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THE COMPARISON OF CAP88-PC VERSION 2.0  
VERSUS CAP88-PC VERSION 1.0

BY  
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C. R. Palmer  
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December 1997

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Prepared for the  
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VERSUS CAP88-PC VERSION 1.0**

**BY**

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**December, 1997**

**Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH Zip: 45253-8704  
Division: Facility Closure and Demolition Project  
Department: Environmental Compliance**

**\*FDF with the U.S. Department of Energy, under Contract No. DE-AC24-92OR21972**

## TABLE OF CONTENTS

<u>SECTION</u>	<u>TITLE</u>	<u>PAGE</u>
1.0	EXECUTIVE SUMMARY .....	2
2.0	INTRODUCTION .....	3
3.0	EVALUATION PROCEDURE .....	3
4.0	RESULTS AND DISCUSSION .....	5
5.0	CONCLUSIONS. ....	5
6.0	RECOMMENDATIONS .....	5

## LIST OF TABLES

<u>TABLE</u>	<u>TITLE</u>	<u>PAGE</u>
1	CAP88-PC INPUT DATASETS .....	4
2	CAP88-PC MEI OUTPUT SUMMARY .....	5

## LIST OF ATTACHMENTS

- ATTACHMENT A - DATASET #1, CAP88-PC v1.0 AND v2.0  
SYNOPSIS AND SUMMARY FILES
- ATTACHMENT B - DATASET #2, CAP88-PC v1.0 AND v2.0  
SYNOPSIS AND SUMMARY FILES
- ATTACHMENT C - DATASET #3, CAP88-PC v1.0 AND v2.0  
SYNOPSIS AND SUMMARY FILES

## 1.0 EXECUTIVE SUMMARY

The personal computer software program CAP88-PC was developed at the Department of Energy (DOE) for use in calculating dose and risk values from facilities that emit radionuclide materials. CAP88-PC version 1.0 was approved by the United States Environmental Protection Agency (EPA) for use in calculating Effective Dose Equivalent (EDE) values in accordance with Subpart H of 40 CFR 61. The DOE has since released CAP88-PC version 2.0, which has not yet been approved by the EPA. Version 2.0 provides several advantages over version 1.0.

In order to use version 2.0 when making Subpart H calculations approval to do so must be requested from the EPA. In support of any request for approval it must be demonstrated that the EDE values obtained via version 2.0 are comparable to the values obtained when using version 1.0. This report describes a comparison of the two CAP88-PC versions which shows that when using similar inputs, the two versions yield identical results. It is recommended that a request be made of the EPA to approve CAP88-PC version 2.0 for use in calculating EDE values in accordance with Subpart H of 40 CFR 61.

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## **2.0 INTRODUCTION**

40 CFR Part 61 (Subpart H of the NESHAP) requires DOE facilities to use approved sampling procedures, computer models, or other approved procedures when calculating Effective Dose Equivalent (EDE) values to members of the public. Currently version 1.0 of the approved computer model CAP88-PC is used to calculate EDE values. The DOE has upgraded the CAP88-PC software to version 2.0. This version provides simplified data entry, better printing characteristics, the use of a mouse, and other features.

The DOE has developed and released version 2.0 for testing and comment. This new software is a WINDOWS - based application that offers a new graphical user interface with new utilities for preparing and managing population and weather data, and several new decay chains. The program also allows the user to view results before printing. This document describes a test that confirmed CAP88-PC version 2.0 generates results comparable to the original version of the CAP88-PC program.

## **3.0 EVALUATION PROCEDURE**

To confirm that the algorithms used in version 2.0 are identical to those used in version 1.0 three sets of input data were created to be run under both CAP88-PC versions. These datasets are summarized in Table 1.

Each of the three datasets were run under each of the CAP88-PC versions. For a given dataset, the resulting EDE values from each CAP88-PC version were compared.

			DATASET #1	DATASET #2		DATASET #3					
Nuclide	Class	Size	Source #1 Ci/y	Source #1 Ci/y	Source #2 Ci/y	Source #1 Ci/y	Source #2 Ci/y	Source #3 Ci/y	Source #4 Ci/y	Source #5 Ci/y	Source #6 Ci/y
Th-228	Y	0.30	4.3E-07	4.3E-07	4.3E-07	4.3E-07	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Th-230	Y	0.30	1.3E-06	1.3E-06	1.3E-06	1.3E-06	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Th-232	Y	0.30	6.8E-08	6.8E-08	6.8E-08	6.8E-08	1.2E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Th-234	Y	0.30	6.4E-05	6.4E-05	6.4E-05	6.4E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
H-3	*	1.00				1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Np-237	W	1.00				1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Np-238	W	1.00				1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Np-239	W	1.00				1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Np-240	W	1.00				2.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
Np-240m	W	1.00				3.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00
U-234	Y	0.30	1.4E-05	1.4E-05	1.4E-05						
U-235	Y	1.00	7.8E-07	7.8E-07	7.8E-07						
U-236	Y	1.00	5.6E-07	5.6E-07	5.6E-07						
U-238	Y	0.30	1.6E-05	1.6E-05	1.6E-05						
RA-226	W	0.30	1.0E-08	1.0E-08	1.0E-08						
RA-228	W	0.30	4.1E-08	4.1E-08	4.1E-08						
Stack Height (m)			8.0	8.0	8.0	8.0	9.0	10.0	9.0	7.0	20.0
Diameter (m)			6.0	0.3	0.3	6.0	6.0	5.0	4.0	1.0	1.0
Plume Rise Momentum (m/s)			123.0	1.0E+00	1.0E+00	123	130	120	100	150	165
Temperature (degrees C)			9	9		9					
Precipitation (cm/y)			150	150		150					
Mixing Height (m)			950	950		950					
Wind File			1996.WND	1996.WND		ERIEPA.WND					
Type of Run			Individual	Individual		Population					
Population File			None	None		RMIASHTA.POP					
Distances (m)			1, 2, 3, 4, 5.	364, 377, 569, 578, 751, 880, 896, 972, 1004, 1111, 1239, 1243, 1345, 1416, 1553.		310, 810, 1500, 2500, 3500, 4500, 7500, 15000, 25000, 35000, 45000, 55000, 70000.					

TABLE 1 - CAP88-PC INPUT DATASETS

Table 2 summarizes the results for the Maximally Exposed Individual (MEI) for each of the CAP88-PC runs. This Table shows that, for a given input dataset, both versions of CAP88-PC yield identical EDE values for the MEI.

	DATASET #1			DATASET #2			DATASET #3		
	Version 1.0	Version 2.0	Change	Version 1.0	Version 2.0	Change	Version 1.0	Version 2.0	Change
Effective Dose Equivalent (mrem/yr)	8.28e-02	8.28e-02	0%	8.04e-02	8.04e-02	0%	3.46e-02	3.46e-02	0%
Location of the Maximally Exposed Individual	1 Meter Northeast	1 Meter Northeast	None	364 Meters Northeast	364 Meters Northeast	None	2500 Meters North	2500 Meters North	None
Lifetime Fatal Cancer Risk	4.56e-07	4.56e-07	0%	1.04e-06	1.04e-06	0%	3.24e-03	3.24e-03	0%

TABLE 2 - CAP88-PC MEI OUTPUT SUMMARY

The EDE values calculated by the CAP88-PC programs for other members of the public were also compared. Again, for a given dataset, no differences were found in the EDE values calculated between versions 1.0 and 2.0. Attachments A, B, and C contain the Synopsis and Summary files for each dataset run under versions 1.0 and 2.0.

The advantages of using version 2.0 come not from more accurate calculations, but from a more user-friendly program. Version 2.0 offers the convenience of choosing some program inputs via a mouse; it provides a better format of printouts; and, it saves files by their dataset names instead of sequenced letters.

With version 2.0, a user may set up the CAP88-PC program to accommodate his/her available printer. Version 1.0 does not have this ability and as a result printouts are formatted poorly and use more paper than necessary. To print the CAP88-PC outputs in an acceptable format, users must exit the program and use a word processing program to reformat the files. If multiple CAP88-PC runs are saved in the CAP88-PC output subdirectory, identification of the desired files is onerous. Files saved by their dataset names are much easier to locate than files saved through a sequenced letters system.

## 5.0 CONCLUSIONS

- (1) For like inputs, CAP88-PC version 2.0 yields results identical to that of version 1.0.
- (2) CAP88-PC version 2.0 is a more compatible program to our computer operating system.

## 6.0 RECOMMENDATIONS

- (1) FDF should request EPA approval to use CAP88-PC version 2.0 for Subpart H purposes.
- (2) The FC&DP Environmental Compliance Team should develop procedures to instruct team members on how to use CAP88-PC version 2.0.



**ATTACHMENT A - DATASET #1,**

**CAP88-PC v1.0 and v2.0  
SYNOPSIS and SUMMARY FILES**

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S   R E P O R T

Non-Radon Individual Assessment

Dec 15, 1997   1:13 pm

Facility: FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Address: P.O. BOX 398704

7400 WILLEY ROAD

City: CINCINNATI

State: OH                      Zip: 45253-8704

Effective Dose Equivalent  
(mrem/year)

---

8.28E-02

---

At This Location: 1 Meters Northeast

Source Category: REMEDIATION SITE

Source Type: Stack

Emission Year: 1997

Comments: Dataset #1. Individual

Evaluative Test Run with one source.

