150, August 18, 1988, Proposed Rule); National Primary Water Regulations (56 FR 33050, July 18, 1991, Proposed Rule)	See table	Water	Proposed maximum contaminant levels (PMCLs) and proposed secondary maximum contaminant levels (PSMCLs) for drinking water delivered directly to the ultimate user of a public water system are as follows.	To be considered	These requirements are not promulgated standards however may be considered if water impacted by the site would be directly used as a drinking water supply.

Parameter	Unit	PMCL	PSMCL
Metals:			
Lead	μg/L	5	-
Radionuclides:			
Radon-222	pCi/L	300	-
Radium-226	pCi/L	20	-
Radium-228	pCi/L	20	-
Uranium	μg/L	20	-
Adjusted gross Alpha	pCi/L	15	-
Beta particle and photon emitters	ede/yr	4	-
Others:			
PCBs	μg/L	0.5	-

NOTE: 20 μg/L uranium is approximately equal to 30 pCi/L using an activity-to-mass conversion of 1.3 pCi/μg. The activity-to-mass ratio can vary depending on the relative amounts of uranium-234, -235, and -238 that are present in a sample. The MCL applies to the total mass of uranium in the sample. The unit mrem ede/yr refers to the dose committed over a period of 50 years to reference man (ICRP 1975) from an annual intake at the rate of 2 liters of drinking water per day.

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
National Primary Drinking Water Regulations; Maximum Contaminant Level Goals, Subpart F (40 CFR 141.50-141.52)	See table	Water	Maximum contaminant level goals are the maximum level of contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur. Contaminant — Limit Ethylbenzene — 0.7 mg/L Xylenes (totals) — 10.0 mg/L Toluene — 1.0 mg/L Asbestos — 7 million fibers/L Cadmium — 0.005 mg/L Chromium — 0.1 mg/L Mercury — 0.002 mg/L Nitrate — 10 (as Nitrogen) mg/L PCBs — 0 mg/L Benzene — 0 mg/L Trichloroethylene — 0 mg/L Fluoride — 4 mg/L Copper — 1.3 mg/L Fluoride — 4.0 mg/L Lead — 0 mg/L Barium — 2 mg/L	Potentially relevant and appropriate	These regulations are not applicable because OU3 is not a public water system, however, if drinking water supplies would be impacted by actions at the site, these requirements could be relevant and appropriate. MCLGs may be relevant and appropriate where they meet all the standards set forth in 40 CFR 300.400(g). However, MCLGs of zero are not considered ARARs under CERCLA.
Ore Mining and Dressing Point Source Category (40 CFR 440), Subpart C, Uranium, Radium, and Vanadium Ores Subcategory	Radium and uranium	Water	Limits for surface-water discharges from mines that produce uranium ore are as follows: uranium, 2 mg/L as a 30-day average and 4 mg/L as a 24-hour maximum; radium-226 (dissolved and total), 3 and 10 pCi/L as a 30-day average and 10 and 30 pCi/L as a 24-hour maximum, respectively.	Potentially relevant and appropriate	These requirements are neither applicable nor relevant and appropriate because surface water discharged from the site is not mine drainage. However, they may be considered relevant and appropriate in establishing remediation goals.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192)	Uranium	Water	Surface impoundments for the disposal of uranium byproduct wastes shall conform to the groundwater protection standards of 40 CFR 264.92 and in addition concentration limits for combined radium-226 and radium-228 shall not exceed 5 pCi/L and gross alpha-particle activity (excluding radon and uranium) shall not exceed 15 pCi/L.	Potentially applicable	These requirements may be applicable if water impacted by the site would be directly used as a drinking water supply.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Federal Water Pollution Control Act, Clean Water Act (33 USC 1251-1376); Water Quality Criteria (40 CFR 122)	See table	Water	The concentration of contaminants in surface water should be limited to the following for the protection of human health and aquatic life.	To be considered	Federal WQC are non-enforceable guidelines used by States to set water quality standards for surface water; however, they may be considered if the waters concerned are a public water supply or if fishing is also included in the State's designated use of the waters concerned. If a State has promulgated a numerical water quality standard for a given contaminant, the State standard would be relevant and appropriate rather than a federal WQC.

Water Quality Criteria for Protection of Human Health

Contaminant	Unit	Water and Fish Ingestion	Fish Consumption
Metals:			
Lead	μg/L	50	-
PCB	μg/L	7.9E-05[b]	7.9E-05[b]

Ambient Water Quality Criteria for Protection of Aquatic Life

Contaminant	Unit	Freshwater Acute	Freshwater Chronic
Metals:			
Lead	μg/L	82[a]	3.2[a]
Others:			
PCBs	μg/L	2.0	0.014

[a] Water-hardness dependent criterion (based on 100 mg/L).

