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**1992 NATIONAL EMISSIONS STANDARDS FOR
HAZARDOUS AIR POLLUTANTS ANNUAL
REPORT FOR THE FERNALD ENVIRONMENTAL
MANAGEMENT PROJECT, 40 CFR 61, SUBPART
H; WITH SUPPLEMENTAL INFORMATION**

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LETTER



Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6357

DOE-2281-93

Valdas V. Adamkus
Regional Administrator
U.S. Environmental Protection Agency
Region V, 5A-14
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

1992 NATIONAL EMISSIONS STANDARDS FOR HAZARDOUS AIR POLLUTANTS ANNUAL REPORT FOR THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT, 40 CFR 61, SUBPART H; WITH SUPPLEMENTAL INFORMATION.

Enclosed is the annual report on maximum calculated off-site dose due to the emission of radionuclides from the Fernald Environmental Management Project (FEMP) during Calendar Year (CY) 1992, as required in 40 CFR 61.94 (b). The report estimates that the Effective Dose Equivalent (EDE) to the Maximally Exposed Individual (MEI) was 0.24 mrem, which represents 2.4% of the 10 mrem standard.

If you or your staff have any questions please contact Wally Quaider at extension (513) 648-3137.

Sincerely,

A handwritten signature in cursive script that reads "Ray Hansen".

Raymond J. Hansen
Acting Manager

FN:Quaider

Enclosures: As Stated

cc w/enc:

S.M. Beckman, FERMCO/65-2
AR Coordinator, FERMCO
F.L. Moleski, MTC
P.J. Sturdevant, DES
Tom Tucker, OEPA

Air Emissions Annual Report
(under Subpart H, 40 CFR 61.94)
Calendar Year 1992

Site Name: Fernald Environmental Management Project, Fernald, Ohio

Operations Office Information:

Office: Fernald Field Office (FN), U. S. Department of Energy

Address: Post Office Box 398705

Cincinnati, Ohio 45239-8705

Contact: Mr. Wally Quaider

Phone: (513) 648-3137

Site Information

Operating

Contractor: Fernald Environmental Restoration Management Corp.

Address: 7400 Willey Road, Fernald, Ohio 45030 (location)

Post Office Box 398704, Cincinnati, Ohio 45239-8704 (mail)

Contact: Robert Roulston

Phone: (513) 738-6907

SECTION I: FACILITY INFORMATION

A. Site Description

The primary activity of the Feed Materials Production Center (FMPC) was the manufacture of purified uranium-metal products. On July 10, 1989, the FMPC suspended production operations, remaining on standby for certain segments of production. On February 4, 1990, DOE formally announced the termination of uranium production at the FMPC. On August 23, 1991, the site was renamed as the Fernald Environmental Management Project (FEMP) to more closely describe its new mission. Currently, the primary activity of the FEMP is identification and implementation of removal actions and remedial actions under CERCLA.

The FEMP is located in southwestern Ohio, approximately 20 miles northwest of the city of Cincinnati and 2 miles south of Ross, Ohio. The FEMP comprises 1050 acres (425 hectares). The Production area covers approximately 136 acres (55 hectares) in the center of the FEMP. The center of the site is located at Latitude 39°-17'-56" north and Longitude 84°-41'-16" west.

The area immediately surrounding the FEMP is primarily rural in nature, characterized by the predominance of agriculture, with some light industry and private residences. FEMP is located in an ancestral river valley known as the New Haven Trough. Today, the region is influenced by the flooding and meandering of the Great Miami River. FEMP is located on a relatively level plain which is outside the 500 year flood plain of the Great Miami River.

Data from the Greater Cincinnati Airport has been used to characterize the climate of the region. The climate is defined as continental, with average temperatures ranging from 29.2°F (-1.56°C) in January, to 75.7°F (24.3°C) in July for the period 1960 through 1989. Average annual precipitation for the period 1960 through 1989 was 40.56 inches (103.0 cm), ranging from 27.99 to 52.76 inches (71 to 134 cm). Based on data from the Cincinnati airport, prevailing wind flow is from the south-southwest.

