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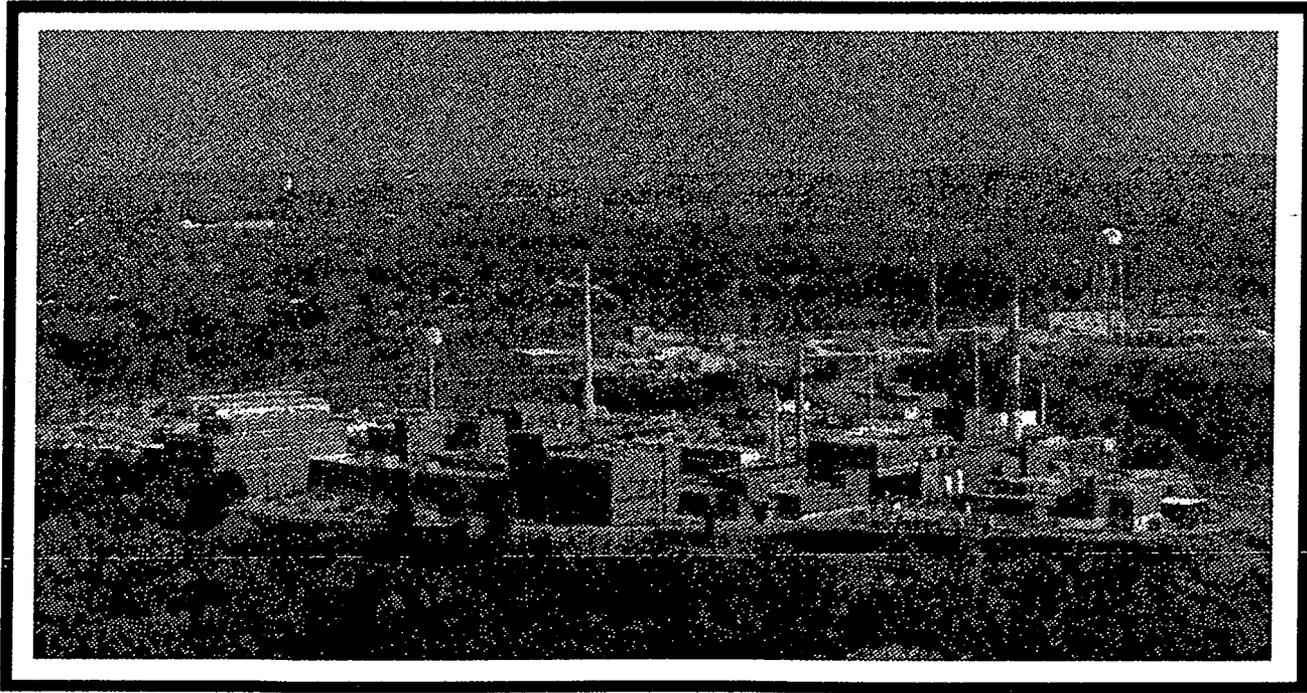
**Environmental
Restoration
Program**



MOUND PLANT

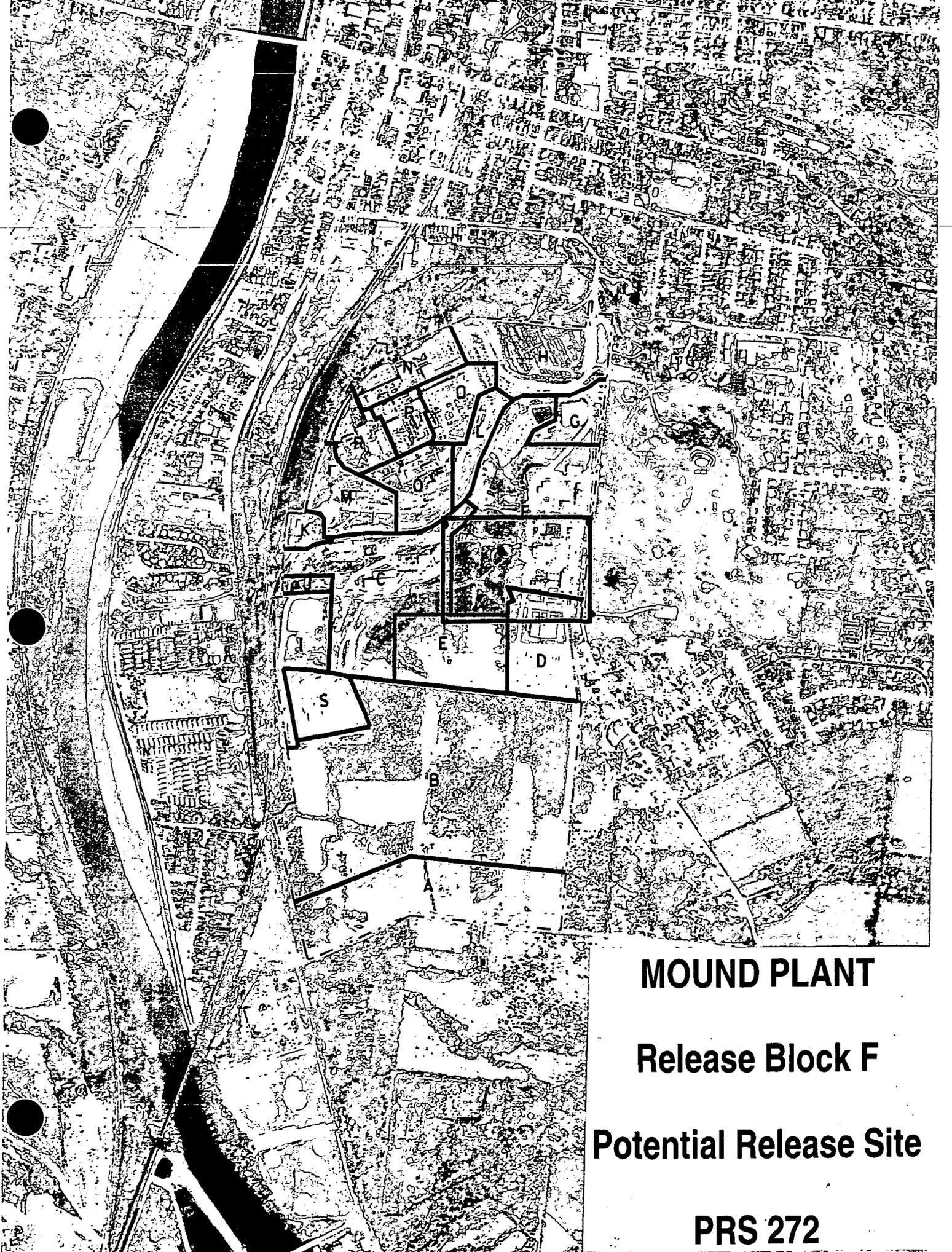
Potential Release Site Package

PRS # 272



PRS 272

REV	DESCRIPTION	DATE
0 PUBLIC RELEASE	Available for comments.	Jul. 18, 1996
1 FINAL	Comment period expired. No comments. Recommendation page annotated.	Oct. 10, 1996

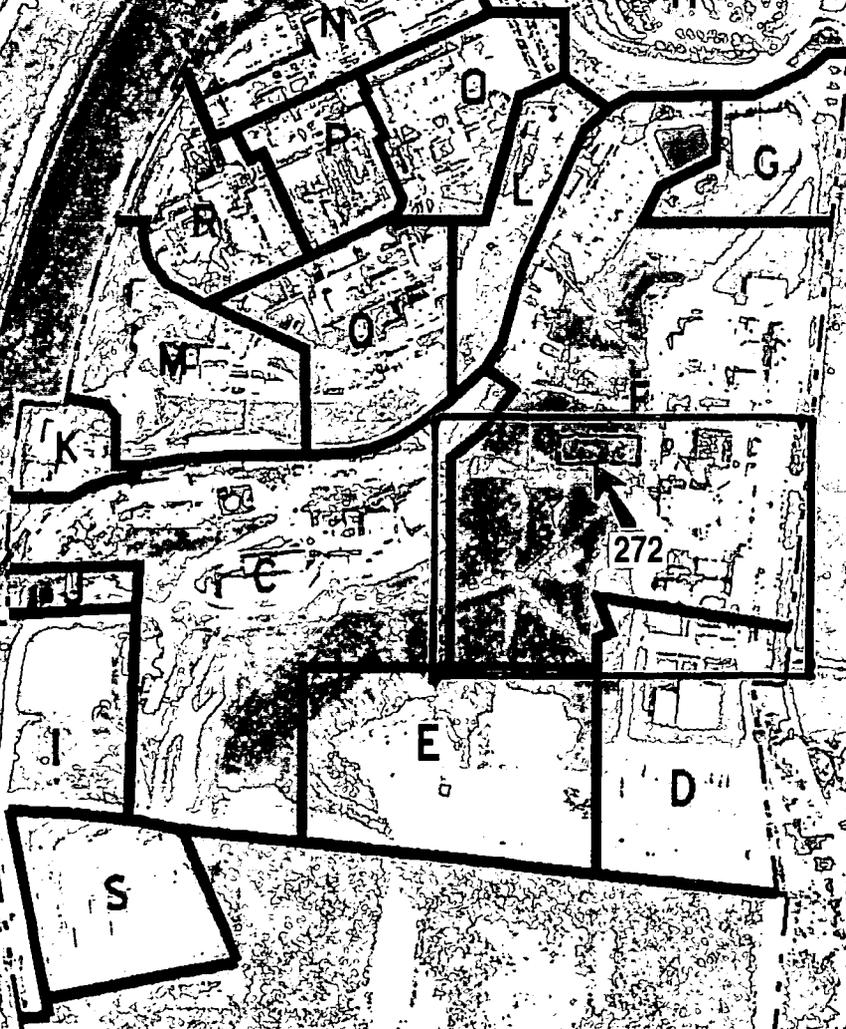
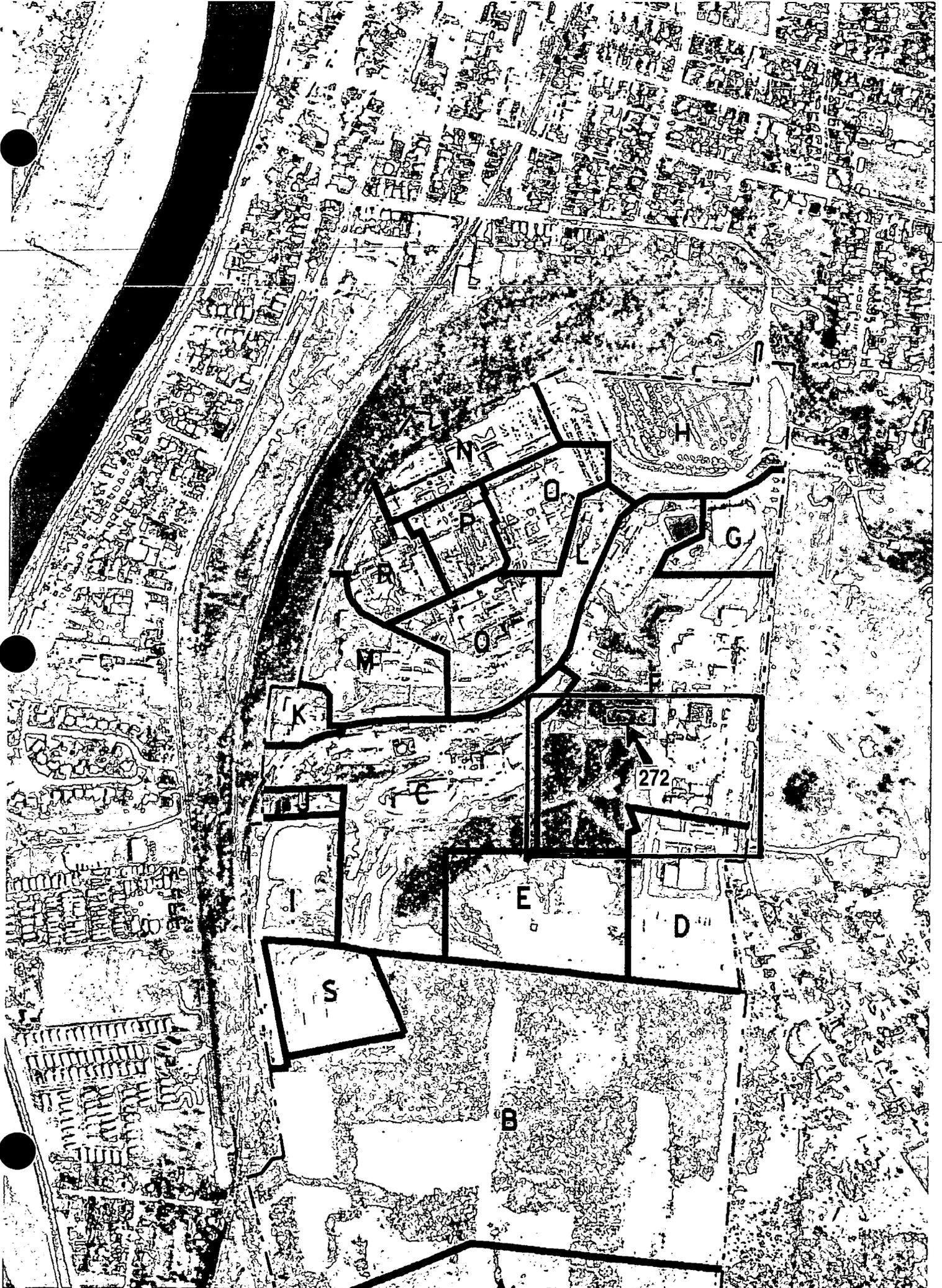