[b] Human health criteria reported for three risk levels; reported value is for the 1 x 10^{-6} level.

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Ohio Water Quality Standards, Ohio Administrative Code 3745-1-01, 3745-1-07; Ohio NPDES Permits, Ohio Administrative Code 3745-33	Any	Water	All surface waters shall be free of: suspended solids or other substances that will settle and form putrescent or otherwise objectionable sludge deposits or that will adversely affect aquatic life; free of floating debris, oil, scum or other floating materials in amounts sufficient to be unsightly or cause degradation; free from materials producing color, odor or other conditions in such a degree as to create a nuisance; free of substances in concentrations that are toxic or harmful to human, animal or aquatic life and/or are rapidly lethal in the mixing zone, and free from nutrients in concentrations that create nuisance growths of aquatic weeds and algae. Water use designations and chemical specific criteria are presented in Tables 7-1 through 7-16 of the Ohio Water Quality Standard regulations. Such criteria apply as outside mixing zone or inside mixing zone maximums for the designated use of the affected body of water.	Potentially applicable	It is not anticipated the actions at OU3 will result in discharges directly from a point source into any waters of the State of Ohio so these regulations would not be applicable. However, if wastewater may be indirectly discharged to a POTW, applicable pretreatment standards and requirements apply. Fernald holds a NPDES permit for its treatment works and any discharge of waste water must comply with such permit. All such discharges would have to meet the pretreatment standards and requirements and not cause any violation of the NPDES permit conditions.

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
Ohio Drinking Water Regulations, Ohio Administrative Code, Title 3745, Chapter 81-Public Water System Primary Contaminant Control	See table	Water	Maximum contaminant levels for inorganic chemicals are:	Potentially relevant and appropriate	These requirements may be relevant and appropriate if water impacted by the site would be used directly as a drinking water supply.

Contaminant	mg/L
Arsenic	0.05
Cadmium	0.010
Chromium	0.05
Fluoride	4.0
Lead	0.05
Mercury	0.002
Nitrate	10.0
Silver	0.05
Selenium	0.01

Maximum contaminant levels for organic chemicals are:

Contaminant	mg/L
Trihalo-methanes	0.10
Benzene	0.005
Carbon tetrachloride	0.005
Trichloroethylene	0.005
1,2-Dichloroethane	0.005
1,1-Dichloroethylene	0.007
1,1,1-Trichloroethane	0.20

Maximum contaminant levels for radionuclides:

Isotope	pCi/L
Radium-226 and -228 combined	5.0
Gross alpha particle activity (including radium-226, but excluding radon and uranium	15.0

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TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement	Preliminary Determination	Remarks
			Maximum contaminant levels for beta particle and photon radioactivity from man-made radionuclides shall not produce an annual dose equivalent to the total body or any internal organ greater than 4 mrem/yr, based on two liter per day drinking water intake using the 168-hour data listed in NBS Handbook 69, as amended August 1963, U.S. Department of Commerce. If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/yr. Also, for strontium-90 the average annual concentration assumed to produce a total body or organ dose of 4 mrem/yr for bone marrow is 8 pCi/L.		
Ohio Drinking Water Regulations Ohio Administrative Code, Title 3745, Chapter 82 - Public Water System Secondary Contaminant Control	See chart	Water	Secondary Maximum Contaminant levels are:	Potentially relevant and appropriate	These regulations may be relevant and appropriate if water impacted by the site would be used directly as a drinking water supply.