B. Source Description

Production at the FEMP was historically divided into chemical and metallurgical operations. Chemical operations commenced with dissolving uranium ore concentrates and recycled material in nitric acid to produce a uranyl nitrate (UNH) feed solution. The solution was then purified using a solvent extraction process. Purified UNH solution was concentrated by evaporation and thermally denitrated to uranium trioxide (UO₃). UO₃ was converted to uranium tetrafluoride (UF₄). Metallurgical processing began at this step. UF₄ was reacted with magnesium metal to produce uranium metal, in the form of elemental uranium, derby metal. Metallic scraps from subsequent processing of the uranium metal were combined with derby metal and melted in graphite crucibles. When the proper temperature was achieved, the melt was bottom-poured to pre-heated molds to form ingots varying in size, weight and shape determined by their final intended use. Ingots could be further shaped at the FEMP, or other DOE contractors, with final forms being heat treated and machined at the FEMP. As discussed above, most of these operations ceased in 1989.

Radioactive materials handled and stored at the FEMP include pitchblende ore residues containing radium (stored in the K-65 silos), thorium metal and thorium compounds stored in several locations within the FEMP production area, uranium metal, uranium compounds, contaminated magnesium fluoride (MgF₂), and contaminated metals.

In 1992, emission sources included operation of monitored and unmonitored fume hoods in site analytical laboratories (Laboratory Building [Building 15], the Water Plant [Building 20], and the Health & Safety Building [Building 53]), filtering of process wastewater sludge (Plant 8), radionuclides contained in the drift loss from the Cooling Tower, and fugitive emissions from inactive waste storage pit nos. 5 & 6.

Additional emissions of the decay products of ^{222}Rn and ^{220}Rn were estimated from structures in which surveillance has indicated elevated levels of those two radionuclides. While emissions of those two radioisotopes are not subject to 40 CFR 61, Subpart H, emission of the decay products which form prior to the release of the Radon isotopes are regulated. Conservative emission estimates were developed and dose impacts were calculated for those structures for which adequate surveillance records have been developed. Surveillance is continuing at the site, and additional sources may be identified in the future. No release of decay products was assumed from the K-65 silos.

SECTION II: AIR EMISSIONS DATA

Tables 1 and 2 provide information on the measured and calculated emissions of radionuclides from the FEMP in CY-1992.

SECTION III: DOSE ASSESSMENT

A. Description of Dose Model

The radionuclide dose calculations were performed using the CAP88-PC Version 1.0 computer code. This package contains EPA's most recent version of the AIRDOS-EPA computer code, which implements a steady-state, Gaussian plume, atmospheric dispersion model to calculate environmental concentrations of released radionuclides and U. S. Nuclear Regulatory Commission Regulatory Guide 1.109 (Revision 1, dated 10/77 is the most current version) foodchain models to calculate human exposures, both internal and external, to radionuclides deposited in the environment. The human exposure values are then used by the EPA's latest version of the DARTAB computer code to calculate radiation doses to man from radionuclides released during the year. The dose calculations use dose conversion factors in the latest version of the RADRISK data file, which is provided by the EPA with the CAP88-PC package.

B. Summary of Input Parameters

Unless otherwise discussed, all important input parameter values used were the default values provided with the CAP88-PC computer codes and data bases by the USEPA.

1. Source Characteristics Data

Information on the emission sources was gathered from plant records, and are provided Tables 3 and 4. Distances from sources to nearest receptor(s) were calculated using information from a map of the site with the Ohio State Planar Coordinate System coordinates. Distances from the sources to the nearest farms producing vegetables, milk and meat were calculated from the source to the on-site fencelines which border areas where cattle are allowed to graze on FEMP property.