MOUND PLANT

Release Block F

Potential Release Site

PRS 272



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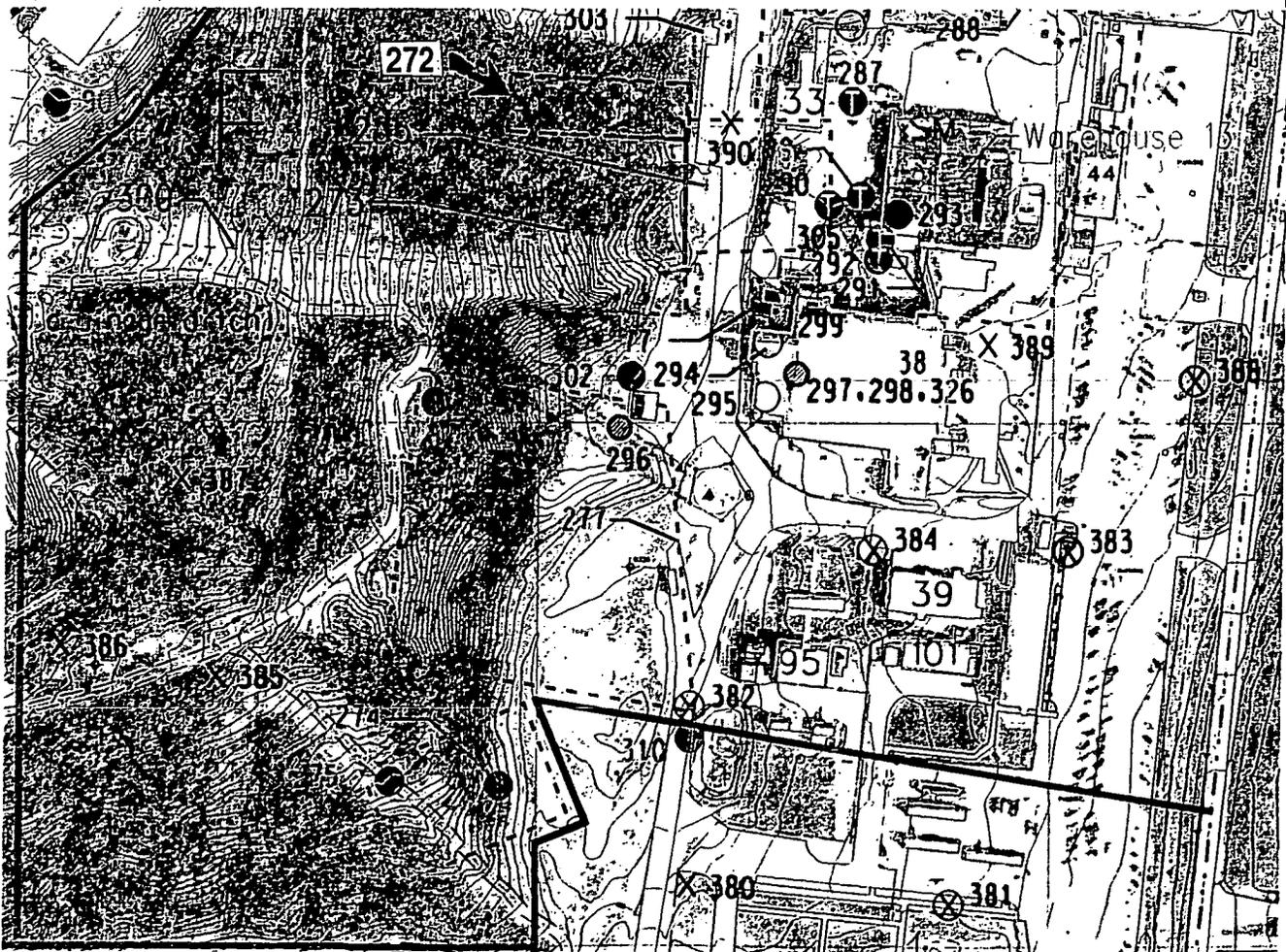
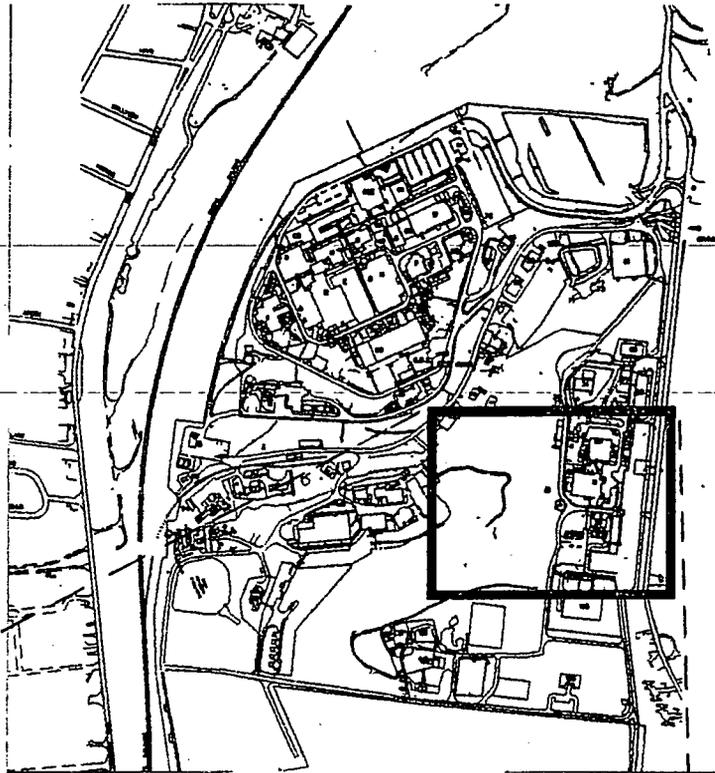
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MOUND PLANT

Release Block F

Potential Release Site

PRS 272





PRS 272

PRS HISTORY:

PRS 272 (also known as Area 10) was identified as a potential release site¹ during the Comprehensive-Environmental-Assessment-and-Response-Program Phase I Installation Assessment in 1986.² PRS 272 was identified because of historical evidence that radioactively contaminated debris was dumped in this area and because of suspicion of contamination due to run-off from Area 12 (PRS 273).^{3,4,5} The site is an area of land located west of Building 33 on the slope of the SM/PP Hill, covering an area of approximately 13,000 square feet.²

PROCESS DESCRIPTION:

Prior to the acquisition of the current Mound property, research and production work was conducted at various locations in Dayton, OH, known as Unit III and Unit IV. These ceased all operations in 1948. Some Unit III structures and most of the Unit IV structure were demolished and transported to Mound for disposal. Demolished debris were reported to consist of concrete contaminated with polonium-210.³ One hundred and sixty truckloads of debris were brought to Mound from Unit IV and 100 truckloads were brought from Unit III. Some of this is thought to have been dumped in PRS 272.³ Some more recent disposal may also have occurred in PRS 272, but this is not known for certain.³

CONTAMINATION:

Polonium contaminated debris located in PRS 272 is no longer present due to rapid radioactive decay (138 day half life).²

In 1984, the Site Survey Project⁴ took two surface samples at PRS 272 and analyzed them for plutonium and thorium contamination. Samples results were below the soil cleanup guidelines for plutonium-238 (Mound ALARA for plutonium-238 is 25 pCi/g) and thorium-232 (5 pCi/g⁸).⁴

A soil sampling at PRS 272 (extent and exact location unknown) indicated one core sample with a plutonium-238 concentration between 10 to 99 pCi/g.⁴

In 1994, a PETREX soil gas survey was conducted at PRS 272.⁶ No relative elevated readings were detected.

In 1995, the Other Soils Characterization^{7,9,10} divided PRS 272 into 15 foot by 15 foot grids and sampled for organics (organic vapor analyzer), metals (X-ray fluoroscope) and radionuclides (field detection via FIDLER and lab analysis via Mound gamma spectroscopy).^{7,9,10} Samples were taken in 4 foot intervals down to 12 feet unless refusal was reached prior to 12 feet.^{7,9,10} A total of 64 samples were analyzed.¹⁰

1) Two samples exceeded soil guideline value for plutonium-238⁷ (Mound ALARA for plutonium-238 is 25 pCi/g). Maximum plutonium-238 concentration identified was 41 pCi/g (plutonium-238 detection levels varied between 12 and 87 pCi/g).⁷

Five samples exceeded the soil guideline value for cesium-137 (10^{-6} Risk Based Guideline Value is 0.46 pCi/g). Maximum cesium-137 concentration identified was 0.70 pCi/g (Mound background for cesium-137 is 0.42 pCi/g).

- 2) No organics were detected above background levels.⁷
- 3) Chromium was detected above field action levels (285 mg/kg) but 400 times less than the 10^{-6} Risk Based Soil Guideline value (1×10^6 mg/kg).^{7, 11} One lead sample (535 mg/kg) exceeded the residential regulatory guideline for lead (400 mg/kg).⁷

READING ROOM REFERENCES:

- 1) OU9 Site Scoping Report: Vol. 12 - Site Summary Report, December 1994. (pages 6-8)
- 2) Comprehensive Environmental Assessment and Response Program (CEARP) Phase I: Installation Assessment, April, 1986. (pages 9-10)
- 3) OU9 Site Scoping Report: Vol. 7 - Waste Management, February 1993. (pages 11-14)
- 4) OU9, Site Scoping Report: Vol. 3 - Radiological Site Survey, June 1993. (pages 15-19)
- 5) Preliminary Review/Visual Site Inspection for RCRA Facility of Mound Plant, July 1988. (pages 20-21)
- 6) OU5, Operational Area Phase I Investigation Non-AOC Field Report, June 1995. (pages 22-26)
- 11) Risk Based Guideline Values, December 1995, Final, Revision 3.

OTHER REFERENCES:

- 7) Other Soils Characterization Report, Draft, January 1996. (pages 27-33)
- 8) Code of Federal Regulations, 40CFR192.12 and 40CFR192.41.
- 9) Sampling and Analysis ran for the Other Soils Areas, Addendum 2: Area 10, June 1994. (pages 34-37)
- 10) Other Soils Field Sampling Data. (pages 38-41)

PREPARED BY:

Jean Boling, Member of EG&G Technical Staff
George Liebson, Member of EG&G Technical Staff

**MOUND PLANT
PRS 272
CONCRETE DEBRIS DISPOSAL SITE
AREA 10 (SM/PP HILLSIDE)**

RECOMMENDATION:

This soils area was identified as a Potential Release Site (PRS) because of (1) evidence that polonium-210 contaminated debris was dumped in the area and (2) suspicion of thorium-232 and or plutonium-238 run-off from Area 12 (PRS 273). The half-life of polonium is 138 days. Therefore, it would no longer be present above naturally occurring background. The most extensive sampling of PRS 272 took place in 1995. Sixty-four samples were taken from the 13,000 square foot area. Results showed all thorium-232 concentrations were at or below regulatory guidelines. Two plutonium-238 samples exceeded the 25 pCi/g Mound ALARA. However, all plutonium-238 concentrations were below both the DOE historical on-site plutonium clean-up level (100 pCi/g) and the 2×10^{-5} Risk Based Guideline Value. The fact that five cesium-137 samples exceeded the 1×10^{-6} Risk Based Guideline Value does not indicate contamination since the cesium 10^{-6} Risk Value is similar to the Mound cesium background value (0.46 pCi/g versus 0.42 pCi/g). All cesium-137 concentrations were below the 2×10^{-6} Risk Based Guideline Value and were within two times background cesium levels. One lead detection exceeded the residential standard of 400 mg/kg. Since only one sample exceeded (1.3 times) the residential standard and the remaining 63 samples were well below the standard, lead is of no concern in an industrial scenario.