Contaminant	mg/L
Copper	1.0
Fluoride	2.0
Iron	0.3

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement		Preliminary Determination	Remarks
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Radiation	Water	Residual concentrations of radionuclides in water in uncon-trolled areas are limited to the following. (For known mixtures of radionuclides, the sum of the ratios of the observed concentration of each radionuclide to its corresponding limit must not exceed 1.0.)		To be considered	Although not promulgated standards, these constitute requirements for protection of the public with which the proposed action will comply.
			Isotope	**Concentration**		
			Actinium-227	1×10^{-8}		
			Actinium-228	6×10^{-5}		
			Americium-241	3×10^{-8}		
			Bismuth-210	2×10^{-5}		
			Bismuth-212	1×10^{-4}		
			Bismuth-214	6×10^{-4}		
			Europium-152	2×10^{-5}		
			Lead-210	3×10^{-8}		
			Lead-212	3×10^{-6}		
			Lead-214	2×10^{-4}		
			Protactinium-231	1×10^{-8}		
			Protactinium-234	7×10^{-5}		
			Thorium-228	4×10^{-7}		
			Thorium-230	3×10^{-7}		
			Thorium-232	5×10^{-8}		
			Thorium-227	4×10^{-6}		
			Thorium-234	1×10^{-5}		
			Radium-223	3×10^{-7}		
			Radium-224	4×10^{-7}		
			Radium-226	1×10^{-7}		
			Radium-228	1×10^{-7}		
			Radon-220[c]	3×10^{-9}		
			Radon-222[c]	3×10^{-9}		
			Technetium-99	1×10^{-4}		
			Neptunium-237	3×10^{-8}		
			Ruthenium-106	6×10^{-6}		
			Cesium-137	3×10^{-6}		
			Cobalt-60[b]	1×10^{-5}		
				5×10^{-6}		
			Polonium-210	8×10^{-8}		
			Plutonium-238[d]	4×10^{-8}		
				3×10^{-6}		
			Plutonium-239[d]	3×10^{-8}		
				2×10^{-6}		
			Plutonium-240[d]	3×10^{-8}		
				2×10^{-6}		

TABLE B.1 (Cont'd)

Potential ARAR	Contaminant	Medium	Requirement		Preliminary Determination	Remarks
			Isotope	Concentration		
			Plutonium-241[b]	1×10^{6}		
				1×10^{4}		
			Plutonium-242[b]	3×10^{8}		
				2×10^{6}		
			Strontium-90[b]	1×10^{6}		
				1×10^{5}		
			Uranium-233[b]	5×10^{7}		
				5×10^{6}		
			Uranium-234[b]	5×10^{7}		
				5×10^{6}		
			Uranium-235[b]	6×10^{7}		
				5×10^{6}		
			Uranium-236[b]	5×10^{7}		
				6×10^{6}		
			Uranium-238[b]	6×10^{7}		
				6×10^{6}		
			U-natural[b]	6×10^{7}		
				6×10^{6}		

[a]Exposure conditions assume an ingestion rate of 730 L/yr of water (based on exposure during 365 d/yr).

[b]All other concentration levels are for plutonium radionuclides with a f^1 value of 1×10^{5}. For uranium radionuclides with a f^1 value of 2×10^{3}. All other concentration levels are for uranium radionuclides with a f^1 value of 5×10^{2}. For cobalt radionuclides the f_1 values are 5×10^{2} and 3×10^{1} consecutively. For strontium radionuclides the f_1 values are 3×10^{0} and 1×10^{2} consecutively.

[c]Still being assessed.

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TABLE B.2 Potential Location-Specific Requirements

Potential ARAR	Location	Requirement	Preliminary Determination	Remarks
Antiquity Act; Historic Sites Act (16 USC 431-433; 16 USC 461-467; 40 CFR 6.301(a))	Land	Cultural resources, such as historic buildings and sites and natural landmarks, must be preserved on federal land to avoid adverse impacts.	Potentially applicable	No adverse impacts to such resources are expected to result from the proposed action; however, if these resources were affected, the requirement would be applicable.
National Historic Preservation Act, as amended (16 USC 470 et seq.; 40 CFR 6.301(b); 36 CFR 800)	Land	The effect of any federally assisted undertaking must be taken into account for any district, site, building, structure, or object included in or eligible for the *National Register of Historic Places.*	Potentially applicable	No adverse impacts to such properties are expected to result from the proposed action; however, if these resources were affected, the requirement would be applicable.
Archeological and Historic Preservation Act (16 USC 469; 40 CFR 6.301(c); PL 93-291; 88 Stat. 174)	Land	Prehistorical, historical, and archeological data that might be destroyed as a result of a federal, federally assisted, or federally licensed activity or program must be preserved.	Potentially applicable	No destruction of such data is expected to result from the proposed action. However, if these data were affected, the requirement would be applicable.
Archeological Resources Protection Act (16 USC 470(a))	Land	A permit must be obtained if an action on public or Indian lands could impact archeological resources.	Potentially applicable	No impacts to archeological resources are expected to result from the proposed action. However, if these resources were affected, the requirement would be applicable.
Protection and Enhancement of the Cultural Environment (Executive Order 11593; 40 CFR 6.301)	Land	Historic, architectural, archeological, and cultural resources must be preserved, restored, and maintained, and must be evaluated for inclusion in the *National Register.*	Potentially applicable	No impacts to such resources are expected to result from the proposed action. However, if these resources were affected, the requirement would be applicable.
Endangered Species Act, as amended (16 USC 1531-1543; 50 CFR Subpart B; 40 CFR 6.302(h)); Migratory Bird Treaty Act (16 USC 703 et seq); Bald & Golden Eagle Protection Act (16 USC 668-668(d))	Any	Federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify any critical habitat.	Potentially applicable	No critical habitat exists in the affected area. No adverse impacts to threatened species are expected to result from the proposed action; however, if such species were affected, the requirement would be applicable.
Fish and Wildlife Coordination Act (16 USC 661-666; 40 CFR 6.302(a))	Any	Adequate protection of fish and wildlife resources is required when any federal department or agency proposes or authorizes any modification (e.g., diversion or channeling) of any stream or other water body or any modification of areas affecting any stream or other water body.	Not an ARAR	No modification of streams or stream areas is planned as part of the proposed action.
Conservation of Natural Resources, Ohio Revised Code, Title 15; Department of Natural Resources Regulations, Chapter 1518:18 - Endangered Species and 1518:31 - Endangered Wildlife	Any	No person may willfully root up, injure, destroy, remove, or carry away on or from public highways, public property, or the waters of the state any endangered or threatened plant listed in the regulations. No person shall take, kill, possess, transport, buy, or sell any wild animal contrary to any order or rule of the Division of Wildlife.	Potentially applicable	If critical habitat or endangered species or wildlife will be affected by any proposed action, these regulations would be applicable.