Dataset Name: Dataset #1

Dataset Date: Dec 15, 1997 1:13 pm

Wind File: WNDFILES\1996.WND

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1 Meters Northeast  
Lifetime Fatal Cancer Risk: 4.56E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	3.97E-03
BREAST	4.59E-03
R MAR	8.83E-02
LUNGS	3.62E-03
THYROID	3.85E-03
ENDOST	1.25E+00
RMNDR	1.09E-01
EFFEC	8.28E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 1997

Radionuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
TH-228	Y	0.30	4.3E-07	4.3E-07
TH-230	Y	0.30	1.3E-06	1.3E-06
TH-232	Y	0.30	6.8E-08	6.8E-08
TH-234	Y	0.30	6.4E-05	6.4E-05
U-234	Y	0.30	1.4E-05	1.4E-05
U-235	Y	1.00	7.6E-07	7.6E-07
U-236	Y	1.00	5.6E-07	5.6E-07
U-238	Y	0.30	1.6E-05	1.6E-05
PA-226	W	0.30	1.0E-08	1.0E-08
PA-228	W	0.30	4.1E-08	4.1E-08

SITE INFORMATION

Temperature: 9 degrees C  
Precipitation: 150 cm/y  
Mixing Height: 950 m

SOURCE INFORMATION

Source Number: 1  
Stack Height (m): 8.00  
Diameter (m): 6.00  
Plume Rise  
Momentum (m/s): 1.23E+02  
(Exit Velocity)

AGRICULTURAL DATA

	<u>Vegetable</u>	<u>Milk</u>	<u>Meat</u>
Fraction Home Produced:	0.700	0.399	0.442
Fraction From Assessment Area:	0.300	0.601	0.558
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.  
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

1 2 3 4 5

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

D O S E   A N D   R I S K   E Q U I V A L E N T   S U M M A R I E S

Non-Radon Individual Assessment  
Dec 15, 1997 1:13 pm

Facility: FERNALD ENVIRONMENTAL MANAGEMENT PROJECT  
Address: P.O. BOX 398704  
7400 WILLEY ROAD  
City: CINCINNATI  
State: OH                      Zip: 45253-8704

Source Category: REMEDIATION SITE  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #1. Individual  
Evaluational Test Run with one source.

Dataset Name: Dataset #1  
Dataset Date: Dec 15, 1997 1:13 pm  
Wind File: WNDFILES\1996.WND

ORGAN DOSE EQUIVALENT SUMMARY

<u>Organ</u>	<u>Selected Individual (mrem/y)</u>
GONADS	3.97E-03
BREAST	4.59E-03
R MAR	8.83E-02
LUNGS	3.62E-03
THYROID	3.85E-03
ENDOST	1.25E+00
RMNDR	1.09E-01
EFFEC	8.28E-02

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

<u>Pathway</u>	<u>Selected Individual (mrem/y)</u>
INGESTION	8.19E-02
INHALATION	0.00E+00
AIR IMMERSION	0.00E+00
GROUND SURFACE	9.04E-04
INTERNAL	8.19E-02
EXTERNAL	9.04E-04
TOTAL	8.28E-02



NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

<u>Nuclide</u>	<u>Selected Individual (mrem/y)</u>
TH-228	1.78E-04
TH-230	1.54E-03
TH-232	7.34E-05
TH-234	9.51E-04
U-234	3.74E-02
U-235	2.69E-03
U-236	1.42E-03
U-238	3.85E-02
RA-226	3.23E-05
RA-228	6.74E-05
TOTAL	8.28E-02

## CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
LEUKEMIA	9.98E-08
BONE	6.64E-08
THYROID	9.24E-10
BREAST	1.07E-08
LUNG	8.82E-09
STOMACH	6.75E-09
BOWEL	1.70E-08
LIVER	5.79E-09
PANCREAS	3.96E-09
URINARY	2.30E-07
OTHER	4.84E-09
TOTAL	4.56E-07

## PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	4.35E-07
INHALATION	0.00E+00
AIR IMMERSION	0.00E+00
GROUND SURFACE	2.08E-08
INTERNAL	4.35E-07
EXTERNAL	2.08E-08
TOTAL	4.56E-07

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
TH-228	8.54E-10
TH-230	5.00E-09
TH-232	2.34E-10
TH-234	1.08E-08
U-234	1.89E-07
U-235	2.77E-08
U-236	7.16E-09
U-238	2.14E-07
RA-226	1.71E-10
RA-228	4.80E-10
TOTAL	4.56E-07

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)  
(All Radionuclides and Pathways)

---

Direction	Distance (m)				
	1	2	3	4	5
N	4.8E-02	2.9E-02	2.2E-02	1.9E-02	1.7E-02
NNW	3.5E-02	2.2E-02	1.8E-02	1.6E-02	1.4E-02
NW	3.6E-02	2.2E-02	1.8E-02	1.6E-02	1.4E-02
WNW	3.4E-02	2.2E-02	1.7E-02	1.5E-02	1.4E-02
W	5.1E-02	3.0E-02	2.3E-02	1.9E-02	1.7E-02
WSW	5.5E-02	3.2E-02	2.4E-02	2.0E-02	1.8E-02
SW	3.3E-02	2.1E-02	1.7E-02	1.5E-02	1.4E-02
SSW	3.0E-02	2.0E-02	1.6E-02	1.4E-02	1.3E-02
S	3.2E-02	2.1E-02	1.7E-02	1.5E-02	1.4E-02
SSE	4.5E-02	2.7E-02	2.1E-02	1.8E-02	1.6E-02
SE	5.6E-02	3.2E-02	2.5E-02	2.1E-02	1.8E-02
ESE	5.5E-02	3.2E-02	2.5E-02	2.1E-02	1.9E-02
E	6.6E-02	3.8E-02	2.9E-02	2.4E-02	2.1E-02
ENE	6.7E-02	3.9E-02	2.9E-02	2.4E-02	2.1E-02
NE	8.3E-02	4.6E-02	3.3E-02	2.7E-02	2.4E-02
NNE	6.5E-02	3.8E-02	2.8E-02	2.4E-02	2.1E-02

---

INDIVIDUAL LIFETIME RISK (deaths)  
(All Radionuclides and Pathways)

---

Direction	Distance (m)				
	1	2	3	4	5
N	2.6E-07	1.6E-07	1.2E-07	1.0E-07	9.2E-08
NNW	1.9E-07	1.2E-07	9.6E-08	8.4E-08	7.7E-08
NW	2.0E-07	1.2E-07	9.7E-08	8.4E-08	7.7E-08
WNW	1.9E-07	1.2E-07	9.4E-08	8.2E-08	7.5E-08
W	2.8E-07	1.6E-07	1.2E-07	1.0E-07	9.3E-08
WSW	3.0E-07	1.7E-07	1.3E-07	1.1E-07	9.8E-08
SW	1.8E-07	1.2E-07	9.4E-08	8.3E-08	7.6E-08
SSW	1.6E-07	1.1E-07	8.7E-08	7.7E-08	7.1E-08
S	1.8E-07	1.1E-07	9.2E-08	8.1E-08	7.4E-08
SSE	2.5E-07	1.5E-07	1.1E-07	9.7E-08	8.7E-08
SE	3.1E-07	1.8E-07	1.3E-07	1.1E-07	9.9E-08
ESE	3.0E-07	1.8E-07	1.4E-07	1.1E-07	1.0E-07
E	3.6E-07	2.1E-07	1.6E-07	1.3E-07	1.1E-07
ENE	3.7E-07	2.1E-07	1.6E-07	1.3E-07	1.2E-07
NE	4.6E-07	2.5E-07	1.8E-07	1.5E-07	1.3E-07
NNE	3.6E-07	2.1E-07	1.5E-07	1.3E-07	1.1E-07

---

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment  
Dec 16, 1997 02:25 pm

Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH Zip: 45253-8704

Source Category: Remediation Site  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #1. Individual  
Evaluative Test Run with one source

Effective Dose Equivalent  
(mrem/year)

---

8.28E-02

---

At This Location: 1 Meters Northeast

Dataset Name: Dataset12  
Dataset Date: Dec 16, 1997 02:24 pm  
Wind File: F:\CAP88PC2\WINDFILES\1996.WND

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 1 Meters Northeast  
Lifetime Fatal Cancer Risk: 4.56E-07

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	3.97E-03
BREAST	4.59E-03
R MAR	8.83E-02
LUNGS	3.62E-03
THYROID	3.85E-03
ENDOST	1.25E+00
RMNDR	1.09E-01
EFFEC	8.28E-02

## RADIONUCLIDE EMISSIONS DURING THE YEAR 1997

Nuclide	Class	Size	Source	TOTAL
			#1 Ci/y	Ci/y
TH-228	Y	0.30	4.3E-07	4.3E-07
TH-230	Y	0.30	1.3E-06	1.3E-06
TH-232	Y	0.30	6.8E-08	6.8E-08
TH-234	Y	0.30	6.4E-05	6.4E-05
U-234	Y	0.30	1.4E-05	1.4E-05
U-235	Y	1.00	7.6E-07	7.6E-07
U-236	Y	1.00	5.6E-07	5.6E-07
U-238	Y	0.30	1.6E-05	1.6E-05
RA-226	W	0.30	1.0E-08	1.0E-08
RA-228	W	0.30	4.1E-08	4.1E-08

## SITE INFORMATION

Temperature:	9 degrees C
Precipitation:	150 cm/y
Mixing Height:	950 m



SOURCE INFORMATION

Source Number: 1

Stack Height (m): 8.  
Diameter (m): 6.