Therefore, since the polonium-210 has decayed away and since characterization of the PRS 272 area has not shown a contamination problem, PRS 272 requires NO FURTHER ASSESSMENT.

CONCURRENCE:

DOE/MB: Arthur W. Kleinrath 7/18/96
Arthur W. Kleinrath, Remedial Project Manager (date)

USEPA: Timothy J. Fischer 7/18/96
Timothy J. Fischer, Remedial Project Manager (date)

OHIO EPA: Brian K. Nickel 7/18/96
Brian K. Nickel, Project Manager (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 8/15/96 to 9/15/96.

No comments were received during the comment period.

Comment responses can be found on page _____ of this package.

REFERENCE MATERIAL
PRS 272

Environmental Restoration Program

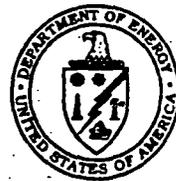
**OPERABLE UNIT 9 SITE SCOPING REPORT:
VOLUME 12 – SITE SUMMARY REPORT**

**MOUND PLANT
MIAMISBURG, OHIO**

December 1994

Final

**U.S. Department of Energy
Ohio Field Office**



EG&G Mound Applied Technologies

Table A.1. Comprehensive Tabulation of Potential Release Sites

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref.	Releases	Media	Ref.	Analytes ^a	Results	Ref.
272	Area 10, Concrete Debris	G-8 G-9	Grounds	Polonium-210, Cobalt-60, Plutonium-238 (from runoff)	1, 4, 5, 18	Suspected	S	4, 6	14	Table B.1 (Table III.6 in Ref. 6)	6
273	Area 12, Thorium-Contaminated Soil from Area 1	G-9	Grounds	Thorium, Plutonium-238 (from runoff)	1, 4, 5, 18	Suspected thorium	S	4, 6	14, 15	Table B.1 (Table V.5 in Ref. 6)	6
274	Area 21, Old Banker	H-9	Grounds	Cesium-137, Strontium-90, Actinium-227, Radium-226	4, 5, 18	Suspected thorium	S	4, 6	14, 15, 16	Table B.1 (Table VII.2 in Ref. 6)	6
275	Area 21, Detonator Shack	H-8	Grounds	Cesium-137, Strontium-90, Actinium-227, Radium-226	4, 5, 18	Suspected thorium	S	4, 6	14, 15, 16	Table B.1 (Table VII.2 in Ref. 6)	6
	Orphan Soil from other Areas	I-8	Inactive	Polonium-210, Radium-226, Cobalt-60, Plutonium-238, Cesium-237	4, 5, 18	Suspected	S	6	14, 15, 16	Table B.1 (Table X.1 in Ref. 6)	6
	Hillside Disposal Area	H-8	Historical	Construction/building debris, Paints, Thinners, Chemical contaminants, Asbestos, Thorium, Plutonium-238	1, 4, 18	Suspected VOCs	S	4	1	SGS ^b Table B.2	12
	Dredged Material Disposal Area 11a)	H-9							14, 15, 16	Table B.1 (Table X.2 in Ref. 6)	6
	Hillside catch basin	H-8	In service	Plutonium-238 (from runoff)	1, 4, 18	Suspected	SW	18	No Data		
	Ring Range Drum Storage Area	H-9	Historical	Liquid chemical wastes	5, 18	Confirmed VOCs	S	4	1	SGS ^b Table B.2 Locations 3152, 3153, and 3187	12
									2, 3, 4, 5, 6	Tables B.6, B.7, B.8, and B.9	7
									14, 15	RSS ^c Locations S0162, S0163, and S0647 (Appendix E in Ref. 6)	6

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^aAnalyte List Codes

^bSGS, Soil Gas Survey

^cRSS, Radiological Site Survey

- 1 - Soil Gas Survey - Freon 11, Freon 113, Trans-1,2-Dichloroethylene, Cis-1,2-Dichloroethylene, 1,1,1-Trichloroethane, Perchloroethylene, Trichloroethylene, Toluene
- 2 - Gamma Spectroscopy - Thorium-228, -230, Cobalt-60, Cesium-137, Radium-224, -226, -228, Americium-241, Actinium-227, Bismuth-207, Bismuth-210m, Potassium-40
- 3 - Target Analyte List
- 4 - Target Compound List (VOC)
- 5 - Target Compound List (SVOC)
- 6 - Target Compound List (Pesticides/Polychlorinated Biphenyl)
- 7 - Dioxins/Furans
- 8 - Extractable Petroleum Hydrocarbons (EPH)/Total Petroleum Hydrocarbons (TPH)
- 9 - Lithium
- 10 - Nitrate/Nitrite
- 11 - Chloride
- 12 - Explosives
- 13 - Plutonium-238
- 14 - Plutonium-238, Thorium-232
- 15 - Cobalt-60, Cesium-137, Radium-226, Americium-241
- 16 - Tritium

Reference List

1. DOE 1986 "Phase I: Installation Assessment Mound [DRAFT]."
2. DOE 1992a "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (Final)."
3. DOE 1992c "Mound Plant Underground Storage Tank Program Plan & Regulatory Status Review (Final)."
4. DOE 1993a "Site Scoping Report: Vol. 7 - Waste Management (FINAL)."
5. EPA 1988a "Preliminary Review/Visual Site Inspection for RCRA Facility Assessment of Mound Plant"
6. DOE 1993d "Operable Unit 9, Site Scoping Report: Vol. 3 - Radiological Site Survey (FINAL)."
7. DOE 1993c "Operable Unit 3, Misc. Sites Limited Field Investigation Report."
8. DOE 1992d "Reconnaissance Sampling Report Decontamination & Decommissioning Areas, OU6, (FINAL)."
9. Fentiman 1990 "Characterization of Mound's Hazardous, Radioactive and Mixed Wastes."
10. DOE 1992f "Operable Unit 9, Site Scoping Report: Vol. 9 - Spills and Response Actions (FINAL)."
11. Styron and Meyer 1981 "Potable Water Standards Project: Final Report."
12. DOE 1993b "Reconnaissance Sampling Report - Soil Gas Survey & Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill (FINAL)."
13. DOE 1993d "Operable Unit 9, Site Scoping Report: Vol. 3 - Radiological Site Survey (FINAL)."
14. DOE 1991b "Main Hill Seeps, Operable Unit 2, On-Scene Coordinator Report for CERCLA Section 104 Remedial Action, West Powerhouse PCB Site."
15. Halford 1990 "Results of South Pond Sampling."
16. DOE 1993e "Operable Unit 4, Special Canal Sampling Report, Miami Erie Canal."
17. DOE 1990 "Preliminary Results of Reconnaissance Magnetic Survey of Mound Plant Areas 2, 6, 7, and C."
18. DOE 1992a "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (FINAL)."
19. Rogers 1975 "Mound Laboratory Environmental Plutonium Study, 1974."
20. DOE 1992h "Ground Water and Seep Water Quality Data Report Through First Quarter, FY92."
21. Dames and Moore 1976a, b "Potable Water Standards Project Mound Laboratory" and "Evaluation of the Buried Valley Aquifer Adjacent to Mound Laboratory."
22. DOE 1992i "Closure Report, Building 34 - Aviation Fuel Storage Tank."
23. DOE 1992j "Closure Report, Building 51 - Waste Storage Tank."
24. DOE 1994 "Operable Unit 1, Remedial Investigation Report."
25. EG&G 1994 "Active Underground Storage Tank Plan."

ALBUQUERQUE OPERATIONS OFFICE
ENVIRONMENT, SAFETY AND HEALTH DIVISION
ENVIRONMENTAL PROGRAMS BRANCH

COMPREHENSIVE ENVIRONMENTAL ASSESSMENT
AND RESPONSE PROGRAM

PHASE I:
INSTALLATION ASSESSMENT
MOUND

~~NOT FOR PUBLIC DISSEMINATION~~

~~May contain unclassified controlled nuclear information subject to Section 148 of the AEA, as amended (42 USC 2168). Approval by the Department of Energy prior to release is required.~~

~~April 1986~~

*No longer contains
UCNI.*

*James A. Booth
Attorney D. C.
6/10/96*

DRAFT DRAFT DRAFT DRAFT DRAFT

Table V.3 (cont)

Area ^a	Isotopes	Planned Future Actions (PFA)
9	²³² Th	1965. Thorium storage and redrumming area cleaned up and backfilled with clean soil. Area approximately 40,000 ft ² . PFA--Area 9 is being submitted under the Site Survey Program for remedial action.
10	²¹⁰ Po	1950. Polonium contaminated concrete from Unit 4 Dayton operations. (Polonium has decayed out). Area approximately 13,000 ft ² . PFA--No further action is warranted.
11	²³⁸ Pu	Prior to 1965. Area was contaminated from SM Bldg. operations. No estimate available for quantity of activity or affected volume. The recent analysis of surface scrapings indicate some degree of contamination. PFA--Area 11 was submitted to and accepted by SFMP. SFMP-funded remedial action is underway.
12	²³² Th	1965. Subsurface contaminated dirt from Area 1. Area approximately 19,000 ft ² . PFA--Area 12 is being submitted under the Site Survey Program for remedial action.
13	²¹⁰ Po	1950. Polonium-contaminated wood from Unit 4 Dayton operations burned. (Polonium has decayed out to nondetectable levels.) Area approximately 9,000 ft ² . PFA--No further action is warranted.

Environmental Restoration Program

**OPERABLE UNIT 9, SITE SCOPING REPORT:
VOLUME 7 - WASTE MANAGEMENT**

**MOUND PLANT
MIAMISBURG, OHIO**

February 1993

**FINAL
(Revision 0)**

**Department of Energy
Albuquerque Field Office**

Environmental Restoration Program
EG&G Mound Applied Technologies



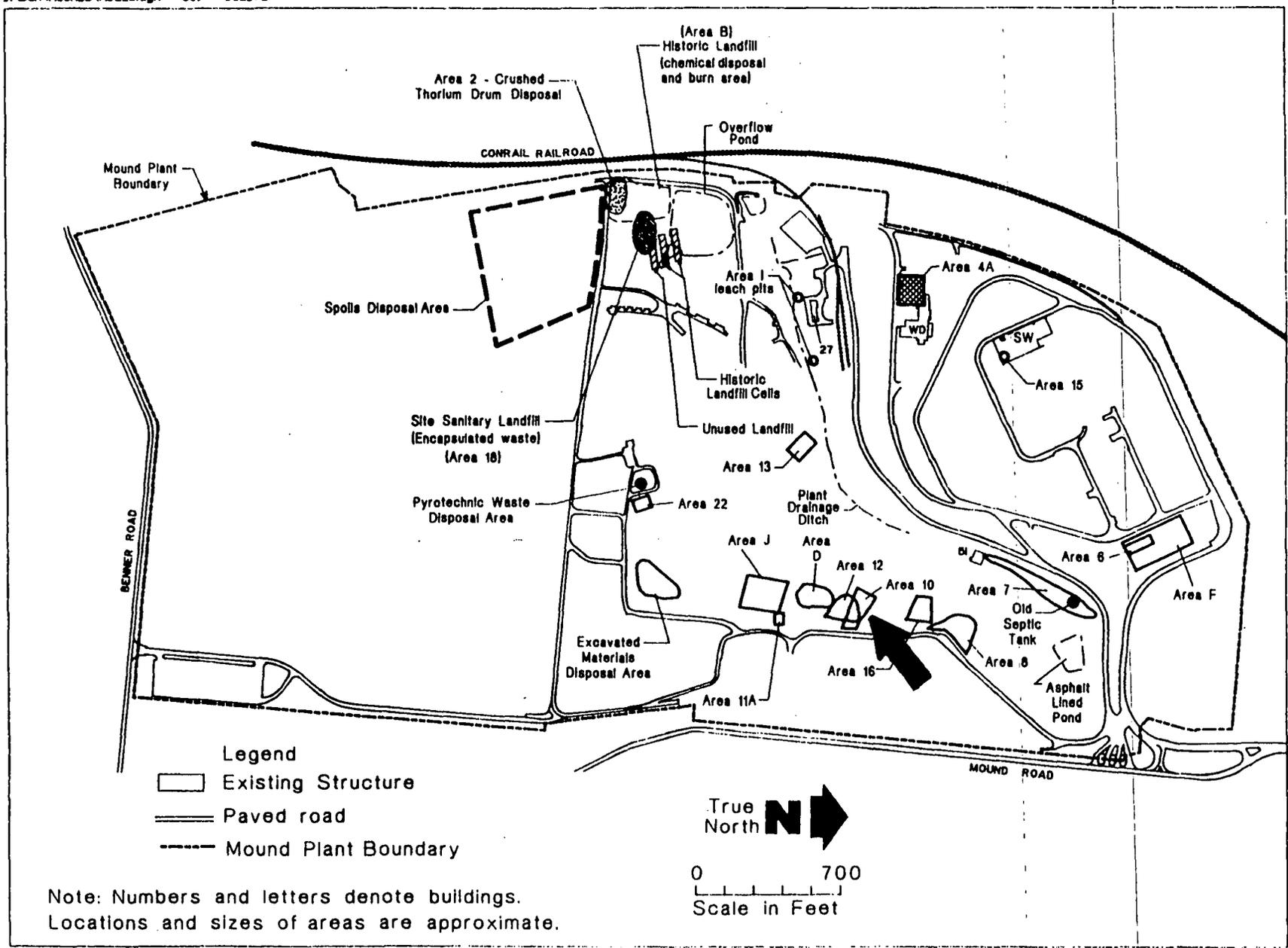


Figure 6.1 On-plant waste disposal areas.