2. Meteorological Data

CAP88-PC analysis was accomplished using meteorological data developed from the on-site FEMP meteorological station. This station experienced a data recovery rate of 96.36% in CY-1992, which was considered acceptable for the purposes of running the CAP88-PC code. Wind speed and direction data were compiled in a Statistical Array (STAR) format and converted using the GETWIND subroutine provided in the CAP88-PC package. This data is provided in Table 5. Additional input developed from site observations was:

Average Temperature: 11.12° C

Other meteorological data provided were developed from the information developed by the National Weather Service at its station at the Greater Cincinnati International Airport in Covington, KY (CVG). This input was:

Annual Rainfall: 95.22 cm
 Average mixing layer height: 965 m

3. Other Input Parameters

The CAP88-PC code provides dose estimates from radionuclides ingested. Beef, milk, and food crop production was assumed to be the maximum possible for the available ground area, an assumption that overstates these activities in the area. It was further assumed that 100% of the foodstuffs consumed by the local population were grown within the 80 km/50 mi radius, which also provides a conservative estimate for the impact. The default values used were:

Fraction of foodstuffs from:	Local Area	50-mile radius	Beyond 50 miles
Vegetables & Produce:	0.700	0.300	0.000
Meat:	0.442	0.558	0.000
Milk:	0.399	0.601	0.000

C. Compliance Assessment

Results of the CAP88-PC runs are provided in the following table:

Emission sources considered	Effective Dose Equivalent to Maximally Exposed Individual (mrem/year)	Location of Maximally Exposed Individual from center of FEMP
All Sources	2.4E-01	1348 m WNW
Point Sources only	2.1E-03	1081 m ESE

All Sources includes dose due to emissions from all point sources, waste pits nos. 5 and 6, and the utility cooling tower, and the areas identified as having potential releases of ²²²Radon/²²⁰Radon progeny.

These results indicate that the FEMP is in compliance with the dose limitations of 40 CFR 61, Subpart H.

SECTION IV: ADDITIONAL INFORMATION

A) Construction/Modification at the FEMP

Title 40, Code of Federal Regulations, Subpart H [40 CFR 61.94(b)(8)], requires that this report provide information on all construction/modifications completed at the FEMP in CY-1992 for which approval was not sought from the United States EPA per the provisions of 40 CFR 61.96. This section addresses that requirement.

In CY-1992, no projects were completed for which the requirements to apply to the USEPA for approval to construct or modify were waived due to the provisions of 40 CFR 61.96. All projects completed were those with no air emissions associated with their normal operation. As there will be no emissions to the air from these structures under normal conditions, there were no emissions to evaluate under the provisions of 40 CFR 61.93(b)(4)(ii) or as described in Appendix D to 40 CFR part 61.

As discussed on Section I, there were no unplanned releases of radionuclides to the atmosphere in CY-1992. This determination is based on a review of the 165 spills/releases evaluated by the site release evaluators in CY-1992.

SECTION V: CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. (see 18 U.S.C. 1001).

Raymond J. Hansen (name)
Acting Manager (title)
6-25-93 (date)

LIST OF TABLES:

- TABLE 1:** Point Sources - Radionuclide release rates
- Table 2:** Diffuse/fugitive sources - Radionuclide release rates
- Table 3:** Point Source input parameters
- Table 4:** Diffuse/fugitive source input parameters
- Table 5:** STAR format Meteorological file for CY-1992 from the FEMP site meteorological station.

TABLE 1:
POINT SOURCES - RADIONUCLIDES RELEASE RATES (Ci/year)