Plume Rise  
Momentum (m/s): 123.  
(Exit Velocity)

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.399	0.442
Fraction From Assessment Area:	0.300	0.601	0.558
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.  
Default Values used.

DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

1 2 3 4 5

## Clean Air Act Assessment Package - 1988

## DOSE AND RISK EQUIVALENT SUMMARIES

## Non-Radon Individual Assessment

Dec 16, 1997 02:25 pm

Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH Zip: 45253-8704

Source Category: Remediation Site  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #1. Individual  
Evaluative Test Run with one source

Dataset Name: Dataset12  
Dataset Date: Dec 16, 1997 02:24 pm  
Wind File: F:\CAP88PC2\WINDFILES\1996.WND

## ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
GONADS	3.97E-03
BREAST	4.59E-03
R MAR	8.83E-02
LUNGS	3.62E-03
THYROID	3.85E-03
ENDOST	1.25E+00
RMNDR	1.09E-01
EFPEC	8.28E-02

## PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	8.19E-02
INHALATION	0.00E+00
AIR IMMERSION	0.00E+00
GROUND SURFACE	9.04E-04
INTERNAL	8.19E-02
EXTERNAL	9.04E-04
TOTAL	8.28E-02

## NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
TH-228	1.78E-04
TH-230	1.54E-03
TH-232	7.34E-05
TH-234	9.51E-04
U-234	3.74E-02
U-235	2.69E-03
U-236	1.42E-03
U-238	3.85E-02
RA-226	3.23E-05
RA-228	6.74E-05
TOTAL	8.28E-02

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
LEUKEMIA	9.98E-08
BONE	6.64E-08
THYROID	9.24E-10
BREAST	1.07E-08
LUNG	8.82E-09
STOMACH	6.75E-09
BOWEL	1.70E-08
LIVER	5.79E-09
PANCREAS	3.96E-09
URINARY	2.30E-07
OTHER	4.84E-09
TOTAL	4.56E-07

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	4.35E-07
INHALATION	0.00E+00
AIR IMMERSION	0.00E+00
GROUND SURFACE	2.08E-08
INTERNAL	4.35E-07
EXTERNAL	2.08E-08
TOTAL	4.56E-07

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
TH-228	8.54E-10
TH-230	5.00E-09
TH-232	2.34E-10
TH-234	1.08E-08
U-234	1.89E-07
U-235	2.77E-08
U-236	7.16E-09
U-238	2.14E-07
RA-226	1.71E-10
RA-228	4.80E-10
TOTAL	4.56E-07

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)  
(All Radionuclides and Pathways)

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	Distance (m)				
Direction	1	2	3	4	5
N	4.8E-02	2.9E-02	2.2E-02	1.9E-02	1.7E-02
NNW	3.5E-02	2.2E-02	1.8E-02	1.6E-02	1.4E-02
NW	3.6E-02	2.2E-02	1.8E-02	1.6E-02	1.4E-02
WNW	3.4E-02	2.2E-02	1.7E-02	1.5E-02	1.4E-02
W	5.1E-02	3.0E-02	2.3E-02	1.9E-02	1.7E-02
WSW	5.5E-02	3.2E-02	2.4E-02	2.0E-02	1.8E-02
SW	3.3E-02	2.1E-02	1.7E-02	1.5E-02	1.4E-02
SSW	3.0E-02	2.0E-02	1.6E-02	1.4E-02	1.3E-02
S	3.2E-02	2.1E-02	1.7E-02	1.5E-02	1.4E-02
SSE	4.5E-02	2.7E-02	2.1E-02	1.8E-02	1.6E-02
SE	5.6E-02	3.2E-02	2.5E-02	2.1E-02	1.8E-02
ESE	5.5E-02	3.2E-02	2.5E-02	2.1E-02	1.9E-02
E	6.6E-02	3.8E-02	2.9E-02	2.4E-02	2.1E-02
ENE	6.7E-02	3.9E-02	2.9E-02	2.4E-02	2.1E-02
NE	8.3E-02	4.6E-02	3.3E-02	2.7E-02	2.4E-02
NNE	6.5E-02	3.8E-02	2.8E-02	2.4E-02	2.1E-02

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INDIVIDUAL LIFETIME RISK (deaths)  
(All Radionuclides and Pathways)

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	Distance (m)				
Direction	1	2	3	4	5
N	2.6E-07	1.6E-07	1.2E-07	1.0E-07	9.2E-08
NNW	1.9E-07	1.2E-07	9.6E-08	8.4E-08	7.7E-08
NW	2.0E-07	1.2E-07	9.7E-08	8.4E-08	7.7E-08
WNW	1.9E-07	1.2E-07	9.4E-08	8.2E-08	7.5E-08
W	2.8E-07	1.6E-07	1.2E-07	1.0E-07	9.3E-08
WSW	3.0E-07	1.7E-07	1.3E-07	1.1E-07	9.8E-08
SW	1.8E-07	1.2E-07	9.4E-08	8.3E-08	7.6E-08
SSW	1.6E-07	1.1E-07	8.7E-08	7.7E-08	7.1E-08
S	1.8E-07	1.1E-07	9.2E-08	8.1E-08	7.4E-08
SSE	2.5E-07	1.5E-07	1.1E-07	9.7E-08	8.7E-08
SE	3.1E-07	1.8E-07	1.3E-07	1.1E-07	9.9E-08
ESE	3.0E-07	1.8E-07	1.4E-07	1.1E-07	1.0E-07
E	3.6E-07	2.1E-07	1.6E-07	1.3E-07	1.1E-07
ENE	3.7E-07	2.1E-07	1.6E-07	1.3E-07	1.2E-07
NE	4.6E-07	2.5E-07	1.8E-07	1.5E-07	1.3E-07
NNE	3.6E-07	2.1E-07	1.5E-07	1.3E-07	1.1E-07

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**ATTACHMENT A - DATASET #2,**

**CAP88-PC v1.0 and v2.0  
SYNOPSIS and SUMMARY FILES**

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment

Dec 15, 1997 12:38 am

Facility: FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Address: P.O. BOX 398704

7400 WILLEY ROAD

City: CINCINNATI

State: OH Zip: 45253-8704

Effective Dose Equivalent  
(mrem/year)

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8.04E-02

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At This Location: 364 Meters Northeast

Source Category: REMEDIATION SITE

Source Type: Stack

Emission Year: 1997

Comments: Dataset #2. Individual

Evaluative Test Run with two sources.

Dataset Name: Dataset #2

Dataset Date: Dec 15, 1997 12:38 am

Wind File: WNDFILES\1996.WND

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 364 Meters Northeast  
Lifetime Fatal Cancer Risk: 1.04E-06

ORGAN DOSE EQUIVALENT SUMMARY

<u>Organ</u>	<u>Dose Equivalent (mrem/y)</u>
GONADS	1.54E-04
BREAST	1.74E-04
R MAR	8.89E-03
LUNGS	6.22E-01
THYROID	1.50E-04
ENDOST	1.15E-01
RMNDR	3.71E-03
EFFEC	8.04E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 1997

Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	TOTAL Ci/y
TH-228	Y	0.30	4.3E-07	4.3E-07	8.6E-07
TH-230	Y	0.30	1.3E-06	1.3E-06	2.6E-06
TH-232	Y	0.30	6.8E-08	6.8E-08	1.4E-07
TH-234	Y	0.30	6.4E-05	6.4E-05	1.3E-04
U-234	Y	0.30	1.4E-05	1.4E-05	2.8E-05
U-235	Y	1.00	7.6E-07	7.6E-07	1.5E-06
U-236	Y	1.00	5.6E-07	5.6E-07	1.1E-06
U-238	Y	0.30	1.6E-05	1.6E-05	3.2E-05
RA-226	W	0.30	1.0E-08	1.0E-08	2.0E-08
RA-228	W	0.30	4.1E-08	4.1E-08	8.2E-08

SITE INFORMATION

Temperature: 9 degrees C  
Precipitation: 150 cm/y  
Mixing Height: 950 m

SOURCE INFORMATION

Source Number:	1	2
	<hr/>	<hr/>
Stack Height (m):	8.00	8.00
Diameter (m):	0.30	0.30
Plume Rise		
Momentum (m/s):	1.00E+00	1.00E+00
(Exit Velocity)		

AGRICULTURAL DATA

	<u>Vegetable</u>	<u>Milk</u>	<u>Meat</u>
Fraction Home Produced:	0.700	0.399	0.442
Fraction From Assessment Area:	0.300	0.601	0.558
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.  
Default Values used.