~~cans used to jacket the bismuth slugs. Other impurities were also present and are described in the polonium section of this report. The nickel and beryllium originated from the polonium source and initiator production programs as well. The extent of thorium use at the Dayton units probably involved research quantities of materials.~~

~~The work at the Dayton units principally involved the separation and purification of polonium-210. Work also involved research and development of calorimetry and other instruments for measuring small quantities of alpha-emitting radionuclides, such as polonium. Other work included mechanical development of micro beam balances and electronic equipment and limited biological research on the toxic effects of polonium (Svirbely et al. 1947). Neutron and alpha particle sources, powered by polonium-210, were manufactured for sale to government and research organizations.~~

~~Pilot plant investigations of waste disposal by incineration were started in February 1948 at Unit III. The first pilot plant operated about six weeks (MCC 1949).~~

~~All radioactive waste generated at Unit III was packaged in strong, leak-proof containers according to ICC regulations and shipped on government vehicles to Oak Ridge National Laboratory (ORNL) for onsite burial. No materials were buried onsite at Unit III or sent to city landfills or other disposal sites. Disposal was controlled. Wastewater containing low-level alpha activity was discharged to the Dayton sewer system and was monitored at the Great Miami River by health physics personnel (Bradley 1951a). All operations ceased at Unit III in 1948. The facilities and site were decontaminated and turned over to the Dayton Board of Education, the site owner (Halbach 1949). Some Unit III block structures were demolished and transported to Mound for disposal. The Coonset hut was dismantled and subsequently rebuilt at Mound and still stands today as Building 19.~~

~~All radioactive waste was handled at Unit IV in the same manner as at Unit III. It was packaged and shipped by government vehicles to ORNL for burial. The principal isotope was polonium-210. Radioactive waste was not buried onsite or in the immediate area of Unit IV. All operations at Unit IV ceased and were transferred to Mound late in 1948. By the spring of 1950, all Unit IV structures, services, and utilities were removed, and the soil was excavated to a depth of 7 ft (Halbach 1950). Highly contaminated materials were packaged and shipped to ORNL for burial. Most of the Unit IV structure was transported to Mound for disposal. Clean fill dirt replaced the excavated soil, and the site was completely landscaped to blend with the surrounding well-kept, upper-class suburban Oakwood neighborhood. The property was then returned to the Talbott family estate.~~

~~Radioactive materials present at the warehouse were limited to trace quantities of polonium-210 from the analysis of environmental monitoring samples, bioassay samples.~~

~~Later versions of the map appeared in the waste management site plans of the mid-1970s (e.g., MRC 1974c) with the correct thorium-232 isotope identified.~~

The contamination levels within Area 7, reported as a result of the Site Survey Project investigation, are plutonium-238 and thorium concentrations of 7.40 and 20.52 pCi/g, respectively, in surface samples (DOE 1991c). Other radionuclides detected included radium-226 (2 pCi/g), cesium-137 (1.2 pCi/g), and tritium (5.23 nCi/L).

~~6.1.1.4. Area 8, Thorium-Contaminated Soils from Areas 1 and 9 (Historical)~~

~~Area 8 is northwest of Building 31, on the SM/PP Hill in the eastern portion of Mound (Figure 6.1), and encompasses approximately 25,000 ft² (MRC 1985a). Area 9 and Area 1 were contaminated by the repackaging of the thorium-232 sludges in 1965 and 1966. When these areas were scraped to remove the surficial contamination (in 1965), the soils were disposed of in Area 8 and Area 12. During the 1982 to 1985 Radiological Site Survey (DOE 1991c), plutonium-238 was detected at a maximum concentration of 24.4 pCi/g in a surface sample; all other surface samples were less than 10 pCi/g. The maximum thorium concentration was 254.3 pCi/g in a subsurface sample at a depth of 80 inches.~~

6.1.1.5. Area 10, Debris from Dayton Units (Historical)

Area 10 is west of Building 30, on the slope of the SM/PP Hill, in the east-central portion of Mound (Figure 6.1) (DOE 1991c). It was used for the disposal of concrete contaminated with polonium-210 from the Dayton operations. The concrete was deposited in 1950 and, because of the short half-life of polonium-210 (138.4 days), is no longer radioactive (DOE 1992g). One hundred and sixty truckloads of debris were brought to Mound from Dayton Unit IV (Halbach 1950), and 100 truckloads were brought from Unit III. It is unknown how much of this was stored in Warehouse 10, the tropical huts, or dumped in Area 10. Many of the temporary buildings at Unit III were also razed and brought to Mound when that facility was decommissioned. Some more recent concrete disposal may also have occurred, but nothing is known for certain. The area is estimated to be approximately 150 ft by 100 ft. The single surface soil sample collected from Area 10 during the 1982 to 1985 Radiological Site Survey had a plutonium-238 concentration of 11.8 pCi/g and a thorium concentration of less than 2 pCi/g (DOE 1991c).

~~6.1.1.6. Area 12, Thorium Contaminated Soil from Area 1~~

~~Area 12 is west of Building 38, on the SM/PP Hill, in the eastern portion of Mound (Figure 6.1) (DOE 1991c). In 1965, soil contaminated with thorium-232 was transferred from Area 1 to Area 12.~~

Environmental Restoration Program

**OPERABLE UNIT 9, SITE SCOPING REPORT
VOLUME 3 - RADIOLOGICAL SITE SURVEY**

**MOUND PLANT
MIAMISBURG, OHIO**

June 1993

FINAL

**Department of Energy
Albuquerque Field Office**

Environmental Restoration Program
EG&G Mound Applied Technologies



~~pCi/g, and 5.23 nCi/l, respectively. Seven coreholes and four surface samples (C0008, C0009, C0020, C0015, C0024, C0025, C0032 and S0276, S0278, S0299 and S0316, respectively; Table III.5) were analyzed for cobalt-60. All analyses indicate that nothing above the LBL was encountered.~~

~~The core locations in Area 7 were drilled and sampled to maximum depths of 96 to 234 inches (8 to 19.5 ft). Mound Plant drawing #FSE16472, reproduced in the Site Scoping Report: Volume 2 Addendum (DOE 1992f) indicates the depth to bedrock in this area is 9 to 15 ft at the north end of the area, and to 65 ft at the southern end near Building 51. Because a boring log is available for only one of the Area 7 locations, it is not known if bedrock was encountered during the drilling; however, it appears that the majority of the core sampling did not penetrate fill and reach the original disposal area.~~

3.7. AREA 10

Area 10 is located on the slope of the SM/PP Hill, adjacent to Area 12 (Plate 1). Area 10 contains concrete and debris contaminated with polonium-210 from the 1949 and 1950 demolition of the old Dayton operations (DOE 1992g). The debris was covered over with a layer of dirt. With a half-life of 138.4 days, the polonium-210 is no longer present due to radioactive decay. The actual size of the area affected by the debris disposal is unknown so the area depicted on Plate 1 should be viewed as schematic.

One surface sample was collected in Area 10 during the Site Survey Project, sample S0604 (Plate 1; Table III.6). This sample contained 11.8 pCi/g of plutonium-238, and less than 2 pCi/g of thorium. It is not known where this sample was collected in relation to the debris. No analyses are known for gamma spectroscopy that would have detected cobalt-60 or perhaps bismuth-207. *

Because of its location on the slope of the SM/PP Hill, Area 10 is in a position to receive surface water runoff from areas upgradient, such as the adjacent Area 12. Since there are no other known contaminants associated with the concrete, it is believed that the plutonium-238 detected in the surface sample is the result of deposition from surface water runoff. The original Site Survey Project Report notes that more recent D&D Program core sampling in Area 10 indicated one sample with a plutonium-238 concentration between 10 and 99 pCi/g.

*
NOTE: After this report was written, the 1995 Other Soils Characterization Sampling effort (REF 7 & 9 of this PRS) did perform gamma spectroscopy analysis of PRS 272 (area 10).

Table III.6. Mound Site Survey Project - Area 10

Plate 1	Coordinates		MRC ID		Depth	Plutonium-238	Thorium ^b
<u>Location^a</u>	<u>South</u>	<u>West</u>	<u>No.</u>	<u>Mo-Yr</u>	<u>(inch)</u>	<u>(pCi/g)</u>	<u>(pCi/g)</u>
S0603	2750	2415	6784	08-84	0	0.69	b
S0604	2750	2465	1319	08-84	0	11.80	b

^aMap locations are given using a "C" to designate core locations and an "S" to designate surface locations.

^bA "b" indicates that the total thorium concentration was less than the background level of 2.0 pCi/g, using FIDLER screening. Therefore, radiochemical analysis was not performed.

FIDLER - field instrument for the detection of low-energy radiation

MRC ID - Monsanto Research Corporation Identification

pCi/g - picocuries per gram

GAMMA SPECTROSCOPY

RADIOCHEMICAL ANALYSIS

Table XI.1. Maximum Radioactivity Concentrations in Soil Samples from Major Areas

Site	Plutonium-238 [pCi/g]	Thorium [pCi/g]	Tritium [pCi/mL]	Cobalt-60 [pCi/g]	Cesium-137 [pCi/g]	Radium-226 [pCi/g]	Americium-241 [pCi/g]	Actinium-227 [pCi/g]	Bismuth-207 [pCi/g]	Bismuth-210m [pCi/g]
Area 1	24.000	824.2	1.67	LDL	0.6	1.1	LDL			
Area 2	17.10	3.31	--	--	--	--	--	--	--	--
Area 3	1,236	63	--	--	--	--	--	--	--	--
Area 4/4a	355.00	<2	--	LDL	LDL	1.2	1.0	--	--	--
Area 5	0.35 ^b	<2 ^b	--	260	1.6	0.6	LDL	--	--	--
Area 6	--	--	--	LDL	LDL	0.9	LDL	--	--	--
Area 7	7.40 ^d	20.52	6.23	LDL	1.2	2.0	LDL	1,400	--	--
Area 8	24.40	254.30	1.12	LDL	LDL	3.3	LDL	--	--	--
Area 9	8.15	150	--	--	--	--	--	--	--	--
Area 10	99	<2	--	--	--	--	--	--	--	--
Area 11	100,000	60	--	--	--	--	--	--	--	--
Area 12	313.00	189.90	--	LDL	LDL	1.1	LDL	--	--	--
Area 13	6.74	<2	--	--	--	--	--	--	--	--
Area 14	29 ^f	2.24	--	LDL	LDL	1.2	LDL	--	--	--
Area 15 ^g	--	--	--	--	--	--	--	--	--	--
Area 16	0.35	1.2	0.35	LDL	LDL	1.2	LDL	--	--	--