STACKS	U-234	U-235	U-236	U-238	Sr-90	Tc-99	Ru-106		
Bldg. 15, Controlled	2.48E-07	1.31E-08	9.64E-09	2.77E-07	1.46E-09	3.07E-08	5.70E-09		
Plant 8	5.85E-06	3.14E-07	2.14E-07	7.74E-06	4.35E-08	9.13E-07	1.70E-07		
Bldg. 15, General	1.70E-06	9.01E-08	6.61E-08	1.90E-06	1.00E-08	2.11E-07	3.91E-08		
Bldg. 53	2.09E-07	1.11E-08	8.12E-09	2.34E-06	1.23E-09	2.59E-08	4.80E-09		
Bldg. 20(a)	1.42E-09	7.61E-11	5.20E-11	1.88E-09	1.06E-11	2.22E-10	4.12E-11		
Bldg. 20(b)	1.42E-09	7.61E-11	5.20E-11	1.88E-09	1.06E-11	2.22E-10	4.12E-11		
STACKS	Cs-137	Ba-137m	Ra-226	Ra-228	Th-228	Th-230	Th-232		
Bldg. 15, Controlled	4.26E-09	4.26E-09	1.76E-10	7.06E-10	7.45E-09	2.19E-08	1.17E-09		
Plant 8	1.27E-07	1.27E-07	5.24E-09	2.10E-08	2.22E-07	1.56E-08	3.49E-08		
Bldg. 15, General	2.92E-08	2.92E-08	1.21E-09	4.84E-09	5.11E-08	1.50E-07	8.04E-09		
Bldg. 53	3.59E-09	3.59E-09	1.48E-10	5.95E-10	6.28E-09	1.85E-08	9.87E-10		
Bldg. 20(a)	3.08E-11	3.08E-11	1.27E-12	5.10E-12	5.38E-11	3.78E-12	8.46E-12		
Bldg. 20(b)	3.08E-11	3.08E-11	1.27E-12	5.10E-12	5.38E-11	3.78E-12	8.46E-12		
STACKS	Th-234	Pa-234m	Np-237	Pu-238	Pu-239	Pu-240	Pu-241	Pu-242	TOTAL
Bldg. 15, Controlled	1.10E-06	1.10E-06	8.89E-11	1.06E-10	6.78E-10	1.70E-10	2.43E-09	3.82E-14	2.82E-06
Plant 8	3.26E-05	3.26E-05	2.27E-08	3.14E-09	2.02E-08	5.04E-09	7.24E-08	1.14E-12	8.11E-05
Bldg. 15, General	7.52E-06	7.52E-06	6.10E-10	7.24E-10	4.65E-09	1.16E-09	1.67E-08	2.62E-13	1.94E-05
Bldg. 53	9.23E-07	9.23E-07	7.49E-11	8.89E-11	5.71E-10	1.43E-10	2.05E-09	3.22E-14	2.38E-06
Bldg. 20	7.91E-09	7.91E-09	5.52E-12	7.62E-13	4.90E-12	1.22E-12	1.76E-11	2.76E-16	1.97E-08
Bldg. 20	7.91E-09	7.91E-09	5.52E-12	7.62E-13	4.90E-12	1.22E-12	1.76E-11	2.76E-16	1.97E-08

TABLE 2:

NON-POINT SOURCES, URANIUM BASED SOURCES
RELEASE RATES (Ci/year)

SOURCES	U-234	U-235	U-236	U-238	Sr-90	Tc-99	Ru-106		
Waste Pits 5 & 6	2.5E-05	1.03E-06	2.56E-06	1.90E-05	2.34E-07	3.37E-05	0.00E-00		
Cooling Tower	3.31E-05	1.78E-06	1.21E-06	4.38E-05	2.46E-07	5.17E-06	9.60E-05		
SOURCES	Cs-137	Ba-137m	Ra-226	Ra-228	Th-228	Th-230	Th-232		
Waste Pits 5 & 6	7.60E-7	7.18E-07	1.62E-05	1.99E-06	2.57E-06	2.89E-04	1.99E-06		
Cooling Tower	7.18E-07	7.18E-07	2.97E-08	1.19E-07	1.26E-06	8.82E-08	1.97E-07		
SOURCES	Th-234	Pa-234m	Np-237	Pu-238	Pu-239	Pu-240	Pu-241	Pu-242	TOTAL
Waste Pits 5 & 6	1.91E-05	1.91E-05	2.99E-07	5.68E-08	7.33E-08	7.33E-08	4.96E-07	2.59E-12	4.38E-04
Cooling Tower	1.85E-04	1.85E-04	1.29E-07	1.78E-08	1.14E-07	2.86E-08	4.10E-07	6.44E-12	4.59E-04