DISTANCES USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

364	377	569	578	751	880	896	972	1004	1111
1239	1243	1345	1416	1553					

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

D O S E   A N D   R I S K   E Q U I V A L E N T   S U M M A R I E S

Non-Radon Individual Assessment  
Dec 15, 1997 12:38 am

Facility: FERNALD ENVIRONMENTAL MANAGEMENT PROJECT  
Address: P.O. BOX 398704  
7400 WILLEY ROAD  
City: CINCINNATI  
State: OH                      Zip: 45253-8704

Source Category: REMEDIATION SITE  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #2. Individual  
Evaluational Test Run with two sources.

Dataset Name: Dataset #2  
Dataset Date: Dec 15, 1997 12:38 am  
Wind File: WNDFILES\1996.WND

## ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
GONADS	1.54E-04
BREAST	1.74E-04
R MAR	8.89E-03
LUNGS	6.22E-01
THYROID	1.50E-04
ENDOST	1.15E-01
RMNDR	3.71E-03
EFPEC	8.04E-02

## PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	2.59E-03
INHALATION	7.78E-02
AIR IMMERSION	3.89E-09
GROUND SURFACE	2.92E-05
INTERNAL	8.03E-02
EXTERNAL	2.92E-05
TOTAL	8.04E-02



NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

<u>Nuclide</u>	<u>Selected Individual (mrem/y)</u>
TH-228	1.98E-03
TH-230	5.82E-03
TH-232	4.43E-04
TH-234	6.64E-05
U-234	3.48E-02
U-235	1.06E-03
U-236	7.79E-04
U-238	3.54E-02
RA-226	2.52E-06
RA-228	3.73E-06
TOTAL	8.04E-02

## CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
LEUKEMIA	8.36E-09
BONE	5.52E-09
THYROID	3.40E-11
BREAST	3.80E-10
LUNG	1.02E-06
STOMACH	2.55E-10
BOWEL	6.57E-10
LIVER	3.70E-10
PANCREAS	1.50E-10
URINARY	7.64E-09
OTHER	1.83E-10
TOTAL	1.04E-06

## PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	1.38E-08
INHALATION	1.02E-06
AIR IMMERSION	8.68E-14
GROUND SURFACE	6.70E-10
INTERNAL	1.04E-06
EXTERNAL	6.70E-10
TOTAL	1.04E-06

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
TH-228	4.01E-08
TH-230	4.88E-08
TH-232	2.52E-09
TH-234	2.72E-09
U-234	4.55E-07
U-235	1.39E-08
U-236	1.00E-08
U-238	4.66E-07
RA-226	4.10E-11
RA-228	4.41E-11
TOTAL	1.04E-06

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)  
(All Radionuclides and Pathways)

Direction	Distance (m)						
	364	377	569	578	751	880	896
N	4.4E-02	4.2E-02	2.4E-02	2.3E-02	1.5E-02	1.2E-02	1.1E-02
NNW	2.9E-02	2.8E-02	1.6E-02	1.6E-02	1.1E-02	8.2E-03	8.0E-03
NW	2.6E-02	2.5E-02	1.4E-02	1.4E-02	9.3E-03	7.1E-03	6.9E-03
WNW	2.4E-02	2.3E-02	1.4E-02	1.4E-02	9.2E-03	7.1E-03	6.9E-03
W	4.2E-02	4.0E-02	2.2E-02	2.2E-02	1.4E-02	1.1E-02	1.1E-02
WSW	4.9E-02	4.7E-02	2.6E-02	2.6E-02	1.7E-02	1.3E-02	1.3E-02
SW	3.0E-02	2.8E-02	1.5E-02	1.5E-02	9.9E-03	7.6E-03	7.3E-03
SSW	2.6E-02	2.5E-02	1.4E-02	1.3E-02	8.9E-03	6.9E-03	6.7E-03
S	2.8E-02	2.7E-02	1.5E-02	1.5E-02	9.9E-03	7.6E-03	7.4E-03
SSE	4.0E-02	3.8E-02	2.1E-02	2.1E-02	1.4E-02	1.1E-02	1.0E-02
SE	5.3E-02	5.1E-02	2.8E-02	2.8E-02	1.8E-02	1.4E-02	1.4E-02
ESE	6.1E-02	5.9E-02	3.3E-02	3.2E-02	2.1E-02	1.6E-02	1.6E-02
E	7.5E-02	7.2E-02	4.0E-02	3.9E-02	2.6E-02	2.0E-02	1.9E-02
ENE	7.6E-02	7.3E-02	4.1E-02	4.0E-02	2.6E-02	2.0E-02	1.9E-02
NE	8.0E-02	7.7E-02	4.4E-02	4.3E-02	2.8E-02	2.2E-02	2.1E-02
NNE	7.0E-02	6.7E-02	3.8E-02	3.7E-02	2.5E-02	1.9E-02	1.8E-02

Direction	Distance (m)						
	972	1004	1111	1239	1243	1345	1416
N	1.0E-02	9.4E-03	8.0E-03	6.8E-03	6.7E-03	5.9E-03	5.5E-03
NNW	7.0E-03	6.6E-03	5.7E-03	4.8E-03	4.7E-03	4.2E-03	3.9E-03
NW	6.1E-03	5.7E-03	4.9E-03	4.1E-03	4.1E-03	3.6E-03	3.4E-03
WNW	6.0E-03	5.7E-03	4.9E-03	4.1E-03	4.1E-03	3.6E-03	3.4E-03
W	9.2E-03	8.7E-03	7.4E-03	6.2E-03	6.2E-03	5.5E-03	5.0E-03
WSW	1.1E-02	1.0E-02	8.8E-03	7.4E-03	7.4E-03	6.5E-03	6.0E-03
SW	6.4E-03	6.1E-03	5.2E-03	4.4E-03	4.3E-03	3.8E-03	3.5E-03
SSW	5.8E-03	5.5E-03	4.7E-03	4.0E-03	4.0E-03	3.5E-03	3.2E-03
S	6.4E-03	6.1E-03	5.2E-03	4.4E-03	4.4E-03	3.9E-03	3.6E-03
SSE	9.0E-03	8.5E-03	7.2E-03	6.1E-03	6.1E-03	5.3E-03	4.9E-03
SE	1.2E-02	1.1E-02	9.6E-03	8.0E-03	8.0E-03	7.0E-03	6.5E-03
ESE	1.4E-02	1.3E-02	1.1E-02	9.4E-03	9.4E-03	8.3E-03	7.6E-03
E	1.7E-02	1.6E-02	1.3E-02	1.1E-02	1.1E-02	9.9E-03	9.1E-03
ENE	1.7E-02	1.6E-02	1.4E-02	1.1E-02	1.1E-02	1.0E-02	9.2E-03
NE	1.8E-02	1.7E-02	1.5E-02	1.2E-02	1.2E-02	1.1E-02	9.9E-03
NNE	1.6E-02	1.5E-02	1.3E-02	1.1E-02	1.1E-02	9.4E-03	8.7E-03

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)  
(All Radionuclides and Pathways)

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Distance (m)	
Direction	1553
N	4.7E-03
NNW	3.3E-03
NW	2.9E-03
WNW	2.9E-03
W	4.3E-03
WSW	5.2E-03
SW	3.1E-03
SSW	2.8E-03
S	3.1E-03
SSE	4.3E-03
SE	5.6E-03
ESE	6.6E-03
E	7.8E-03
ENE	7.9E-03
NE	8.5E-03
NNE	7.5E-03

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INDIVIDUAL LIFETIME RISK (deaths)  
(All Radionuclides and Pathways)

Direction	Distance (m)						
	364	377	569	578	751	880	896
N	5.7E-07	5.5E-07	3.1E-07	3.0E-07	2.0E-07	1.5E-07	1.5E-07
NNW	3.8E-07	3.6E-07	2.1E-07	2.0E-07	1.4E-07	1.0E-07	1.0E-07
NW	3.3E-07	3.2E-07	1.8E-07	1.8E-07	1.2E-07	9.1E-08	8.8E-08
WNW	3.1E-07	3.0E-07	1.8E-07	1.7E-07	1.2E-07	9.0E-08	8.8E-08
W	5.4E-07	5.1E-07	2.9E-07	2.8E-07	1.8E-07	1.4E-07	1.3E-07
WSW	6.4E-07	6.1E-07	3.4E-07	3.3E-07	2.2E-07	1.7E-07	1.6E-07
SW	3.8E-07	3.7E-07	2.0E-07	1.9E-07	1.3E-07	9.6E-08	9.3E-08
SSW	3.3E-07	3.2E-07	1.8E-07	1.7E-07	1.1E-07	8.7E-08	8.4E-08
S	3.6E-07	3.5E-07	2.0E-07	1.9E-07	1.3E-07	9.7E-08	9.4E-08
SSE	5.2E-07	5.0E-07	2.8E-07	2.7E-07	1.8E-07	1.4E-07	1.3E-07
SE	6.9E-07	6.6E-07	3.7E-07	3.6E-07	2.4E-07	1.8E-07	1.7E-07
ESE	7.9E-07	7.6E-07	4.3E-07	4.2E-07	2.8E-07	2.1E-07	2.1E-07
E	9.7E-07	9.3E-07	5.2E-07	5.1E-07	3.3E-07	2.5E-07	2.5E-07
ENE	9.9E-07	9.4E-07	5.3E-07	5.1E-07	3.4E-07	2.6E-07	2.5E-07
NE	1.0E-06	9.9E-07	5.6E-07	5.5E-07	3.6E-07	2.8E-07	2.7E-07
NNE	9.0E-07	8.6E-07	4.9E-07	4.8E-07	3.2E-07	2.4E-07	2.3E-07