Ar ^aThe total thorium concentration was less than the background level of 2 pCi/g, using FIDLER screening; therefore, radiochemical analysis was not performed.
^bMost of the results for this radionuclide for this area are reported as NR. See the area-specific tabulated results.
^cArea 15 emits 1 Ci per year of radon, indicating the presence of radium-226.
^dSampling of Area 18 was verification sampling conducted after remedial action.
^eSW Building soils were sampled in 1977 (Demes and Moore 1977).
^fCurrent remedial action guidelines are subject to change, pending additional pathways analysis and risk assessment.
^gCurrent D&D cleanup level is 100 pCi/g (DOE 1983); 25 pCi/g, if feasible (as low as reasonably achievable (ALARA)).
^hremedial action guideline (CFR 1990)
ⁱremedial action guideline (DOE 1983)
^jvalue for Area 7 does not include value at Building 66
^kvalue indicated is thorium-230 isotope
^lvalue is mean during verification sampling after cleanup
^mhighest residual level after verification cleanup
ⁿ-- Dashes indicate that no data are available for the given area and given radionuclide.
 Ar FIDLER - field instrument for the detection of low-energy radiation
 LDL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226 and actinium-227.
 Ar NE - Not established
 NR - No result
 Ar pCi/g - picocuries per gram
 Ar pCi/mL - picocuries per milliliter
 Ar Ci - curie
 Ar 147
 Ar 147
 Ar 147

**PRELIMINARY REVIEW/VISUAL SITE
INSPECTION FOR RCRA FACILITY
OF MOUND PLANT**

JULY 1988

Table 3

Other Areas of Concern

<u>Name</u>	<u>Contaminant</u>	<u>Location</u>	<u>Volume/Area</u>	<u>Cause</u>	<u>Reference</u>
Plutonium Spill Area	Plutonium	See Figure V.1., Page V-19, Ref. 66	Unknown	Spilled Solutions	55
Paint Shop Spills	Paint, paint wastes	Soil adjacent to Paint Shop	Unknown	Leaks, spills, or dumping	55
Powerhouse Spills	Oil	Soil adjacent to Powerhouse	Unknown	Spills	55
WD Building Underground Tanks (4)	Radioactive Wastes	WD Building	Unknown	Corrosion Leaks (suspected)	55
Building 61 Spills	Waste Oil	Soil adjacent to Building 61	Unknown	Dumping (suspected)	55
Building 9 Spills	Waste Oil	Soil adjacent to Building 9	Unknown	Dumping	55
Valley-3 area	Sand Containing Cobalt-60	Between the Overflow Pond and Well No. 1	15,000 ft ²	Contaminated soil dumping area	81
Main Hill-6	Sand Containing polonium-210 and cobalt-60	North of Building 76 east of Building 65	2,100 ft ²	Soil dumping area	81
SM/PP Hill-4	Thorium-238 contaminated dirt	West of Building 30	25,000 ft ²	Dumping area for contaminated dirt	81
SM/PP Hill-5	Polonium contaminated concrete	West of Building 30	13,000 ft ²	Dumping area	81

Environmental Restoration Program

**OPERABLE UNIT 5
OPERATIONAL AREA PHASE I INVESTIGATION
NON-AOC FIELD REPORT**

**MOUND PLANT
MIAMISBURG, OHIO**

VOLUME II - APPENDICES A-G

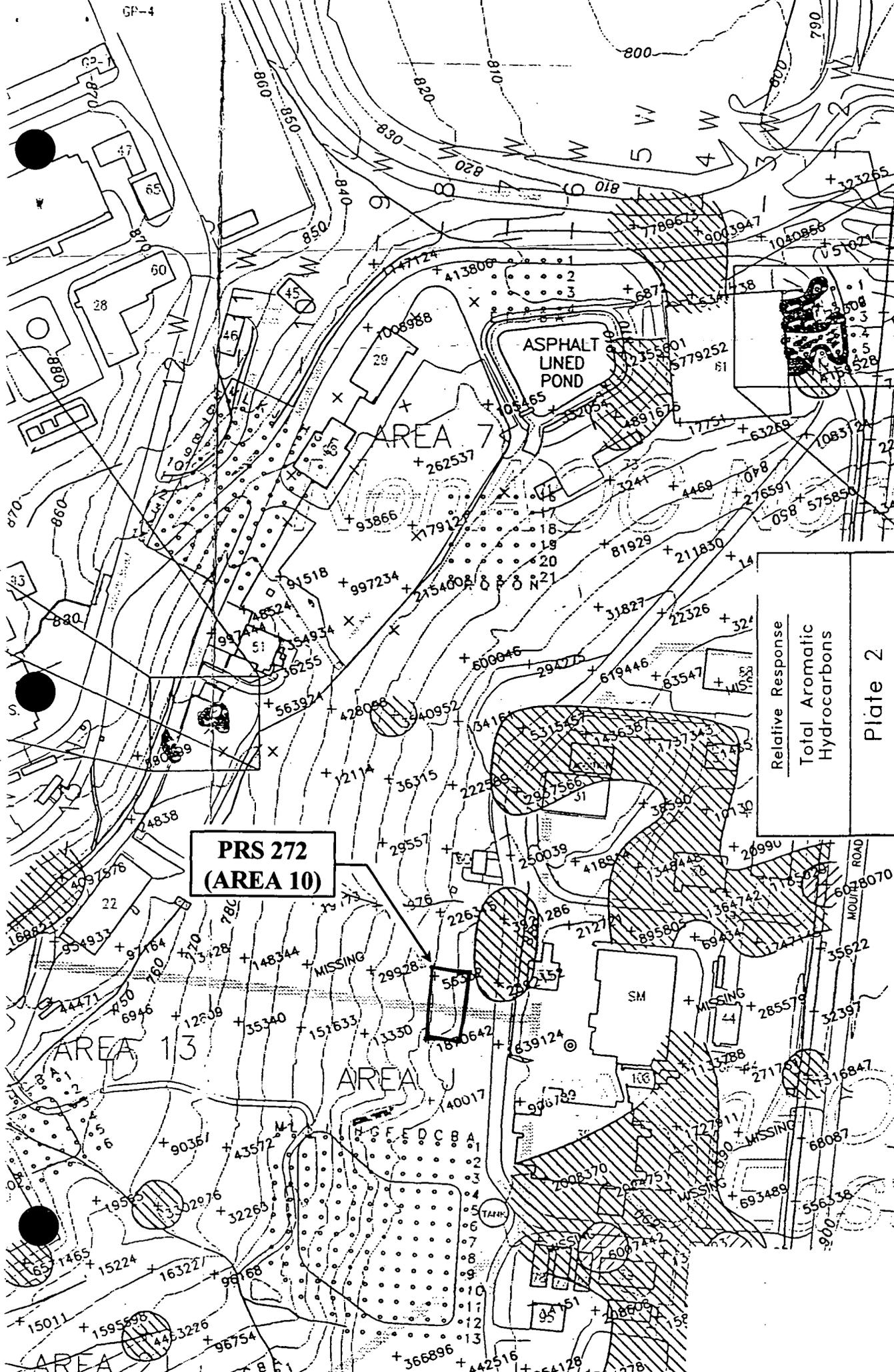
June 1995

Final (Revision 0)

**U.S. Department of Energy
Ohio Field Office**



EG&G Mound Applied Technologies



**PRS 272
(AREA 10)**

Relative Response
Total Aromatic
Hydrocarbons
Plate 2

LEGEND

Relative Response Values (in ion counts):

NonAOC-South	NonAOC-West	NonAOC-East	NonAOC-North	Area 61
<ul style="list-style-type: none"> ≥ 4,200,000 850,000-4,199,999 	<ul style="list-style-type: none"> ≥ 20,000,000 2,600,000-19,999,999 	<ul style="list-style-type: none"> ≥ 5,000,000 850,000-4,999,999 	<ul style="list-style-type: none"> ≥ 10,000,000 1,500,000-9,999,999 	<ul style="list-style-type: none"> ≥ 5,800,000 1,400,000-5,799,999

Features:

- + PETREX Sample Location
- ND Not Detected
- T Denotes interference by terpenes; see text.

26 N
25 N

**PRS 272
(AREA 10)**

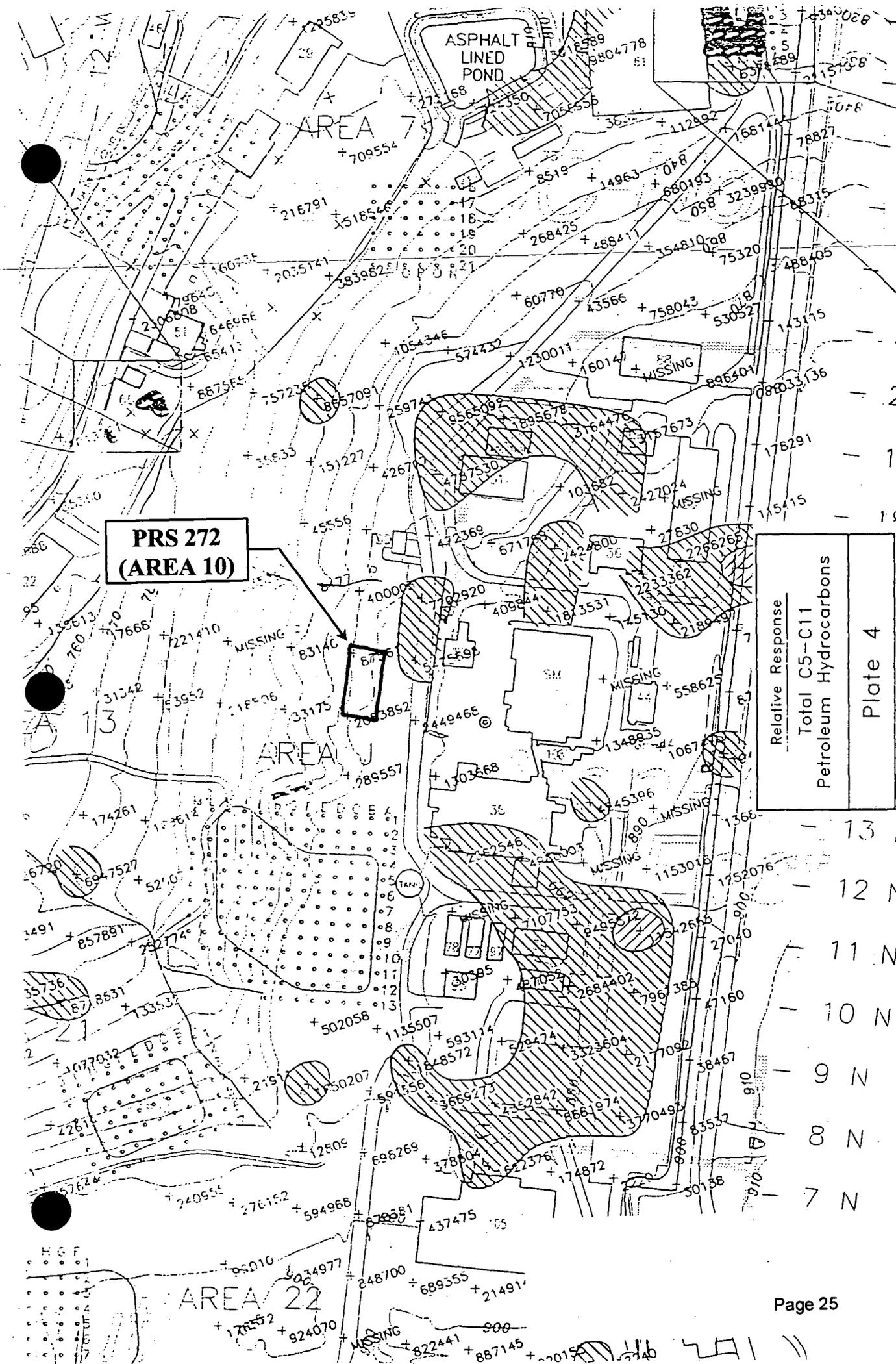
Relative Response
Total C5-C11
Petroleum Hydrocarbons
Plate 4

LEGEND

Relative Response Values (in ion counts):

Area 61	NonAOC-North	NonAOC-East	NonAOC-West	NonAOC-South
2 25,000,000	2 23,000,000	2 11,500,000	2 29,000,000	2 8,000,000
3,000,000-24,999,999	4,000,000-22,999,999	1,600,000-11,499,999	3,000,000-28,999,999	1,500,000-7,999,999

Features:
+ PETRIX Sample Location
T Denotes interference by terpinenes; see text.



DRAFT
OTHER SOILS
CHARACTERIZATION
REPORT

MOUND PLANT
MIAMISBURG, OHIO

JANUARY 1996

U.S. DEPARTMENT OF ENERGY
OHIO FIELD OFFICE

DECONTAMINATION AND DECOMMISSIONING PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

3.0 Methods

Area 9

Of the 160 locations projected for Area 9 sampling, 106 locations were sampled and screened. The remainder were eliminated due to the presence of utilities or other physical constraints (curbing and fencing).