TABLE B.2 (Cont'd)

Potential ARAR	Location	Requirement	Preliminary Determination	Remarks
Floodplain Management (Executive Order 11988; 10 CFR 1022)	Floodplain	Federal agencies must avoid, to the maximum extent possible, any adverse impacts associated with direct and indirect development of a floodplain.	Potentially applicable	OU3 is not located within the 100-year floodplain. However, if a floodplain were affected by the proposed action, the requirement would be applicable.
Protection of Wetlands (Executive Order 11990; 10 CFR 1022)	Wetland	Federal agencies must avoid, to the extent possible, any adverse impacts associated with the destruction or loss of wetlands and the support of new construction in wetlands if a practicable alternative exists.	Potentially applicable	Wetlands exist in the potentially affected areas.

TABLE B.3 Potential Action-Specific Requirements

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Hazardous Material Transportation Act, as amended (49 USC 1801-1812); Solid Wastes (40 CFR 263), Standards Applicable to Transportation of Hazardous Waste	Transportation	Generic requirements are established for minimizing the environmental impacts of spills or releases of hazardous materials, as are procedures for transporting hazardous waste.	Potentially applicable	These requirements are not part of an environmental law and hence are not subject to evaluation for attainment or waiver as part of the ARAR process. However, they could be pertinent to the proposed action if hazardous waste is transported off-site. In this case, the pertinent requirements (e.g., for spill response) would be addressed during implementation.
Hazardous Materials Regulations; Shippers -- General Requirements for Shipments and Packagings (49 CFR 173), Subpart I, Radioactive Materials	Transportation	Low-specific-activity radioactivity materials must be packaged in strong, tight containers to prevent leakage of radioactivity under conditions normally incident to transportation, and the vehicles must be placarded. In exclusive-use vehicles, external radiation levels on packages must be <200 mrem/h, or <1,000 mrem/h if secured in a closed transport vehicle with no intermediate loading or unloading; external radiation levels on the outer surface of the vehicle are limited to <200 mrem/h at any point and <10 mrem/h at 2 m from the surface of the vehicle; and levels in any normally occupied space are limited to <2 mrem/h.	Potentially applicable	These requirements are not part of an environmental law and hence are not subject to evaluation for attainment or waiver as part of the ARAR process. However, they could be pertinent to the proposed action if the waste is transported off-site because the average concentration of radionuclides in certain waste could meet the criteria for classification as low-specific-activity material.
Noise Control Act, as Amended; Noise Pollution and Abatement Act	Decontamination	The public must be protected from noises (e.g., that could result from remedial action activities) that jeopardize health or welfare.	Potentially applicable	Because equipment and vehicles would be involved in certain aspects of the proposed action, all pertinent requirements of the act would be followed.
Termination of Operating Licenses for Nuclear Reactors (U.S. Nuclear Regulatory Commission Regulatory Guide 1.86)	Decontamination	Structural debris associated with licensed reactors that is released for reuse without radiological restrictions shall be decontaminated to the specified levels.	To be considered	These requirements are not applicable because Fernald, OU3 is not a nuclear reactor licensed by the U.S. Nuclear Regulatory Commission. Furthermore, they have been incorporated into DOE Order 5400.5, with which the proposed action will comply; however, this order does not include the requirements shown here. These requirements may be relevant and appropriate to the release of structural material for reuse without radiological restrictions.
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Decontamination	Structural debris that is released from DOE facilities for reuse without radiological restrictions shall be decontaminated to specified levels.	To be considered	These requirements may be pertinent if structural debris *decontamination is* part of a proposed action.

TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Radioactive Waste Management (DOE Order 5820.2A)	Waste management	External exposure to radioactive waste (including releases) should not result in an effective dose equivalent of >25 mrem/yr to any member of the public; releases to the atmosphere are to meet the requirements of 40 CFR 61 (see related discussion above for contaminant-specific requirements); and an environmental monitoring program must be implemented to address compliance with performance standards.	To be considered	Although not promulgated standards, these constitute requirements with which the proposed action will comply.
Radiation Protection of the Public and the Environment (DOE Order 5400.5)	Interim waste storage and management	The control and stabilization features of a storage facility for waste containing uranium, thorium, and their decay products should be designed to ensure an effective life of 50 years, with a minimum life of at least 25 years, to the extent reasonably achievable; site access controls should be designed to ensure an effective life of at least 25 years, to the extent reasonable; and periodic monitoring, shielding, access restrictions, and safety measures must be implemented to control the migration of radioactive material, as appropriate.	To be considered	Although not promulgated standards, these constitute requirements for storage and management of wastes with which this action will comply.
Licensing Requirements for Disposal of Radioactive Waste, 10 CFR 61, Subpart C and D	Radioactive waste disposal	Land disposal facilities must be sited, designed, operated, closed, and controlled after closure so that reasonable assurance exists that exposures to humans are less than an annual dose equivalent of 25 mrem to the whole body, 75 mrem to the thyroid, 25 mrem to any other organ of any member of the public. Also, operations of such facilities must comply with 10 CFR 20 radiation protection standards.	Potentially relevant and appropriate	These regulations are not applicable if the radioactive waste is disposed of at disposal facilities operated by DOE except to the extent DOE is required to obtain a license from the NRC. These regulations may be relevant and appropriate if there will be permanent disposal of radioactive materials.
Domestic Licensing of Source Material, 10 CFR 40, Appendix A	Radioactive Waste Disposal	The siting and design of uranium mill tailings disposal sites must meet certain technical criteria including geology, topography, hydrology, and meteorology, and monitoring capability including maximum values for ground-water protection as follows:	Potentially relevant and appropriate	These regulations are not applicable if the radioactive waste is disposed of at disposal facilities operated by DOE except to the extent DOE is required to obtain a license from the NRC. These regulations may be relevant and appropriate if there will be disposal of radioactive materials.

Constituent	Concentration
Arsenic	0.05 mg/L
Barium	1.0 mg/L
Cadmium	0.01 mg/L
Chromium	0.05 mg/L
Lead	0.05 mg/L
Mercury	0.002 mg/L
Silver	0.05 mg/L
Combined Radium-226 and Radium-228	5 pCi/L
Gross alpha-particle activity	15 pCi/L

TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192)	Radioactive Waste disposal	Uranium mill tailings shall be disposed of in a manner to ensure effective control for up to 1,000 years to the extent reasonably achievable, and in any case for up to 200 years; controls must provide that radon-222 releases from disposal facilities to the atmosphere will not exceed an annual release rate of 20 pCi/m^2-s or increase the annual average concentration of radon-222 in air at or above any location outside the disposal site by more than 0.5 pCi/L.	Potentially relevant and appropriate	Fernald, OU3 is not a mill tailings site, so these requirements are not appli-cable, however, they may be relevant and appropriate if a disposal facility is part of the proposed action.
Atomic Energy Act, as amended (42 USC 2112)	Radioactive Waste disposal	The DOE can distribute byproduct material only to individuals or organizations who are licensed by the U.S. Nuclear Regulatory Commission to receive such material.	Potentially applicable	These requirements may be applicable to the disposal of radioactively contaminated material (which is byproduct material) from Fernald OU3 site at commercial facilities.
Radioactive Waste Management (DOE Order 5820.2A)	Waste disposal	Large quantities of 11e(2) byproduct material waste shall be managed according to the requirements of 40 CFR 192 and disposed of at specially designated DOE sites. These disposal sites should be identified and developed as needed to support DOE remedial action, and should normally be located in the state in which the wastes are generated. Control and stabilization features for long-term management facilities should provide, to the extent reasonably achievable, an effective life of 1,000 years with a minimum life of at least 200 years. Emanation of radon-222 should be limited to an annual average release rate of 20 pCi/m^2-s, and the annual average concentration of radon-222 outside the site boundary should not be increased by more than 0.5 pCi/L. Potentially biodegradable wastes should be conditioned to limit biogenic gas generation; groundwater should be protected; and access should be controlled, with controls designed to be effective to the extent reasonable for at least 200 years.	To be considered	Although not promulgated standards, these constitute requirements with which the proposed action will comply.
Toxic Substances Control Act, as amended (15 USC 2607-2629; PL 94-469 et seq.); Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761), Subpart A, General	PCB testing	Inspection and testing are required for material contaminated with PCBs.	Potentially applicable	This requirement may be applicable to characterization of site waste for PCBs.
Toxic Substances Control Act, as amended (15 USC 2607-2629; PL 94-499, et seq.); Poly-chlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761), Subpart D, Storage and Disposal	PCB storage	Material contaminated with PCBs >50 ppm must be stored for disposal (within one year) in a facility that is marked for storage and is not located in a 100-year floodplain. The facility should have a roof and walls to prevent rain from reaching the stored PCBs and an impervious floor with 6-inch curbing to provide a double containment volume. Stored articles or containers should be checked monthly for leaks.	Potentially applicable	Storage of articles or containers with PCB concentrations in excess of 50 ppm is expected to be part of the remedial action.

TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Toxic Substances Control Act, as amended (15 USC 2607-2629; PL 94-499, et seq.); Poly-chlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761), Subpart D, Storage and Disposal	PCB incineration	Liquid PCBs should be incinerated in an EPA-approved facility either for 2 seconds at 1200°C with 3% excess oxygen in the stack gas or for 3 seconds at 1600°C with 2% excess oxygen; the combustion efficiency should be 99.9%, and water scrubbers should be used to control hydrochloric acid (HCl). Nonliquid PCBs should be incinerated in an EPA-approved facility with the same combustion efficiency, and mass emissions should not exceed 0.001 g/kg PCB introduced.	Potentially applicable	Should the proposed action include the treatment of material that is contaminated with PCBs these requirements would be applicable.
Toxic Substances Control Act, as amended (15 USC 26070-2629; PL 94-499, et seq.); Poly-chlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (40 CFR 761), Subpart D, Storage and Disposal	PCB disposal	Material contaminated with PCBs >50 ppm must be incinerated or disposed of in a chemical waste landfill. PCB containers for PCBs <500 ppm may be disposed of as municipal solid waste after draining the free liquids; liquids containing <500 ppm PCB can be disposed of in a chemical waste landfill if it is not an ignitable waste. PCB articles with ≥500 ppm PCBs and nonliquid material with >50 ppm PCBs (e.g., contaminated soil, rags, or other debris) should be disposed of by incinerating (or using an alternative treatment) or landfilling. The chemical waste landfill should be located in an area with an in-place soil thickness of 4 ft or compacted thickness of 3 ft and a soil permeability of $\leq 10^{-7}$ cm/s, >30% passing through a No. 200 sieve, a liquid limit >30, and a plasticity index >15; a synthetic liner can be used to achieve an equivalent permeability. The landfill should also contain a leachate collection system, which can be a simple gravity-flow drainfield, a compound system (where a double liner is present), or a suction lysimeter network. The bottom of the landfill should be ≥50 ft above the historical high groundwater table, and the site should not be hydrologically connected to standing or flowing water. Structures should be in place to divert runoff from a 24-hour, 25-year storm. If located below the 100-year floodwater elevation, 2-ft surface water diversion dikes should surround the landfill. The landfill should be located in an area of low to moderate relief to minimize erosion, landslides, and slumping. Surface water and the leachate collection system should be monitored (monthly during operations, then twice a year for surface water), as should groundwater.	Potentially applicable	If such material is disposed of on-site, the requirement may be applicable.

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TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Solid Wastes (40 CFR 261), Subpart C, Characteristics of Hazardous Waste; Subpart D, List of Hazardous Wastes; Ohio Hazardous Waste Management Regulations; Ohio Administrative Code 3745-51.	Waste characterization and management	A waste must be evaluated to determine if it is a hazardous waste, i.e., either a waste listed in this requirement or a characteristic waste. A characteristic waste is determined by its (1) ignitability (defined by flash point, oxidizer, and other); (2) corrosivity (defined by pH ≤2 or ≥12.5, rate of steel corrosion, and other); (3) reactivity (defined by instability, violent reaction with water, explosivity, cyanide- or sulfide-bearing nature and vapor generation potential, and other); or (4) leachability, as defined by an established toxic characteristic leaching procedure (TCLP); the following are maximum contaminant concentrations in leachate for this factor.	Potentially applicable	These requirements are applicable to the characterization and management of site waste; this waste has been evaluated to determine whether the prerequisites for definition as hazardous waste are met.