Direction	Distance (m)						
	972	1004	1111	1239	1243	1345	1416
N	1.3E-07	1.2E-07	1.0E-07	8.6E-08	8.5E-08	7.5E-08	6.9E-08
NNW	8.8E-08	8.4E-08	7.1E-08	6.0E-08	5.9E-08	5.2E-08	4.8E-08
NW	7.6E-08	7.2E-08	6.2E-08	5.2E-08	5.1E-08	4.5E-08	4.1E-08
WNW	7.6E-08	7.2E-08	6.1E-08	5.2E-08	5.1E-08	4.5E-08	4.2E-08
W	1.2E-07	1.1E-07	9.4E-08	7.9E-08	7.8E-08	6.9E-08	6.3E-08
WSW	1.4E-07	1.3E-07	1.1E-07	9.4E-08	9.4E-08	8.2E-08	7.6E-08
SW	8.1E-08	7.6E-08	6.5E-08	5.4E-08	5.4E-08	4.8E-08	4.4E-08
SSW	7.3E-08	6.9E-08	5.9E-08	5.0E-08	4.9E-08	4.3E-08	4.0E-08
S	8.1E-08	7.7E-08	6.6E-08	5.5E-08	5.5E-08	4.8E-08	4.4E-08
SSE	1.1E-07	1.1E-07	9.2E-08	7.7E-08	7.7E-08	6.7E-08	6.2E-08
SE	1.5E-07	1.4E-07	1.2E-07	1.0E-07	1.0E-07	8.9E-08	8.2E-08
ESE	1.8E-07	1.7E-07	1.4E-07	1.2E-07	1.2E-07	1.1E-07	9.7E-08
E	2.1E-07	2.0E-07	1.7E-07	1.4E-07	1.4E-07	1.3E-07	1.2E-07
ENE	2.2E-07	2.1E-07	1.7E-07	1.5E-07	1.5E-07	1.3E-07	1.2E-07
NE	2.3E-07	2.2E-07	1.9E-07	1.6E-07	1.6E-07	1.4E-07	1.3E-07
NNE	2.0E-07	1.9E-07	1.6E-07	1.4E-07	1.4E-07	1.2E-07	1.1E-07

INDIVIDUAL LIFETIME RISK (deaths)  
(All Radionuclides and Pathways)

---

Distance (m)	
Direction	1553
N	5.9E-08
NNW	4.1E-08
NW	3.6E-08
WNW	3.6E-08
W	5.4E-08
WSW	6.5E-08
SW	3.8E-08
SSW	3.4E-08
S	3.8E-08
SSE	5.3E-08
SE	7.0E-08
ESE	8.3E-08
E	9.9E-08
ENE	1.0E-07
NE	1.1E-07
NNE	9.5E-08

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Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Individual Assessment  
Dec 16, 1997 02:10 pm

Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH Zip: 45253-8704

Source Category: Remediation Site  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #2. Individual  
Evaluative Test Run with two sources

Effective Dose Equivalent  
(mrem/year)

---

8.04E-02

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At This Location: 364 Meters Northeast

Dataset Name: Dataset22  
Dataset Date: Dec 16, 1997 02:01 pm  
Wind File: F:\CAP88PC2\WNDFILES\1996.WND



MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 364 Meters Northeast  
Lifetime Fatal Cancer Risk: 1.04E-06

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Dose Equivalent (mrem/y)
GONADS	1.54E-04
BREAST	1.74E-04
R MAR	8.89E-03
LUNGS	6.22E-01
THYROID	1.50E-04
ENDOST	1.15E-01
RMNDR	3.71E-03
EFFEC	8.04E-02

RADIONUCLIDE EMISSIONS DURING THE YEAR 1997

Nuclide	Class	Size	Source	Source	TOTAL
			#1 Ci/y	#2 Ci/y	
TH-228	Y	0.30	4.3E-07	4.3E-07	8.6E-07
TH-230	Y	0.30	1.3E-06	1.3E-06	2.6E-06
TH-232	Y	0.30	6.8E-08	6.8E-08	1.4E-07
TH-234	Y	0.30	6.4E-05	6.4E-05	1.3E-04
U-234	Y	0.30	1.4E-05	1.4E-05	2.8E-05
U-235	Y	1.00	7.6E-07	7.6E-07	1.5E-06
U-236	Y	1.00	5.6E-07	5.6E-07	1.1E-06
U-238	Y	0.30	1.6E-05	1.6E-05	3.2E-05
RA-226	W	0.30	1.0E-08	1.0E-08	2.0E-08
RA-228	W	0.30	4.1E-08	4.1E-08	8.2E-08

SITE INFORMATION

Temperature: 9 degrees C  
 Precipitation: 150 cm/y  
 Mixing Height: 950 m

## SOURCE INFORMATION

Source Number:	1	2
Stack Height (m):	8.	8.
Diameter (m):	0.	0.
Plume Rise		
Momentum (m/s):	1.	1.
(Exit Velocity)		

## AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.700	0.399	0.442
Fraction From Assessment Area:	0.300	0.601	0.558
Fraction Imported:	0.000	0.000	0.000

Food Arrays were not generated for this run.  
Default Values used.

## DISTANCES (M) USED FOR MAXIMUM INDIVIDUAL ASSESSMENT

364	377	569	578	751	880	896	972	1004	1111
1239	1243	1345	1416	1553					

Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Individual Assessment

Dec 16, 1997 02:10 pm

Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH Zip: 45253-8704

Source Category: Remediation Site  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #2. Individual  
Evaluative Test Run with two sources

Dataset Name: Dataset22  
Dataset Date: Dec 16, 1997 02:01 pm  
Wind File: F:\CAP88PC2\WINDFILES\1996.WND

## ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)
GONADS	1.54E-04
BREAST	1.74E-04
R MAR	8.89E-03
LUNGS	6.22E-01
THYROID	1.50E-04
ENDOST	1.15E-01
RMNDR	3.71E-03
EFFEC	8.04E-02

## PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)
INGESTION	2.59E-03
INHALATION	7.78E-02
AIR IMMERSION	3.89E-09
GROUND SURFACE	2.92E-05
INTERNAL	8.03E-02
EXTERNAL	2.92E-05
TOTAL	8.04E-02

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclide	Selected Individual (mrem/y)
TH-228	1.98E-03
TH-230	5.82E-03
TH-232	4.43E-04
TH-234	6.64E-05
U-234	3.48E-02
U-235	1.06E-03
U-236	7.79E-04
U-238	3.54E-02
RA-226	2.52E-06
RA-228	3.73E-06
TOTAL	8.04E-02

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk
LEUKEMIA	8.36E-09
BONE	5.52E-09
THYROID	3.40E-11
BREAST	3.80E-10
LUNG	1.02E-06
STOMACH	2.55E-10
BOWEL	6.57E-10
LIVER	3.70E-10
PANCREAS	1.50E-10
URINARY	7.64E-09
OTHER	1.83E-10
 TOTAL	 1.04E-06

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk
INGESTION	1.38E-08
INHALATION	1.02E-06
AIR IMMERSION	8.68E-14
GROUND SURFACE	6.70E-10
INTERNAL	1.04E-06
EXTERNAL	6.70E-10
 TOTAL	 1.04E-06

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk
TH-228	4.01E-08
TH-230	4.88E-08
TH-232	2.52E-09
TH-234	2.72E-09
U-234	4.55E-07
U-235	1.39E-08
U-236	1.00E-08
U-238	4.66E-07
RA-226	4.10E-11
RA-228	4.41E-11
TOTAL	1.04E-06



INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)  
(All Radionuclides and Pathways)