Area 10

Of the 28 locations projected for Area 10 sampling, 4 were eliminated due to physical constraints (massive concrete slabs or steep slopes of a narrow ravine). Prior to sampling, the services of a local contractor were required to remove brush, small trees, dead wood and branches. All of Area 10 and access to the area required clearing in order to mobilize sampling equipment into the area.

Area 12

Of the 70 locations projected for Area 12 sampling, 23 were eliminated due to the presence of overhead high voltage power lines and underground utilities.

A majority of the Area 12 samples were collected by the field team while wearing Level C respiratory protection. Level of protection and required personnel protective equipment were defined in the RWP and outlined in the site HASP.

Field instruments indicated elevated radiological activity in the soil along the west boundary of the area. After consultation with the Mound Project Engineer, additional sampling was conducted west of the original area boundary.

Prior to sampling, the services of Mound's heavy equipment operators were required to remove brush, small trees, dead wood and branches from the locations to be sampled. A total of 22 additional borings were required in order to define the lateral extent of radiological contamination in this area.

Area 20

Of the 50 locations projected for Area 20 sampling, 37 locations were sampled and screened. The remainder were eliminated due to the presence of a bank of underground high voltage power lines, other underground utilities or other physical constraints (guardrail and ditch).

Area 23

Of the 70 locations projected for Area 23 sampling, 27 locations were sampled and screened. The remainder were eliminated due to the presence of overhead power lines, underground utilities or other physical constraints (guardrail and ditch).

5.0 Results

Area 9

Sixty samples in Area 9 triggered field screening action levels:

- Fifty-five samples exceeded limits for hazardous compounds
- Three samples exceeded limits for radionuclides
- Two samples exhibited elevated levels of both radiological and hazardous compounds

Organic vapors from soil samples peaked at 300 meter units on both the OVA and OVM. Elevated concentrations of Pu238 were found in excess of D&D limits in soil samples collected from the site. Maximum concentration detected was 156.2 pCi/g.

Table 5.6 shows Area 9 field results exceeding action levels. Figure 5.5 graphically represents Area 9 field sampling results.

Area 10

Twenty-two samples in Area 10 triggered field screening action levels:

- Twenty samples exceeded limits for hazardous compounds
- Two samples exhibited elevated levels of both radiological and hazardous compounds

No organic vapors were detected in soil samples at the site. Elevated concentrations of chromium and lead were detected by the PXRf. Pu238 was found in excess of 41 pCi/g in soil samples collected from the site.

Table 5.7 shows Area 10 field results exceeding action levels. Figure 5.6 graphically represents Area 10 field sampling results.

... exceeding the action levels are tabulated below. These tables identify samples from areas of potential contamination. Graphic representations of the Other Soils areas and Hot Spots with a data overlay have been included to facilitate interpretation, and aid in the computation of soil cleanup volumes.

Where Mound Rad Lab method detection limits exceed specified action levels, a symbol indicating the undetermined nature of the data ("U") accompanies the spreadsheet entry.

Table 5.2 shows the action levels used in the Other Soils Field Program to identify potentially contaminated soil.

Table 5.2 Field Action Levels

Field Instruments	Action Level
FIDLER	
Channel 1 (Pu)	1000 cpm Above Background
Channel 2 (Th)	5000 cpm Above Background
OVA	1 Meter Unit Above Background
OVM	1 Meter Unit Above Background
PXRF	
Arsenic	102.07 mg/Kg
Barium	1489 mg/Kg
Cadmium	NA
Chromium (High)	NA
Chromium (Low)	164.43 mg/Kg
Lead	172 mg/Kg
Mercury	NA
Selenium	NA
Silver	2559 mg/Kg
Mound Rad Lab	
Plutonium 238	25 pCi/g
Thorium 232	5 pCi/g
Radium 226	5 pCi/g
Cesium 137	15 pCi/g *
Americium 241	20 pCi/g

* NRC Limit

The action level for Cesium 137 was reduced for this report from the D&D action level of 80 pCi/g to the NRC action level of 15 pCi/g. The basis for adjusting this limit can be found in a communication with the Nuclear Regulatory Commission (NRC) which discusses decommissioning criteria and maximum acceptable isotope concentrations in soil. A copy of the communiqué may be found in Appendix H.

Area 5

Thirteen samples in Area 5 triggered field screening action levels:

LEGEND

-  Radiological Compounds
-  Hazardous Compounds
-  Excluded
-  Grid Number
-  Survey Point

Principal Radionuclides Identified:
(Maximum Concentration)

Pu 238 (41.56pCi/g)

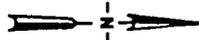
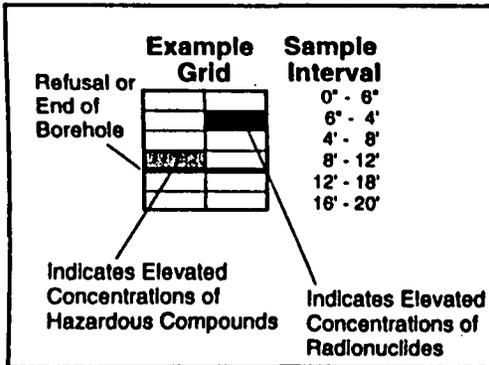
Principal Hazardous Compounds Identified:
(Maximum Concentration)

CrLo (285.07mg/Kg)

Pb (535.39mg/Kg)

Organics

None Detected



Approximate Grid Size = 15ft x 15 ft

96P-0128 1/15/96

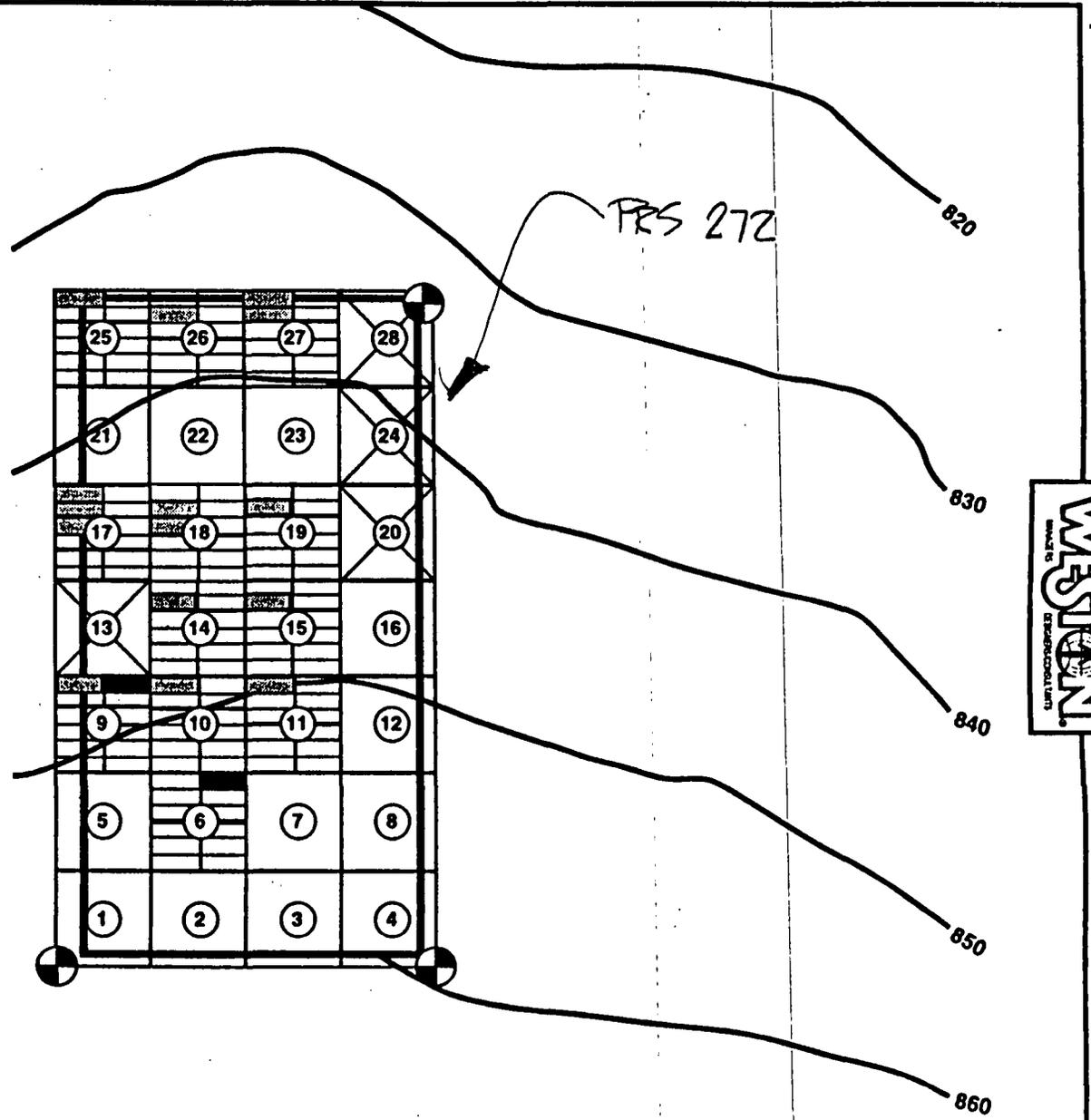


FIGURE 5-6 AREA 10

5.0 Results

Table 5.7 Area 10 Field Sampling Results

Sample ID	FIDLER		Organics		Rad Laboratory					
	Channel 1 (1K)	Channel 2 (5K)	OVA	OVM	Pu 238 (25)	Th 232 (5)	Ra 226 (5)	Cs 137 (15)	Am 241(20)	
1001-5001	<1000	<5000	<1	<1	<28.3	U	0.4	1.4	0.04	<0.04
1001-5004	<1000	<5000	<1	<1	<76.83	U	0.52	1.31	<0.06	<0.08
1002-5001	<1000	<5000	<1	<1	<27.4	U	0.5	1.1	0.05	<0.04
1003-5004	<1000	<5000	NA	<1	<37.69	U	0.35	0.69	0.06	<0.04
1006-5001	<1000	<5000	NA	<1	41.56	*	0.28	0.74	0.04	<0.03
1007-5001	<1000	<5000	NA	<1	<48.96	U	0.76	2.06	0.62	<0.05
1007-5004	<1000	<5000	NA	<1	<48.13	U	0.73	1.77	0.09	<0.05
1009-5001	<1000	<5000	NA	<1	27.05	*	0.97	0.62	0.64	0.09
1010-5001	<1000	<5000	NA	<1	<51.55	U	0.84	0.58	0.53	0.04
1011-5001	<1000	<5000	<1	<1						
1014-5004	<1000	<5000	NA	<1						
1015-5004	<1000	<5000	<1	<1	<18.91		0.87	1.84	0.07	<0.02
1017-5001	<1000	<5000	<1	<1	<44.95	U	0.46	1.87	0.5	<0.04
1017-5004	<1000	<5000	<1	NA	<18.03		0.43	2.11	0.2	<0.02
1017-5008	<1000	<5000	<1	NA	<34.87	U	0.57	1.57	<0.02	<0.04
1018-5004	<1000	<5000	<1	NA						
1018-5008	<1000	<5000	<1	NA	<48.72	U	0.79	2.04	<0.03	<0.05
1019-5004	<1000	<5000	NA	<1	<40.2	U	0.5	1.6	0.2	<0.04
1025-5001	<1000	<5000	NA	<1	<46.1	U	0.5	1.6	0.2	<0.04
1026-5004	<1000	<5000	<1	NA	<39.6	U	0.53	1.61	0.08	<0.04
1027-5001	<1000	<5000	NA	<1	<48.4	U	0.6	1.6	0.7	<0.04
1027-5004	<1000	<5000	NA	<1	<33.1	U	0.5	2.2	0.2	<0.04

Sample ID	PXRF Metals								
	As (102.07)	Ba (1489)	Cd	Cr HI	Cr LO (164.43)	Pb (172)	Hg	Se	Ag (2559)
1001-5001	58.906	144.11	<44.5	<347	166.45	<10	<37	<14	53.8081
1001-5004	57.521	171.69	<44.5	<347	199.03	<10	<37	<14	35.1012
1002-5001	44.444	158.7	<44.5	<347	195.36	12.472	<37	<14	39.001
1003-5004	58.968	90.763	<44.5	<347	169.05	<10	<37	<14	<29
1006-5001	86.926	165.67	<44.5	<347	212.39	<10	<37	<14	<29
1007-5001	54.127	208.15	<44.5	<347	187.05	21.484	<37	<14	<29
1007-5004	65.591	229.76	<44.5	<347	257.92	<10	<37	<14	<29
1009-5001	57.129	202.27	<44.5	<347	167.44	48.56	<37	<14	<29
1010-5001	50.836	215.46	<44.5	<347	184.74	24.226	<37	<14	<29
1011-5001	37.1	270.96	<44.5	<347	181.41	20.851	<37	<14	<29
1014-5004	65.939	212.6	<44.5	<347	168.94	<10	<37	<14	35.2256
1015-5004	57.85	270.91	<44.5	<347	191.11	<10	<37	<14	<29
1017-5001	<34	208.1	<44.5	<347	172.38	145.97	<37	<14	<29
1017-5004	<34	249.24	<44.5	<347	<60.7	535.39	<37	<14	<29
1017-5008	<34	265.73	<44.5	<347	<60.7	346.02	<37	<14	38.054
1018-5004	<34	193.09	<44.5	<347	204.58	107.75	<37	<14	<29
1018-5008	<34	278.69	<44.5	<347	206.08	112.69	<37	<14	38.2822
1019-5004	44.103	212.55	<44.5	<347	285.07	73.396	<37	<14	<29
1025-5001	41.751	217.9	<44.5	<347	171.49	141.57	<37	<14	<29
1026-5004	<34	219.37	<44.5	<347	243.18	147.74	<37	<14	38.2237
1027-5001	50.433	190.9	<44.5	<347	218.41	139.27	<37	<14	<29
1027-5004	59.68	238.94	<44.5	<347	193.29	70.479	<37	<14	<29

This table lists only those samples whose reported concentrations exceeded the Other Soils field action levels.