NON-POINT SOURCES, RADON/THORON PROGENY BASED SOURCES
RELEASE RATES

SOURCE	Po-218	Pb-214	Bi-214	Po-214	Pb-210	Bi-210	
Warehouse 64	1.7E-07	1.7E-07	1.7E-07	1.7E-07	1.7E-07	1.7E-07	
Warehouse 65	3.1E-05	3.1E-05	3.1E-05	3.1E-05	3.1E-05	3.1E-05	
Warehouse 67	6.5E-07	6.5E-07	6.5E-07	6.5E-07	6.5E-07	6.5E-07	
Warehouse 68	1.1E-06	1.1E-06	1.1E-06	1.1E-06	1.1E-06	1.1E-06	
Building 13A	NONE	NONE	NONE	NONE	NONE	NONE	
SOURCE	Po-210	Po-216	Pb-212	Bi-212	Po-212	Tl-208	TOTAL
Warehouse 64	1.7E-07	5.2E-08	5.2E-08	5.2E-08	3.5E-08	1.7E-08	1.4E-06
Warehouse 65	3.1E-05	4.6E-06	4.6E-06	4.6E-06	3.1E-06	1.5E-06	2.4E-04
Warehouse 67	6.5E-07	2.8E-06	2.8E-06	2.8E-06	1.9E-06	9.4E-07	1.6E-05
Warehouse 68	1.1E-06	7.0E-07	7.0E-07	7.0E-07	4.7E-07	4.7E-07	1.1E-05
Building 13A	NONE	3.3E-06	3.3E-06	3.3E-06	2.2E-06	1.1E-06	1.1E-05

TABLE 3:

POINT SOURCES - INDIVIDUAL STACKS

Emission Point	Process	Type of Control	Control Efficiency (%)	Distance to Nearest Resident (m)	Distance to Nearest Food source (m)
Bldg. 15: Controlled	ANALYTICAL LAB FUME HOODS	MEPA/HEPA	99.97	921	458
Plant 8	PROCESS WATER VACUUM FILTRATION	None	NA	969	533
Building 20(a)	WATER PLANT LAB STACK	None	NA	858	495
Building 20(b)	WATER PLANT LAB STACK	None	NA	858	495

POINT SOURCES - GROUPED STACKS

Emission Point	Process (NUMBER OF GROUPED SOURCES)	Type of Control	Control Efficiency (%)	Distance to Nearest Resident (m)	Distance to Nearest Food source (m)
Bldg. 15, General	ANALYTICAL LAB FUME HOODS (57)	NONE	0	921	458
Bldg. 53	ANALYTICAL LAB FUME HOODS (7)	NONE	0	929	305

POINT SOURCE PARAMETERS

Source	Stack Height (m)	Stack Diameter (m)	Stack Exit Velocity (m/s)
Building 15: Controlled	14.75	0.91	17.3
Plant 8	13.72	0.2	13.1
Bldg. 15, General	5.26	0.31	7.47
Building 53	14.90	8.69	7.16
Building 20(a)	8.53	.30	9.45
Building 20(b)	8.53	.30	7.87

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TABLE 4:

NON-POINT SOURCES
URANIUM BASED SOURCES

SOURCE	Distance to nearest resident (m)	Distance to nearest food source (m)	Release Height (m)	Area (m ²) / Stack Diameter (m)	Momentum (m/s)
Waste Pits 5 & 6	641	380	1.00	162(A)	0
Cooling Tower	924	458	14.90	8.69(SD)	7.16

NON-POINT SOURCES
RADON/THORON PROGENY BASED SOURCES

SOURCE	Distance to nearest resident (m)	Distance to nearest food source (m)	Release Height (m)	Area (m ²) / Stack Diameter (m)	Momentum (m/s)
Warehouse 64	824	305	1	0.1(SD)	0
Warehouse 65	828	315	1	0.1(SD)	0
Warehouse 67	945	535	1	0.1(SD)	0
Warehouse 68	781	380	1	0.1(SD)	0
Building 13A	787	458	4.6	861(A)	0