		Distance (m)						
Direction	364	377	569	578	751	880	896	
N	4.4E-02	4.2E-02	2.4E-02	2.3E-02	1.5E-02	1.2E-02	1.1E-02	
NNW	2.9E-02	2.8E-02	1.6E-02	1.6E-02	1.1E-02	8.2E-03	8.0E-03	
NW	2.6E-02	2.5E-02	1.4E-02	1.4E-02	9.3E-03	7.1E-03	6.9E-03	
WNW	2.4E-02	2.3E-02	1.4E-02	1.4E-02	9.2E-03	7.1E-03	6.9E-03	
W	4.2E-02	4.0E-02	2.2E-02	2.2E-02	1.4E-02	1.1E-02	1.1E-02	
WSW	4.9E-02	4.7E-02	2.6E-02	2.6E-02	1.7E-02	1.3E-02	1.3E-02	
SW	3.0E-02	2.8E-02	1.5E-02	1.5E-02	9.9E-03	7.6E-03	7.3E-03	
SSW	2.6E-02	2.5E-02	1.4E-02	1.3E-02	8.9E-03	6.9E-03	6.7E-03	
S	2.8E-02	2.7E-02	1.5E-02	1.5E-02	9.9E-03	7.6E-03	7.4E-03	
SSE	4.0E-02	3.8E-02	2.1E-02	2.1E-02	1.4E-02	1.1E-02	1.0E-02	
SE	5.3E-02	5.1E-02	2.8E-02	2.8E-02	1.8E-02	1.4E-02	1.4E-02	
ESE	6.1E-02	5.9E-02	3.3E-02	3.2E-02	2.1E-02	1.6E-02	1.6E-02	
E	7.5E-02	7.2E-02	4.0E-02	3.9E-02	2.6E-02	2.0E-02	1.9E-02	
ENE	7.6E-02	7.3E-02	4.1E-02	4.0E-02	2.6E-02	2.0E-02	1.9E-02	
NE	8.0E-02	7.7E-02	4.4E-02	4.3E-02	2.8E-02	2.2E-02	2.1E-02	
NNE	7.0E-02	6.7E-02	3.8E-02	3.7E-02	2.5E-02	1.9E-02	1.8E-02	

		Distance (m)						
Direction	972	1004	1111	1239	1243	1345	1416	
N	1.0E-02	9.4E-03	8.0E-03	6.8E-03	6.7E-03	5.9E-03	5.5E-03	
NNW	7.0E-03	6.6E-03	5.7E-03	4.8E-03	4.7E-03	4.2E-03	3.9E-03	
NW	6.1E-03	5.7E-03	4.9E-03	4.1E-03	4.1E-03	3.6E-03	3.4E-03	
WNW	6.0E-03	5.7E-03	4.9E-03	4.1E-03	4.1E-03	3.6E-03	3.4E-03	
W	9.2E-03	8.7E-03	7.4E-03	6.2E-03	6.2E-03	5.5E-03	5.0E-03	
WSW	1.1E-02	1.0E-02	8.8E-03	7.4E-03	7.4E-03	6.5E-03	6.0E-03	
SW	6.4E-03	6.1E-03	5.2E-03	4.4E-03	4.3E-03	3.8E-03	3.5E-03	
SSW	5.8E-03	5.5E-03	4.7E-03	4.0E-03	4.0E-03	3.5E-03	3.2E-03	
S	6.4E-03	6.1E-03	5.2E-03	4.4E-03	4.4E-03	3.9E-03	3.6E-03	
SSE	9.0E-03	8.5E-03	7.2E-03	6.1E-03	6.1E-03	5.3E-03	4.9E-03	
SE	1.2E-02	1.1E-02	9.6E-03	8.0E-03	8.0E-03	7.0E-03	6.5E-03	
ESE	1.4E-02	1.3E-02	1.1E-02	9.4E-03	9.4E-03	8.3E-03	7.6E-03	
E	1.7E-02	1.6E-02	1.3E-02	1.1E-02	1.1E-02	9.9E-03	9.1E-03	
ENE	1.7E-02	1.6E-02	1.4E-02	1.1E-02	1.1E-02	1.0E-02	9.2E-03	
NE	1.8E-02	1.7E-02	1.5E-02	1.2E-02	1.2E-02	1.1E-02	9.9E-03	
NNE	1.6E-02	1.5E-02	1.3E-02	1.1E-02	1.1E-02	9.4E-03	8.7E-03	

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)  
(All Radionuclides and Pathways)

---

Distance (m)

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Direction 1553

---

N	4.7E-03
NNW	3.3E-03
NW	2.9E-03
WNW	2.9E-03
W	4.3E-03
WSW	5.2E-03
SW	3.1E-03
SSW	2.8E-03
S	3.1E-03
SSE	4.3E-03
SE	5.6E-03
ESE	6.6E-03
E	7.8E-03
ENE	7.9E-03
NE	8.5E-03
NNE	7.5E-03

---

INDIVIDUAL LIFETIME RISK (deaths)  
(All Radionuclides and Pathways)

Direction	Distance (m)						
	364	377	569	578	751	880	896
N	5.7E-07	5.5E-07	3.1E-07	3.0E-07	2.0E-07	1.5E-07	1.5E-07
NNW	3.8E-07	3.6E-07	2.1E-07	2.0E-07	1.4E-07	1.0E-07	1.0E-07
NW	3.3E-07	3.2E-07	1.8E-07	1.8E-07	1.2E-07	9.1E-08	8.8E-08
WNW	3.1E-07	3.0E-07	1.8E-07	1.7E-07	1.2E-07	9.0E-08	8.8E-08
W	5.4E-07	5.1E-07	2.9E-07	2.8E-07	1.8E-07	1.4E-07	1.3E-07
WSW	6.4E-07	6.1E-07	3.4E-07	3.3E-07	2.2E-07	1.7E-07	1.6E-07
SW	3.8E-07	3.7E-07	2.0E-07	1.9E-07	1.3E-07	9.6E-08	9.3E-08
SSW	3.3E-07	3.2E-07	1.8E-07	1.7E-07	1.1E-07	8.7E-08	8.4E-08
S	3.6E-07	3.5E-07	2.0E-07	1.9E-07	1.3E-07	9.7E-08	9.4E-08
SSE	5.2E-07	5.0E-07	2.8E-07	2.7E-07	1.8E-07	1.4E-07	1.3E-07
SE	6.9E-07	6.6E-07	3.7E-07	3.6E-07	2.4E-07	1.8E-07	1.7E-07
ESE	7.9E-07	7.6E-07	4.3E-07	4.2E-07	2.8E-07	2.1E-07	2.1E-07
E	9.7E-07	9.3E-07	5.2E-07	5.1E-07	3.3E-07	2.5E-07	2.5E-07
ENE	9.9E-07	9.4E-07	5.3E-07	5.1E-07	3.4E-07	2.6E-07	2.5E-07
NE	1.0E-06	9.9E-07	5.6E-07	5.5E-07	3.6E-07	2.8E-07	2.7E-07
NNE	9.0E-07	8.6E-07	4.9E-07	4.8E-07	3.2E-07	2.4E-07	2.3E-07

Direction	Distance (m)						
	972	1004	1111	1239	1243	1345	1416
N	1.3E-07	1.2E-07	1.0E-07	8.6E-08	8.5E-08	7.5E-08	6.9E-08
NNW	8.8E-08	8.4E-08	7.1E-08	6.0E-08	5.9E-08	5.2E-08	4.8E-08
NW	7.6E-08	7.2E-08	6.2E-08	5.2E-08	5.1E-08	4.5E-08	4.1E-08
WNW	7.6E-08	7.2E-08	6.1E-08	5.2E-08	5.1E-08	4.5E-08	4.2E-08
W	1.2E-07	1.1E-07	9.4E-08	7.9E-08	7.8E-08	6.9E-08	6.3E-08
WSW	1.4E-07	1.3E-07	1.1E-07	9.4E-08	9.4E-08	8.2E-08	7.6E-08
SW	8.1E-08	7.6E-08	6.5E-08	5.4E-08	5.4E-08	4.8E-08	4.4E-08
SSW	7.3E-08	6.9E-08	5.9E-08	5.0E-08	4.9E-08	4.3E-08	4.0E-08
S	8.1E-08	7.7E-08	6.6E-08	5.5E-08	5.5E-08	4.8E-08	4.4E-08
SSE	1.1E-07	1.1E-07	9.2E-08	7.7E-08	7.7E-08	6.7E-08	6.2E-08
SE	1.5E-07	1.4E-07	1.2E-07	1.0E-07	1.0E-07	8.9E-08	8.2E-08
ESE	1.8E-07	1.7E-07	1.4E-07	1.2E-07	1.2E-07	1.1E-07	9.7E-08
E	2.1E-07	2.0E-07	1.7E-07	1.4E-07	1.4E-07	1.3E-07	1.2E-07
ENE	2.2E-07	2.1E-07	1.7E-07	1.5E-07	1.5E-07	1.3E-07	1.2E-07
NE	2.3E-07	2.2E-07	1.9E-07	1.6E-07	1.6E-07	1.4E-07	1.3E-07
NNE	2.0E-07	1.9E-07	1.6E-07	1.4E-07	1.4E-07	1.2E-07	1.1E-07

INDIVIDUAL LIFETIME RISK (deaths)  
(All Radionuclides and Pathways)

---

Distance (m)

---

Direction 1553

---

N	5.9E-08
NNW	4.1E-08
NW	3.6E-08
WNW	3.6E-08
W	5.4E-08
WSW	6.5E-08
SW	3.8E-08
SSW	3.4E-08
S	3.8E-08
SSE	5.3E-08
SE	7.0E-08
ESE	8.3E-08
E	9.9E-08
ENE	1.0E-07
NE	1.1E-07
NNE	9.5E-08

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**ATTACHMENT A - DATASET #3,**

**CAP88-PC v1.0 and v2.0  
SYNOPSIS and SUMMARY FILES**

C A P 8 8 - P C

*Version 1.00*

Clean Air Act Assessment Package - 1988

S Y N O P S I S   R E P O R T

Non-Radon Population Assessment

Dec 15, 1997 10:43 am

Facility: FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Address: P.O. BOX 398704