THE REGULATORY GUIDELINE FOR LEAD IS 400 mg/kg IN SOIL

THE 10 RISK BASED SOIL GUIDELINE VALUE FOR Cr LO IS 1×10^4 mg/kg

6.0 Analysis and Conclusions

Table 6.3 Area 9 Analysis

Area	Sub-Area	Contaminant Type	Contaminant Name	Extent		Volume		Minimum	Maximum	Mean
				Lateral (ft ²)	Vertical (ft)	Net (yd ³)	Gross (yd ³)			
9	A	HAZ	Org	9675ft ²	0'-12'	1600	2136			
	B	HAZ	Org	788ft ²	0.5'-8'	NA	NA			
	C	RAD	Pu	225	4'-8'	33	157	37	37	37
	D	RAD	Pu	450	4'-8'	133	174	141.1	156.2	148.5
	E	HAZ	Org	225	0'-0.5'	NA	NA			
	F	RAD	Pu	225	4'-8'	33	157	27	27	27
	G	HAZ	Org	225	0'-8'	NA	NA			
	H	HAZ	Org	225	0'-0.5'	NA	NA			
	I	RAD	FIDLER Ch2	225	0.5'-4'	13	53.5	10000	10000	10000

Area 10

Table 6.4 shows one sub-area of Area 10 with radioisotopes in excess of D&D action levels for disturbed soil. Surface contamination of Pu238 and elevated concentrations of chromium have been detected in Area 10B. Soil contaminated with Pu and Cr represent 12.5 cubic yards of soil for removal and offsite disposal.

Table 6.4 Area 10 Analysis

Area	Sub-Area	Contaminant Type	Contaminant Name	Extent		Volume		Minimum	Maximum	Mean
				Lateral (ft ²)	Vertical (ft)	Net (yd ³)	Gross (yd ³)			
10	A	HAZ	Cr, Pb	2475ft ²	0'-8'	NA	NA			
	B	RAD	Pu,	675	0'-0.5'	12.5	12.5	27.05	41.56	34.3
	C	HAZ	Cr	675	0'-4'	NA	NA			

Note: This table represents the estimated volume of soil that exceeds field action levels. Field action levels were established as reporting levels and may or may not represent actual soil removal guideline criteria.

DECONTAMINATION & DECOMMISSIONING PROGRAM

**SAMPLING AND ANALYSIS PLAN
FOR THE OTHER SOILS AREAS
ADDENDUM 2: AREA 10**

**MOUND PLANT
MIAMISBURG, OHIO**

FINAL

Prepared for:

**EG&G MOUND APPLIED TECHNOLOGIES
AND
THE U.S. DEPARTMENT OF ENERGY**

Prepared by:

**SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
4031 COLONEL GLENN HIGHWAY, SUITE 300
BEAVERCREEK, OHIO 45431-1600**

JUNE 1994

2. BACKGROUND INFORMATION

This section briefly describes Area 10, its approximate location on Mound Plant, its historical use, and summarizes the historical data obtained from previous studies and investigations.

2.1. LOCATION OF AREA 10

Area 10 is located in the east-central portion of Mound Plant on the western slope of the SM/PP Hill (Figure 1.1.). Covering an area that has been estimated to be 50 feet by 100 feet (5,000 ft²), this site lies west of Building 33 and just northwest of Area 12. Accessibility to Area 10 is limited by the presence of heavy vegetation and the severity of the hillslope. Historically, the area has served as a disposal site for material generated from the demolition of the old Unit IV Dayton Operations dating back to 1950. Approximately six large pieces of concrete (3 feet by 4 feet in size) resulting from the demolition of the polonium processing facility at the former Unit IV currently lay in the brush in Area 10. Although the six concrete blocks were originally contaminated with polonium-210, this contaminant is no longer present due to its short half-life (138.4 days). In addition to the concrete waste, one hundred and sixty truckloads of demolition debris were brought to Mound from Dayton Unit IV and 100 truckloads were brought from Dayton Unit III. It is not known how much of this was stored in Warehouse 10 or dumped in Area 10. The actual size of the area that has been affected by debris disposal, however, is unknown. Reportedly, more concrete debris is contained in the woods to the north of Area 10 and an extensive search for debris over the hillside has not been undertaken. According to the OU9, Site Scoping Report: Volume 5, (DOE 1993b) it is estimated that Area 10 has had from 0 to 10 feet of fill material added to the topographic surface that existed in 1946.

2.2. DATA FROM PREVIOUS INVESTIGATIONS

One surface soil sample from Area 10 (sample S0604) was collected during the Mound Site Survey Project (Stought, et al. 1988). Subsequent analysis of the sample identified a plutonium-238 level of 11.8 pCi/g. This soil sample was not analyzed for chemical contaminants and it is not known where the sample was acquired in relation to the concrete blocks.

Because of its location on the slope of the SM/PP Hill, Area 10 is in a position to receive surface water runoff from adjacent topographically upgradient areas such as Area 12. Soils in Area 12 are known to

contain concentrations of plutonium-238 and thorium-232. Since there are no known contaminants from the concrete rubble, the plutonium levels found in Area 10 are assumed to have occurred from surface runoff from Area 12.

Table-2.1, "Results of Surface Samples from the Mound Site Survey Project -Area 10", shows the two surface samples and their respective plutonium-238 concentrations. These locations can be found on Figure 1.1.

the contamination zone. The outer most bounds will be determined by two successive "non-detect" readings with the screening instruments.

3.2.2. Sample Size and Location

Since the primary objective of this SAP is to obtain sufficient data to enable Mound's D&D organization to estimate the total volume of contaminated soils in each area, the number of samples and their location will be largely based on the lateral and vertical extent of suspected contamination. In order to envelop the contamination in Area 10, the same process of grid points will be used as that which was described in the Final OSA SAP. Due to the size of the area (50' x 100') a 15' x 15' grid will provide the coverage needed. The sample generating quantities will be as indicated in Section 3.2.1. above. The initial depth will be 12' as historical data indicates fill of about 10' in this area. This sampling scheme will provide for the determination of the vertical and horizontal extent of contamination, thus producing an estimate of the volume of contaminated soil to be removed.

OTHER SOILS FIELD SAMPLING DATA

Key to interpreting sample data:

Sample nomenclature is of the form **XXYY-ZZ00**

Where:

XX = Area designation

YY = Sample Location

ZZ = Sample Type
50 = Soil

00 = Sample Depth
01 = Surface
04 = 0-4 feet
08 = 4-8 feet
12 = 8-12 feet

Gamma Scan Data

Sample ID	Co 60	Cs 137	Ra 226	Ac 227	Th 230	Th 232	Pa 231	U 238	Pu 238	Am 241
0879-5012	<0.06	0.15	4.66	0.88	<12.87	55.04	<3.4	<8.66	<170.3	<0.23
0880-5001	<0.02	0.02	1.3	<0.09	<3.2	0.5	<0.8	<3	<31.33	<0.03
0880-5004	<0.02	0.02	0.88	<0.11	<3.5	0.93	<0.75	<2.6	<32	<0.04
0880-5012	<0.04	0.07	3.8	<0.63	18	29	<2.7	<6	<137	<0.17
0883-5001	<0.04	0.2	1.4	<0.3	<10.3	9.9	<1	1.8	<95.9	<0.1
0883-5004	<0.03	0.1	0.7	<0.3	<8.5	8.4	<0.8	0.8	<69.9	<0.09
0884-5004	<0.04	0.06	2.06	<0.31	<7.88	2.65	<1.35	<4.71	<79.3	<0.08
0885-5001	<0.02	0.07	1	0.2	<4.1	0.9	<1.1	<3.5	<38.8	<0.05
0885-5004	<0.02	<0.02	0.91	<0.15	<3.63	0.92	<0.72	<3.35	<31.86	<0.04
0885-5008	<0.02	<0.02	0.5	<0.2	<3.7	0.7	<0.7	0.6	<41.5	<0.04
0885-5012	<0.02	<0.02	1.5	<0.2	<4.1	0.7	<0.9	<3.3	<40	<0.04
0892-5001	<0.02	0.1	1.4	<0.2	<5.2	2.1	<1	<3.6	<42.1	<0.05
0892-50012	<0.03	<0.03	0.8	<0.2	<4.6	0.9	<0.7	0.5	<50.1	<0.05
0892-5004	<0.03	<0.02	0.9	<0.2	<4.5	1.2	<0.6	0.9	<48.4	<0.05
0892-5008	<0.02	<0.02	1.4	<0.1	<3.8	0.6	<1	<3.2	<36	<0.04
0893-5001	<0.03	0.14	1	<0.3	<6	2.8	<0.7	2.1	<61.7	<0.06
0893-5004	<0.02	<0.02	1.64	<0.17	<4.2	0.83	<0.87	<3.58	<39.84	<0.04
0893-5008	<0.02	0.03	0.5	<0.2	<4.8	0.7	<0.6	0.5	<40.6	<0.04
0894-5001	<0.02	0.07	2.8	<0.2	<4.8	1.3	<0.9	<3.1	<38.4	<0.05
0894-5004	<0.03	<0.02	1.6	<0.2	<3.8	0.8	<0.9	<3.8	<30.5	<0.04
0894-5008	<0.03	<0.02	1.46	<0.16	<3.97	0.89	<0.75	<4.04	<38.77	<0.04
0894-5012	D <0.03	<0.02	1.3	<0.2	<4	0.8	<0.9	<4	<32.5	<0.04
0894-5012	<0.03	<0.03	0.6	<0.1	<4.2	0.9	<0.8	<3.1	<31	<0.04
1001-5001	D <0.02	0.04	1.03	<0.26	<6.57	0.28	<1.25	<4.44	<59.88	<0.06
1001-5001	<0.02	0.04	1.4	<0.1	<3.1	0.4	<0.7	<2.7	<28.3	<0.04
1001-5004	D <0.02	0.08	0.4	<0.2	<3.6	0.6	<0.8	<3.1	<33	0.05
1001-5004	D <0.02	0.08	1.7	<0.1	<3.9	1.1	<0.9	<2.6	<26.6	<0.04
1001-5004	<0.05	<0.06	1.31	<0.36	<8.15	0.52	<1.07	<6.55	<76.63	<0.08
1001-5008	D <0.02	<0.02	1.1	<0.1	<3.2	0.5	<0.8	<3.2	<31.6	<0.04
1001-5008	<0.03	0.03	0.83	<0.26	6.19	0.41	<1.51	<4.19	<46.51	<0.06
1001-5012	D <0.02	0.02	0.9	<0.1	<3.6	0.7	<0.9	<2.9	<33	<0.04
1001-5012	<0.03	<0.04	1.1	<0.28	<6.55	<0.28	<0.41	5.32	<87.29	<0.07
1002-5001	D 0.03	0.07	1.11	<0.22	<6.28	0.24	<0.12	<5.73	<40.66	0.06
1002-5001	<0.02	0.05	1.1	<0.1	<3.2	0.5	<0.8	<2.7	<27.4	<0.04
1002-5004	<0.04	0.08	<0.7	<0.25	<8.37	0.26	<1.48	<4.43	<56.07	<0.07
1002-5008	D <0.02	<0.02	1.2	<0.1	<3.2	0.5	<0.7	<3	<31.2	<0.03
1002-5008	<0.05	0.06	0.68	0.23	<5.08	0.27	<1.18	<6.35	<40.17	<0.06
1003-5001	D <0.01	0.04	0.9	<0.04	<1.2	0.3	<0.4	<1.1	<12.2	<0.01
1003-5001	<0.02	0.06	1	<0.08	<3.33	0.42	<0.78	<4.3	<34.18	<0.04
1003-5004	D <0.01	0.08	0.3	<0.07	<1.7	0.3	<0.2	0.3	<18.7	<0.02
1003-5004	<0.02	0.06	0.69	<0.13	<4.3	0.35	<0.88	<4.77	<37.69	<0.04
1004-5001	<0.03	0.5	2.04	<0.18	<6.49	0.89	<1.32	<5.71	<52.73	<0.06
1004-5004	<0.03	0.18	1	<0.14	<4.65	0.68	<0.9	<3.96	<34.96	<0.05
1004-5008	<0.03	<0.03	1.57	<0.12	<5.05	0.87	<0.89	<4.34	<41.89	<0.05
1005-5001	D <0.02	0.11	0.93	<0.15	<3.39	0.33	<0.79	<2.45	<34.53	<0.03
1005-5001	<0.03	0.14	1.07	<0.12	<3.48	0.19	<0.94	<3.94	<35.49	<0.04
1005-5004	D <0.02	0.1	1.07	<0.12	<4.15	0.57	<0.87	<3.23	<36.18	<0.04
1005-5004	<0.02	0.1	1.31	<0.14	<3.63	0.55	<0.67	<2.99	<31.48	<0.04
1006-5001	D <0.02	0.04	0.74	<0.13	<2.65	0.28	<0.65	<2.72	41.56	<0.03
1006-5001	<0.02	0.09	0.64	<0.1	<2.88	0.26	<0.61	<3.01	<23.74	<0.03
1006-5004	D <0.02	0.03	0.89	<0.14	3.07	0.37	<0.57	<2.47	<30.44	<0.03
1006-5004	<0.02	0.04	0.89	<0.1	<3.69	0.46	<0.78	<3.05	<34.16	<0.04
1006-5006	<0.02	0.06	0.86	<0.1	<4.31	0.66	<0.76	<3.38	<39.68	<0.05
1007-5001	<0.04	0.62	2.06	<0.15	<5.07	0.76	<0.96	<4.88	<46.96	<0.05
1007-5004	<0.03	0.09	1.77	<0.14	<5.05	0.73	<0.96	<4.89	<48.13	<0.05
1007-5008	<0.03	0.04	0.74	<0.12	<4.36	0.6	<0.93	<3.9	<35.09	<0.04
1008-5001	<0.01	0.25	1.61	<0.06	<1.83	0.81	<0.36	<1.73	<18.13	<0.02
1008-5004	<0.01	0.01	1.57	<0.08	<1.91	0.98	<0.33	<1.64	<18.43	<0.02
1009-5001	<0.03	0.64	0.62	<0.19	<4.99	0.97	<0.71	1.16	27.05	0.09
1010-5001	<0.03	0.53	0.58	<0.18	<4.41	0.84	<0.62	0.79	<51.55	0.04
1010-5004	<0.02	0.05	1.38	<0.16	<3.85	0.68	<0.79	<3.07	<40.29	<0.04
1011-5004	<0.03	0.14	1.33	<0.21	<4.82	0.95	<0.9	<4.33	<49.48	<0.05
1011-5008	D <0.01	<0.01	1.35	<0.07	<1.67	0.83	<0.34	<1.57	<16.64	<0.02
1011-5008	<0.03	0.72	1.63	<0.21	<4.88	0.72	<1.07	<4.52	<50.34	<0.05