Contaminant	Concentration (mg/L)
Arsenic	5.0
Barium	100.0
Cadmium	1.0
Chromium	5.0
Lead	5.0
Mercury	0.2
Silver	5.0

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Solid Wastes (40 CFR 264), Subpart B, General Facility Standards, Subpart C, Preparedness and Prevention; Subpart D, Contingency Plan and Emergency Procedures; Subpart E, Manifest System, Recordkeeping and Reporting; Ohio Hazardous Waste Management Regulations, Ohio Administrative Code 3745-52.	Waste treatment, storage, and disposal	General requirements are established for storage, treatment and disposal facility location, design and inspection, waste compatibility determination, emergency contingency plans, preparedness plans, recordkeeping, reporting and worker training. Location requirements include (1) facilities must not be located within 61 m (200 ft) of a fault in which displacement has occurred in Holocene time (i.e., since the end of the Pleistocene) and (2) facilities located in a 100-year floodplain must be constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood.	Potentially applicable	These requirements would be applicable if the storage, treatment or disposal of hazardous waste on-site will be within the scope of the proposed action, i.e., if RCRA waste is "placed" on-site and capped for the purpose of leaving it in place without remediation.
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 265) Subpart P - Thermal Treatment and Subpart Q - Chemical, Physical, and Biological Treatment; Ohio Hazardous Waste Management Regulations, Ohio Administrative Code 3745-69.	Waste treatment and disposal.	A waste analysis must be performed prior to thermal treatment. Monitoring and inspection of temperature and emission controls must be performed. At closure, all hazardous waste residues must be removed. Chemical, physical or biological treatment must comply with the requirements for ignitable, reactive or incompatible wastes (40 CFR 264.17). A waste analysis must be performed prior to treatment. Inspection of all discharge controls and safety and monitoring equipment must be performed. At closure, all hazardous waste residues must be removed.	Potentially applicable	If thermal, chemical, physical, or biological treatment is part of the proposed action these regulations would be applicable.

TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Solid Wastes (40 CFR 264), Subpart F, Releases from Solid Waste Management Units; Ohio Hazardous Waste Management Regulations, 3745-55-92.	Waste disposal	A groundwater monitoring system must be maintained for a solid waste management unit such as a surface impoundment, waste pile, land treatment unit, or landfill. An exemption to continued maintenance of this system during the post-closure period of the unit may be appropriate if the unit is an engineered structure; does not receive or contain liquid waste or waste containing free liquid; is designed and operated to exclude liquid, precipitation, and other runon and runoff; has both an inner and outer containment layer with a leak detection system; is maintained to disallow migration beyond the outer containment layer before the post-closure care period; and monitoring results do not identify a statistically significant increase in hazardous constituents in the upper aquifer during the operational life of the impoundment. Where multiple regulated units are present at a facility, the point of compliance for this monitoring can be taken as the circumscription of all of these units. The concentration of a hazardous constituent in the uppermost aquifer beneath a regulated unit is not to exceed the existing background concentration or the maximum concentration listed in the following table if higher than the background level, or an alternate concentration limit, unless an exemption is granted.	Potentially applicable	These requirements would be applicable to the proposed action if the remedial action results in new on-site disposal sites.

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TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
		Constituent / Concentration (μg/L) Metals: Arsenic 50 Barium 1,000 Cadmium 10 Chromium 50 Lead 50 Mercury 2 Silver 50		
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Solid Wastes (40 CFR 264), Subpart I, Use and Management of Containers; Subpart J, Tank Systems; Subpart K, Surface Impoundments; Subpart L, Waste Piles; Subpart M, Land Treatment; Subpart N, Landfills: Ohio Hazardous Waste Management Regulations, Ohio Administrative Code 3745-55-70, 3745-55-90, 3745-56, 3745-57, 3745-59, 3745-66, 3745-67 and 3745-68.	Waste storage and disposal	Containers used to store hazardous waste must be closed and in good condition. Tank systems must be adequately designed and have sufficient structural strength and compatibility with the wastes to be stored or treated to ensure that it will not collapse, rupture, or fail, including secondary containment. Each new surface impoundment must have two or more liners and a leachate collection system between such liners, and must be designed, constructed, maintained and operated to prevent overtopping, overfilling, wind and wave action, rainfall, run-on, malfunctions of detection equipment and human error. Waste piles must have a liner designed, constructed and installed to prevent any migration of wastes out of the pile into adjacent subsurface soil or groundwater or surface water at any time during its active life. No ignitable or reactive waste may be placed in a waste pile unless it has been treated or is managed in such a way that it's protected from conditions which may cause it to ignite or react. Land treatment facilities must be designed to ensure that the hazardous constituents to be placed therein can be degraded, transformed or immobilized within the treatment zone, and must have an unsaturated zone monitoring system that includes soil monitoring using soil cores and soil pore liquid monitoring devices such as lysimeters. Each new landfill must have two or more liners and a leachate collection system above and between the liners, to protect human health and the environment. The landfill must be designed, constructed, operated and maintained to prevent run-off, run-on, and wind dispersal of particulate matter. Placement of liquid waste or waste containing free liquids in a landfill is prohibited.	Potentially applicable	These requirements may be applicable to the proposed action, if there will be on-site storage or disposal of site waste that meets the prerequisites for definition as hazardous waste are a part of the proposed action.