7400 WILLEY ROAD

City: CINCINNATI

State: OH                      Zip: 45253-8704

Effective Dose Equivalent  
(mrem/year)

---

3.46E+02

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At This Location: 2500 Meters North

Source Category: REMEDIATION SITE

Source Type: Stack

Emission Year: 1997

Comments: Dataset #3

Evaluative Test Run with six sources

Dataset Name: Dataset #3

Dataset Date: Dec 15, 1997 10:39 am

Wind File: WNDFILES\ERIEPA.WND

Population File: POPFILES\RMIA SHTA.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 2500 Meters North  
 Lifetime Fatal Cancer Risk: 3.24E-03

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.06E+01	3.60E+02
BREAST	3.36E+00	5.56E+01
R MAR	2.72E+02	4.35E+03
LUNGS	1.54E+03	2.15E+04
THYROID	3.01E+00	5.02E+01
ENDOST	3.37E+03	5.39E+04
RMNDR	6.89E+01	1.23E+03
EFFEC	3.46E+02	5.19E+03

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range higher	Number of People	Number of People In This Risk Range Or Higher	Deaths/Year In This Risk Range	Deaths/Year In This Risk Range Or
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	3038	3038	8.97E-02	8.97E-02
1.0E-03 TO 1.0E-04	64673	67711	2.50E-01	3.40E-01
1.0E-04 TO 1.0E-05	1305208	1372919	3.27E-01	6.68E-01
1.0E-05 TO 1.0E-06	27255	1400174	3.32E-03	6.71E-01
LESS THAN 1.0E-06	0	1400174	0.00E+00	6.71E-01



RADIONUCLIDE EMISSIONS DURING THE YEAR 1997

TOTAL Nuclide	Class	Size	Source #1 Ci/y	Source #2 Ci/y	Source #3 Ci/y	Source #4 Ci/y	Source #5 Ci/y	Source #6 Ci/y	Ci/y
TH-228 5.0E+00	Y	0.30	4.3E-07	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
TH-230 4.0E+00	Y	0.30	1.3E-06	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
TH-232 4.0E+00	Y	0.30	6.8E-08	1.2E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
TH-234 4.0E+00	Y	0.30	6.4E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
H-3 4.0E+00	*	0.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NP-237 4.0E+00	W	1.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NP-238 4.0E+00	W	1.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NP-239 4.0E+00	W	1.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NP-240 4.0E+00	W	1.00	2.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00
NP-240M 4.0E+00	W	1.00	3.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00

SITE INFORMATION

Temperature: 9 degrees C  
 Precipitation: 150 cm/y  
 Mixing Height: 950 m

SOURCE INFORMATION

Source Number:	1	2	3	4	5	6
Stack Height (m):	8.00	9.00	10.00	9.00	7.00	20.00
Diameter (m):	6.00	6.00	5.00	4.00	1.00	1.00
Plume Rise						
Momentum (m/s): (Exit Velocity)	1.23E+02	1.30E+02	1.20E+02	1.00E+02	1.50E+02	1.65E+02

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000
Beef Cattle Density:	2.03E-01		
Milk Cattle Density:	4.56E-02		
Land Fraction Cultivated for Vegetable Crops:	1.70E-02		

POPULATION DATA

Direction	Distance (m)						
	310	810	1500	2500	3500	4500	7500
N	0	0	0	1043	0	0	0
NNW	0	6	0	113	0	0	0
NW	0	0	1987	0	0	0	0
WNW	0	0	0	2218	0	0	0
W	0	0	0	2435	3014	288	183
WSW	0	0	421	810	0	293	1108
SW	0	0	0	0	2435	0	1688
SSW	0	0	0	4350	407	4223	3024
S	0	0	0	0	2002	0	534
SSE	0	0	101	0	0	0	0
SE	0	0	0	0	0	0	974
ESE	0	0	0	851	0	0	125
E	0	0	0	780	0	89	793
ENE	1	0	0	55	0	0	0
NE	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0

Direction	Distance (m)					
	15000	25000	35000	45000	55000	70000
N	0	0	0	0	0	0
NNW	0	0	0	0	0	0
NW	0	0	0	0	0	0
WNW	0	0	0	0	0	0
W	380	0	0	0	0	0
WSW	779	15354	8786	48943	63357	319944
SW	3376	3448	7591	6999	23331	187240
SSW	3059	3396	3128	6847	8940	27255
S	8224	2252	2388	5752	7858	140074
SSE	984	1792	3659	3759	7416	80933
SE	1388	2021	3148	5123	4351	14935
ESE	3161	827	3252	3712	25127	15531
E	265	1693	5397	1338	11236	17820
ENE	14641	6332	5986	13324	45833	150138
NE	0	0	0	0	0	0
NNE	0	0	0	0	0	0

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Version 1.00

Clean Air Act Assessment Package - 1988

D O S E   A N D   R I S K   E Q U I V A L E N T   S U M M A R I E S

Non-Radon Population Assessment  
Dec 15, 1997 10:43 am

Facility: FERNALD ENVIRONMENTAL MANAGEMENT PROJECT  
Address: P.O. BOX 398704  
7400 WILLEY ROAD  
City: CINCINNATI  
State: OH                      Zip: 45253-8704

Source Category: REMEDIATION SITE  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #3  
          Evaluational Test Run with six sources

Dataset Name: Dataset #3  
Dataset Date: Dec 15, 1997 10:39 am  
Wind File: WNDFILES\VERIEPA.WND  
Population File: POPFILES\RMIAASHTA.POP

## ORGAN DOSE EQUIVALENT SUMMARY

<u>Organ</u>	<u>Selected Individual (mrem/y)</u>	<u>Collective Population (person-rem/y)</u>
GONADS	2.06E+01	3.60E+02
BREAST	3.36E+00	5.56E+01
R MAR	2.72E+02	4.35E+03
LUNGS	1.54E+03	2.15E+04
THYROID	3.01E+00	5.02E+01
ENDOST	3.37E+03	5.39E+04
RMNDR	6.89E+01	1.23E+03
EFFEC	3.46E+02	5.19E+03

## PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

<u>Pathway</u>	<u>Selected Individual (mrem/y)</u>	<u>Collective Population (person-rem/y)</u>
INGESTION	2.35E+00	4.86E+02
INHALATION	3.43E+02	4.69E+03
AIR IMMERSION	2.19E-04	2.10E-03
GROUND SURFACE	3.44E-01	5.20E+00
INTERNAL	3.45E+02	5.18E+03
EXTERNAL	3.45E-01	5.20E+00
TOTAL	3.46E+02	5.18E+03

## NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

<u>Nuclides</u>	<u>Selected Individual (mrem/y)</u>	<u>Collective Population (person-rem/y)</u>
TH-228	7.70E+01	1.15E+03
TH-230	7.38E+01	1.03E+03
TH-232	1.07E+02	1.48E+03
TH-234	1.22E-02	6.66E-01
H-3	3.01E-05	2.70E-03
NP-237	8.74E+01	1.53E+03
NP-238	6.71E-03	9.02E-02
NP-239	9.07E-04	1.33E-02
NP-240	1.82E-04	1.43E-03
NP-240M	2.06E-05	1.02E-04
TOTAL	3.46E+02	5.18E+03

## CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
LEUKEMIA	2.32E-04	5.26E-02
BONE	1.51E-04	3.42E-02
THYROID	4.85E-07	1.12E-04
BREAST	5.09E-06	1.14E-03
LUNG	2.61E-03	5.22E-01
STOMACH	2.69E-06	6.52E-04
BOWEL	1.92E-06	9.47E-04
LIVER	2.35E-04	5.81E-02
PANCREAS	1.88E-06	4.36E-04
URINARY	1.12E-06	2.58E-04
OTHER	2.30E-06	5.33E-04
TOTAL	3.24E-03	6.71E-01

## PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
INGESTION	1.05E-05	3.08E-02
INHALATION	3.22E-03	6.38E-01
AIR IMMERSION	5.22E-09	7.07E-07
GROUND SURFACE	7.52E-06	1.60E-03
INTERNAL	3.23E-03	6.69E-01
EXTERNAL	7.52E-06	1.60E-03
TOTAL	3.24E-03	6.71E-01

PATHWAY GENETIC RISK SUMMARY  
(Collective Population)

<u>Pathway</u>	<u>Genetic Risk (person-rem/y)</u>
INGESTION	3.75E+00
INHALATION	1.14E+01
AIR IMMERSION	2.05E-03
GROUND SURFACE	4.37E+00
INTERNAL	1.52E+01
EXTERNAL	4.38E+00
TOTAL	1.96E+01



## NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
TH-228	1.56E-03	3.25E-01
TH-230	6.21E-04	1.19E-01
TH-232	6.13E-04	1.18E-01
TH-234	6.49E-07	2.03E-04
H-3	8.22E-10	1.03E-06
NP-237	4.47E-04	1.09E-01
NP-238	6.98E-08	1.36E-05
NP-239	2.57E-08	5.11E-06
NP-240	4.50E-09	4.97E-07
NP-240M	5.03E-10	3.50E-08
TOTAL	3.24E-03	6.71E-01