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RS-7A

Gamma Scan Data

Sample ID	Co 60	Cs 137	Ra 226	Ac 227	Th 230	Th 232	Pa 231	U 238	Pu 238	Am 241
1012-5001	<0.01	0.67	1.74	<0.08	<1.82	1.04	<0.4	<1.73	<18.08	<0.02
1012-5004	<0.03	0.14	1.62	<0.18	<4.58	0.93	<0.92	<4.08	<39.6	<0.05
1015-5001	<0.03	0.37	2.04	<0.2	<4.95	0.85	<1	<4.93	<51.49	<0.06
1015-5004	<0.01	0.07	1.84	<0.08	<3.47	0.87	<0.4	<1.82	<16.91	<0.02
1016-5001	<0.01	0.32	2.04	<0.07	<1.92	0.81	<0.37	<1.48	<15.2	<0.03
1017-5001	<0.02	0.5	1.87	<0.15	<4.03	0.46	<0.89	<3.49	<44.95	<0.04
1017-5004	<0.01	0.2	2.11	<0.07	1.8	0.43	<0.35	2	<18.03	<0.02
1017-5008	<0.02	<0.02	1.57	<0.15	<3.93	0.57	<0.78	<3.9	<34.87	<0.04
1017-5012	<0.03	<0.02	1.33	<0.16	<3.98	0.61	<0.81	<3.71	<32.94	<0.04
1018-5001	<0.02	0.62	1.6	<0.17	<4.2	0.54	<0.85	<3.54	<42.86	<0.04
1018-5008	<0.03	<0.03	2.04	<0.18	<4.5	0.79	<0.89	<4.45	<46.72	<0.05
1019-5001	0.02	0.3	1.9	<0.1	<3.6	0.6	<1.1	<3.2	<45.4	<0.04
1019-5004	<0.02	0.2	1.6	<0.1	<3.6	0.5	<0.8	<3	<40.2	<0.04
1022-5004	<0.02	0.15	2.13	<0.16	<4.27	0.57	<0.74	<3.52	<38.61	<0.04
1023-5001	<0.02	0.2	1.6	<0.1	<3.5	0.5	<0.9	<2.9	<40.5	<0.04
1023-5004	<0.02	<0.1	1.87	<0.15	<3.32	0.56	<0.68	<3.1	<40.16	<0.04
1025-5001	<0.02	0.2	1.6	<0.1	<3.4	0.5	<1	<3	<46.1	<0.04
1025-5004	<0.02	0.2	2	<0.1	<3.6	0.5	<0.8	<3	<37.4	<0.04
1026-5001	<0.02	0.63	1.63	<0.18	<4.06	0.6	<0.9	<3.86	<43.67	<0.04
1026-5004	<0.02	0.08	1.61	<0.17	<4.22	0.53	<0.9	<3.3	<39.6	<0.04
1026-5008	<0.02	<0.02	1.62	<0.14	<3.98	0.51	<0.69	<3.17	<31.29	<0.04
1027-5001	<0.02	0.7	1.6	<0.2	<3.9	0.6	<1	<3.2	<48.4	<0.04
1027-5004	<0.02	0.2	2.2	<0.1	<3.6	0.5	<0.9	<3	<33.1	<0.04
1201-5004	0.04	<0.1	2.6	<0.7	<16.13	0.53	<3.49	<17.6	<165.2	<0.17
1201-5008	<0.07	<0.09	2.18	<0.51	<11.93	0.38	<2.77	<9.33	<107.1	<0.13
1202-5001	<0.07	0.12	1.67	<0.44	13.24	<0.31	<2.63	<14.45	<80.11	<0.11
1202-5001	<0.02	<0.02	1.5	<0.1	<2.9	0.3	<1	<2.9	<21.5	<0.03
1202-5004	<0.14	0.16	1.2	<0.65	<19.72	0.76	<3.85	<14.06	<116.3	<0.14
1202-5008	<0.08	0.06	1.98	<0.68	<12.72	0.6	<4.22	<10.72	<139.5	<0.15
1203-5001	<0.1	<0.05	3.34	<0.85	<18.45	1.58	<4.32	<12.5	<189.5	<0.2
1210-5004	<0.08	0.06	<0.92	0.37	<14.66	0.9	<4.14	<12.78	<123.8	<0.15
1210-5008	<0.08	0.06	1.94	<0.76	<15.5	0.78	<2.4	<10.45	<159.4	<0.17
1213-5001	<0.1	<0.14	3.53	<0.88	<20.32	<0.67	<3.4	14.74	<207.9	<0.2
1213-5004	<0.05	<0.1	2	<0.42	<11.85	<0.33	<2.71	<15.68	<116	<0.13
1213-5008	<0.07	<0.1	2.59	<0.57	<12.5	0.18	<2.52	<11.56	<120.5	<0.15
1213-5012	<0.08	<0.15	<4.8	2.21	<64.37	33.55	<13.2	<35.35	<440.2	<0.67
1213-5016	<0.11	<0.08	<1.58	<0.74	<15.36	0.67	<4.41	<17.55	<180.8	<0.18
1213-5017	<0.1	0.3	2.61	<0.77	<20.3	2.51	<4.77	<16.23	<153	<0.19
1214-5001	<0.1	<0.1	2.45	<0.76	<17.19	<0.47	<3.85	<18.86	<165.9	<0.21
1214-5004	1.36	<0.09	<1.69	<0.58	<11.85	0.36	3.62	18.04	<128.9	<0.14
1214-5008	<0.09	<0.07	1.99	<0.8	<18.34	1.35	<3.12	<14.17	<155.9	<0.17
1214-5012	<0.08	<0.1	<0.86	<0.55	<12.14	1.03	<3.62	<11.72	<80.77	0.11
1214-5015	<0.07	<0.07	<1.31	<0.56	<11.82	0.53	<2.91	<9.15	<118.5	<0.11
1217-5001	<0.1	<0.07	2.77	<0.81	<25.72	2.51	<3.49	<16.45	<177	<0.26
1217-5004	<0.13	<0.14	<2.9	<1.14	<2.48	4.12	<6.56	<16.62	<246.3	<0.31
1217-5004	<0.04	<0.08	2.8	<0.3	<8.4	7	<1.8	<5	<52.4	<0.08
1217-5008	<0.18	0.37	<4.43	<2.31	<59.39	22.24	<10.61	<30.41	<459.1	<0.61
1217-5008	<0.08	<0.09	1.51	<0.6	<17.3	32.6	<3.4	<1.5	<100.1	<0.2
1218-5001	<0.13	<0.07	<2.61	<0.8	<16.83	3.54	<6.34	<10.61	<183.2	<0.24
1218-5004	<0.14	0.24	<2.82	<1.01	<27.57	3.36	<5.37	<17.43	<202.1	<0.27
1218-5004	<0.03	0.07	3	<0.2	<6.6	2.9	<1.6	<5	<46	<0.06
1218-5012	<0.21	<0.28	11.85	<2.73	<67.72	30.19	<11.76	<29.3	<548.6	<0.68
1219-5001	<0.08	<0.12	3.03	<0.77	<19.5	0.72	<4.1	<10.25	<229.2	<0.21
1219-5004	<0.1	<0.27	<2.02	<1.19	<30.45	4.72	<6.11	<15.47	<213.6	<0.2
1219-5008	<0.13	<0.09	<3.29	<1.33	<23.19	6.9	<7.05	<22.83	<335	<0.34
1219-5012	<0.1	<0.05	3.5	<0.58	<17.43	<0.81	<3.55	<13.77	<126.6	<0.17
1220-5001	0.86	0.19	2.16	<0.57	<14.11	0.61	<4.21	<19.93	<137.6	<0.14
1220-5004	<0.07	<0.09	1.82	<0.52	<15.48	1.91	<2.8	<11.76	<133.3	<0.14
1220-5008	<0.08	0.06	<1.27	<0.32	<12.09	0.33	<2.41	<7.97	<83.45	<0.09
1220-5012	<0.06	<0.06	<1.22	<0.5	<11.71	0.36	1.67	<7.74	<35.81	<0.12
1223-5001	<0.08	0.21	<1.83	<0.72	<17.27	<0.83	<3.67	12.46	<100.7	<0.14
1223-5004	<0.09	<0.14	<2.39	<0.89	<22.11	1.09	<2.36	<14.52	<168.1	<0.18
1223-5008	<0.5	<0.66	17.69	<4.82	<127.4	193.3	<28	<62.8	<980.9	<1.51
1223-5012	<0.48	<0.65	30.43	7.21	<163.8	161.5	<29.12	<65.4	<1227	2.1

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