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TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Land Disposal Restrictions (40 CFR 268), Subpart C, Prohibition on Land Disposal; Obtaining a Soil and Debris Treatability Variance for Remedial Actions, Superfund LDR Guide #6A, OSWER 9347.3-06FS; Ohio Hazardous Waste Management Regulations; Ohio Administrative Code, 3745-59.	Waste disposal	The land disposal of certain hazardous waste (e.g., contaminated soil and debris) without proper treatment is restricted, unless a treatability variance is appropriate. Such treatment must attain levels achievable by the best demonstrated available technologies (BDAT) for each hazardous constituent in the listed waste. For most types of debris (e.g., concrete, steel pipes), which generally cannot be treated, site manager should use best management practices, including decontamination or destruction. Once it is determined that the debris must comply with LDR (i.e., placement will occur), site managers must request a variance, setting forth the specific treatment level range to be achieved (see, Highlight 2, LDR Guide #6A).	Potentially applicable	These requirements would be applicable to the proposed action if permanent, permitted disposal sites are a part of the proposed remedial action. These requirements would be applicable if there will be land disposal of contaminated soil or debris or the consolidation of site wastes into a disposal or storage area which would trigger RCRA land disposal requirements.
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Standards for Hazardous Waste Generators (40 CFR 262) and Standards for Hazardous Waste Transporters (40 CFR 263); Ohio Solid Waste Management Regulations, Ohio Administrative Code 3745-52 and 53.	Waste generation and transportation	General requirements for packaging, labeling, and marking hazardous wastes for temporary storage and transportation.	Potentially applicable	These requirements would be applicable to the proposed remedial action if any site waste meets the prerequisites for definition as characteristic or listed hazardous waste.
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (40 CFR 264), Subpart G, Closure and Post-Closure; Ohio Hazardous Waste Management Regulations, Ohio Administrative Code 3745-55.	Waste disposal	These regulations set forth general requirements for closure of hazardous waste disposal facilities, waste piles, surface impoundments and tank systems.	Potentially applicable	Should hazardous waste disposal facilities, waste piles, surface impoundments and tank systems be closed as a part of the proposed action, these requirements would be applicable.
Ohio Administrative Code, Chapter 119; Rule 1301:7-7 Article 39: Corrective Actions and Cost Recovery Standards for Petroleum Underground Storage Tank Releases.	Removal of Underground Storage Tanks	When there is evidence of the presence of free product, the owner must remove free floating product to the maximum extent practicable while continuing corrective action steps, including conducting investigations to determine the full extent and location of any contamination.	Potentially applicable	These regulations would be applicable if contamination remained after removal of underground storage tanks.

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TABLE B.3 (Cont'd)

Potential ARAR	Action	Requirement	Preliminary Determination	Remarks
Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 CFR 257; Solid Waste Disposal Facilities, Ohio Administrative Code, 3745-27.	Solid Waste Disposal	Solid wastes shall be disposed of by sanitary landfill, incineration or composting. No open dumping shall be allowed. The Ohio Environmental Protection Agency must approve all plans and specifications. Plans shall not be approved for siting a sanitary landfill in a regulatory floodplain outside of a floodway, in a sand or gravel pit, in a limestone or sandstone quarry, within 1,000 ft of a water well, within 200 ft of a stream or lake, so that the seasonal high ground water table and the lowest level of waste materials will be separated by less than 5 ft of soil or low permeability; in an area surrounding a public water supply well, above a designated sole source aquifer, or so that the seasonal high ground water table will be less than 5 ft below the surface of the site. Operation of the site shall prevent erosion and dust, scavenging and salvaging, litter, noise, odors, insects, rodents and other vectors. No sewage solids, semi-solids or liquids, other semi-solids or liquids or hazardous waste shall be accepted. All wastes will be covered within 24 hours. Monitoring wells shall be installed to measure any effect upon the quality of the ground water. Within 60 days of closure, the landfill shall be covered and seeded, land surface shall be graded, gas migration shall be controlled by ventilation. Monitoring wells shall be maintained for three years and leachate shall be inspected for at least three years.	Potentially applicable	If the proposed action includes siting a new solid waste facility these regulations would be applicable.

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