Clean Air Act Assessment Package - 1988

S Y N O P S I S   R E P O R T

Non-Radon Population Assessment

Dec 16, 1997 01:11 pm

Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH                      Zip: 45253-8704

Source Category: Remediation Site  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #3  
Evaluative Test Run with six sources

Effective Dose Equivalent  
(mrem/year)

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3.46E+02

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At This Location: 2500 Meters North

Dataset Name: Dataset32.  
Dataset Date: Dec 16, 1997 01:10 pm  
Wind File: F:\CAP88PC2\WNDFILES\ERIEPA.WND  
Population File: F:\CAP88PC2\POPFILES\RMIASHTA.POP

## MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 2500 Meters North  
Lifetime Fatal Cancer Risk: 3.24E-03

## ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.06E+01	3.60E+02
BREAST	3.36E+00	5.56E+01
R MAR	2.72E+02	4.35E+03
LUNGS	1.54E+03	2.15E+04
THYROID	3.01E+00	5.02E+01
ENDOST	3.37E+03	5.39E+04
RMNDR	6.89E+01	1.23E+03
EFFEC	3.46E+02	5.19E+03

## FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	# of People	# of People in This Risk Range or Higher	Deaths/Year in This Risk Range	Deaths/Year in This Risk Range or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	3038	3038	8.97E-02	8.97E-02
1.0E-03 TO 1.0E-04	64673	67711	2.50E-01	3.40E-01
1.0E-04 TO 1.0E-05	1305208	1372919	3.27E-01	6.68E-01
1.0E-05 TO 1.0E-06	27255	1400174	3.32E-03	6.71E-01
LESS THAN 1.0E-06	0	1400174	0.00E+00	6.71E-01



## RADIONUCLIDE EMISSIONS DURING THE YEAR 1997

Nuclide	Class	Size	Source	Source	Source	Source	Source	Source	TOTAL
			#1	#2	#3	#4	#5	#6	
			Ci/y	Ci/y	Ci/y	Ci/y	Ci/y	Ci/y	Ci/y
TH-228	Y	0.30	4.3E-07	1.0E+00	1.0E+00	1.0E+00	1.0E+00	1.0E+00	5.0E+00
TH-230	Y	0.30	1.3E-06	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
TH-232	Y	0.30	6.8E-08	1.2E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
TH-234	Y	0.30	6.4E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
H-3	*	0.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
NP-237	W	1.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
NP-238	W	1.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
NP-239	W	1.00	1.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
NP-240	W	1.00	2.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00
NP-240M	W	1.00	3.0E-05	1.0E-05	1.0E+00	1.0E+00	1.0E+00	1.0E+00	4.0E+00

## SITE INFORMATION

Temperature: 9 degrees C  
Precipitation: 150 cm/y  
Mixing Height: 950 m

## SOURCE INFORMATION

Source Number:	1	2	3	4	5	6
Stack Height (m):	8.	9.	10.	9.	7.	20.
Diameter (m):	6.	6.	5.	4.	1.	1.
Plume Rise						
Momentum (m/s): (Exit Velocity)	123.	130.	120.	100.	150.	165.

## AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000
Beef Cattle Density:	2.03E-01		
Milk Cattle Density:	4.56E-02		
Land Fraction Cultivated for Vegetable Crops:	1.70E-02		

## POPULATION DATA

		Distance (m)					
Direction	310	810	1500	2500	3500	4500	7500
N	0	0	0	1043	0	0	0
NNW	0	6	0	113	0	0	0
NW	0	0	1987	0	0	0	0
WNW	0	0	0	2218	0	0	0
W	0	0	0	2435	3014	288	183
WSW	0	0	421	810	0	293	1108
SW	0	0	0	0	2435	0	1688
SSW	0	0	0	4350	407	4223	3024
S	0	0	0	0	2002	0	534
SSE	0	0	101	0	0	0	0
SE	0	0	0	0	0	0	974
ESE	0	0	0	851	0	0	125
E	0	0	0	780	0	89	793
ENE	1	0	0	55	0	0	0
NE	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0

		Distance (m)					
Direction	15000	25000	35000	45000	55000	70000	
N	0	0	0	0	0	0	
NNW	0	0	0	0	0	0	
NW	0	0	0	0	0	0	
WNW	0	0	0	0	0	0	
W	380	0	0	0	0	0	
WSW	779	15354	8786	48943	63357	319944	
SW	3376	3448	7591	6999	23331	187240	
SSW	3059	3396	3128	6847	8940	27255	
S	8224	2252	2388	5752	7858	140074	
SSE	984	1792	3659	3759	7416	80933	
SE	1388	2021	3148	5123	4351	14935	
ESE	3161	827	3252	3712	25127	15531	
E	265	1693	5397	1338	11236	17820	
ENE	14641	6332	5986	13324	45833	150138	
NE	0	0	0	0	0	0	
NNE	0	0	0	0	0	0	

Clean Air Act Assessment Package - 1988

D O S E   A N D   R I S K   E Q U I V A L E N T   S U M M A R I E S

Non-Radon Population Assessment

Dec 16, 1997 01:11 pm

Facility: Fernald Environmental Management Project  
Address: P.O. Box 398704  
7400 Willey Road  
City: Cincinnati  
State: OH                      Zip: 45253-8704

Source Category: Remediation Site  
Source Type: Stack  
Emission Year: 1997

Comments: Dataset #3  
Evaluative Test Run with six sources

Dataset Name: Dataset32.  
Dataset Date: Dec 16, 1997 01:10 pm  
Wind File: F:\CAP88PC2\WINDFILES\ERIEPA.WND  
Population File: F:\CAP88PC2\POPFILES\RMIA SHTA.POP

## ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	2.06E+01	3.60E+02
BREAST	3.36E+00	5.56E+01
R MAR	2.72E+02	4.35E+03
LUNGS	1.54E+03	2.15E+04
THYROID	3.01E+00	5.02E+01
ENDOST	3.37E+03	5.39E+04
RMNDR	6.89E+01	1.23E+03
EFFEC	3.46E+02	5.19E+03

## PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)	Collective Population (person-rem/y)
INGESTION	2.35E+00	4.86E+02
INHALATION	3.43E+02	4.69E+03
AIR IMMERSION	2.19E-04	2.10E-03
GROUND SURFACE	3.44E-01	5.20E+00
INTERNAL	3.45E+02	5.18E+03
EXTERNAL	3.45E-01	5.20E+00
TOTAL	3.46E+02	5.18E+03

## NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclides	Selected Individual (mrem/y)	Collective Population (person-rem/y)
TH-228	7.70E+01	1.15E+03
TH-230	7.38E+01	1.03E+03
TH-232	1.07E+02	1.48E+03
TH-234	1.22E-02	6.66E-01
H-3	3.01E-05	2.70E-03
NP-237	8.74E+01	1.53E+03
NP-238	6.71E-03	9.02E-02
NP-239	9.07E-04	1.33E-02
NP-240	1.82E-04	1.43E-03
NP-240M	2.06E-05	1.02E-04
TOTAL	3.46E+02	5.18E+03

## CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
LEUKEMIA	2.32E-04	5.26E-02
BONE	1.51E-04	3.42E-02
THYROID	4.85E-07	1.12E-04
BREAST	5.09E-06	1.14E-03
LUNG	2.61E-03	5.22E-01
STOMACH	2.69E-06	6.52E-04
BOWEL	1.92E-06	9.47E-04
LIVER	2.35E-04	5.81E-02
PANCREAS	1.88E-06	4.36E-04
URINARY	1.12E-06	2.58E-04
OTHER	2.30E-06	5.33E-04
TOTAL	3.24E-03	6.71E-01

## PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
INGESTION	1.05E-05	3.08E-02
INHALATION	3.22E-03	6.38E-01
AIR IMMERSION	5.22E-09	7.07E-07
GROUND SURFACE	7.52E-06	1.60E-03
INTERNAL	3.23E-03	6.69E-01
EXTERNAL	7.52E-06	1.60E-03
TOTAL	3.24E-03	6.71E-01

PATHWAY GENETIC RISK SUMMARY  
(Collective Population)

<u>Pathway</u>	<u>Genetic Risk (person-rem/y)</u>
INGESTION	3.75E+00
INHALATION	1.14E+01
AIR IMMERSION	2.05E-03
GROUND SURFACE	4.37E+00
INTERNAL	1.52E+01
EXTERNAL	4.38E+00
TOTAL	1.96E+01



## NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
TH-228	1.56E-03	3.25E-01
TH-230	6.21E-04	1.19E-01
TH-232	6.13E-04	1.18E-01
TH-234	6.49E-07	2.03E-04
H-3	8.22E-10	1.03E-06
NP-237	4.47E-04	1.09E-01
NP-238	6.98E-08	1.36E-05
NP-239	2.57E-08	5.11E-06
NP-240	4.50E-09	4.97E-07
NP-240M	5.03E-10	3.50E-08
TOTAL	3.24E-03	6.71E-01









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Report Number (14) FEMP--2552

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Publ. Date (11) 199712

Sponsor Code (18) DOE/DP, XF

UC Category (19) UC-702, DOE/ER

DOE