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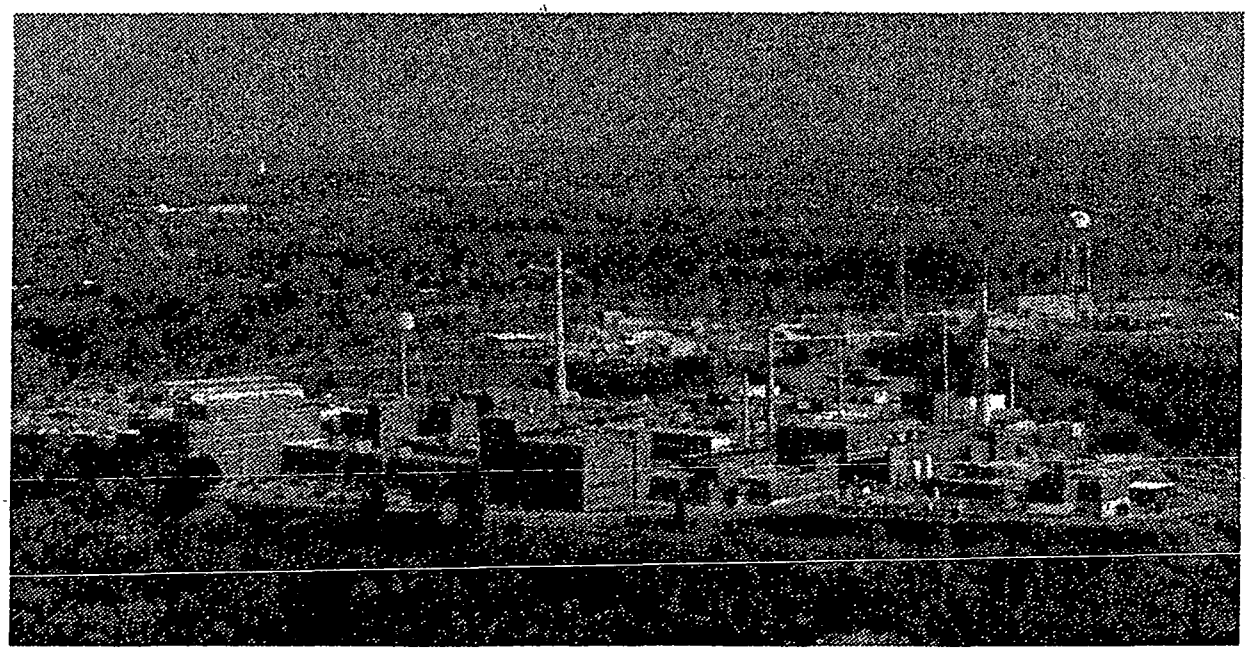
MOUND

Environmental Restoration Program

MOUND PLANT

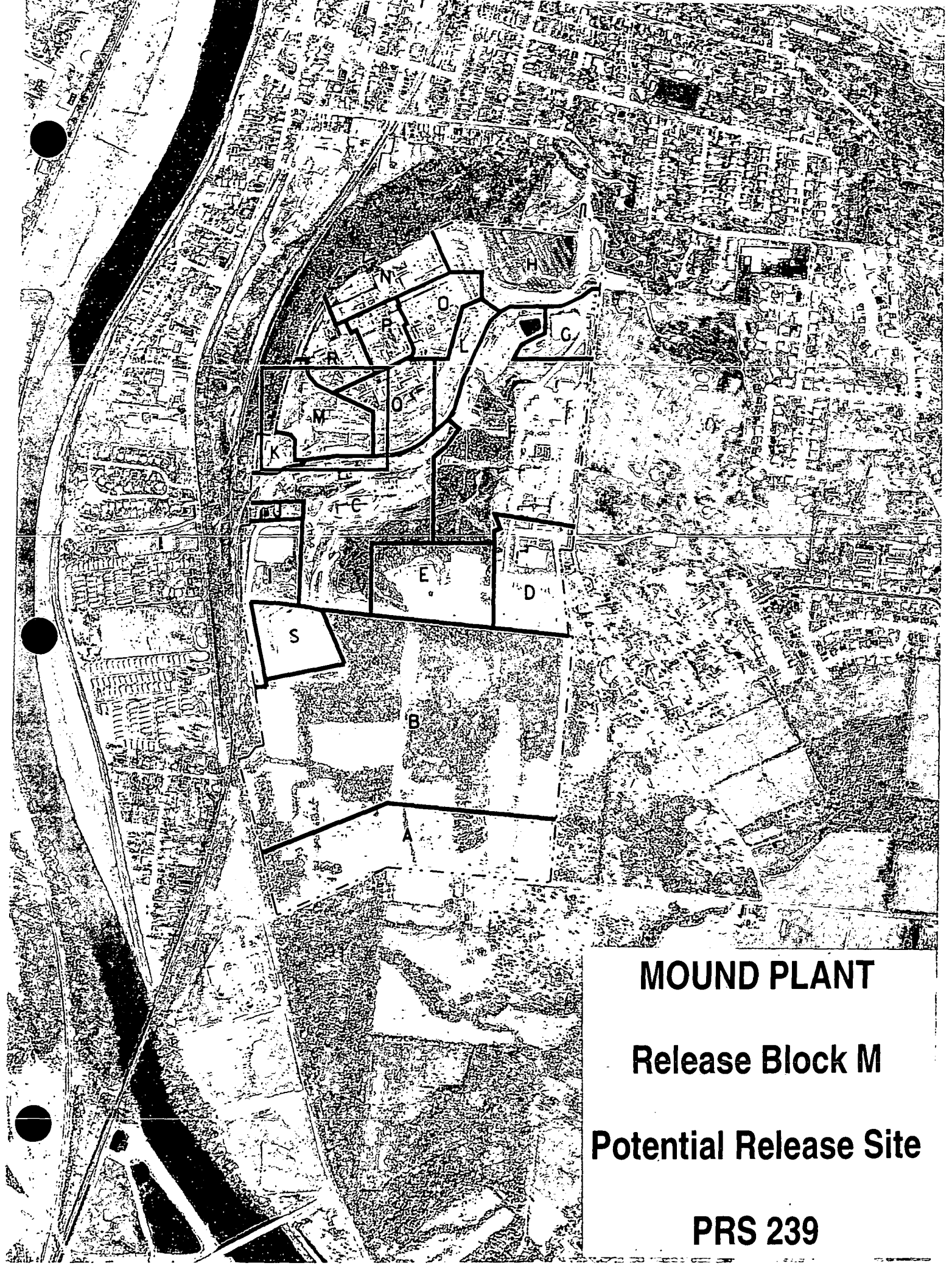
Potential Release Site Package

PRS # 239



PRS 239

REV	DESCRIPTION	DATE
PUBLIC RELEASE 0	Available for comments.	Mar. 4, 1996
FINAL 1	Comment period expired. No comments. Recommendation page annotated.	Oct. 10, 1996

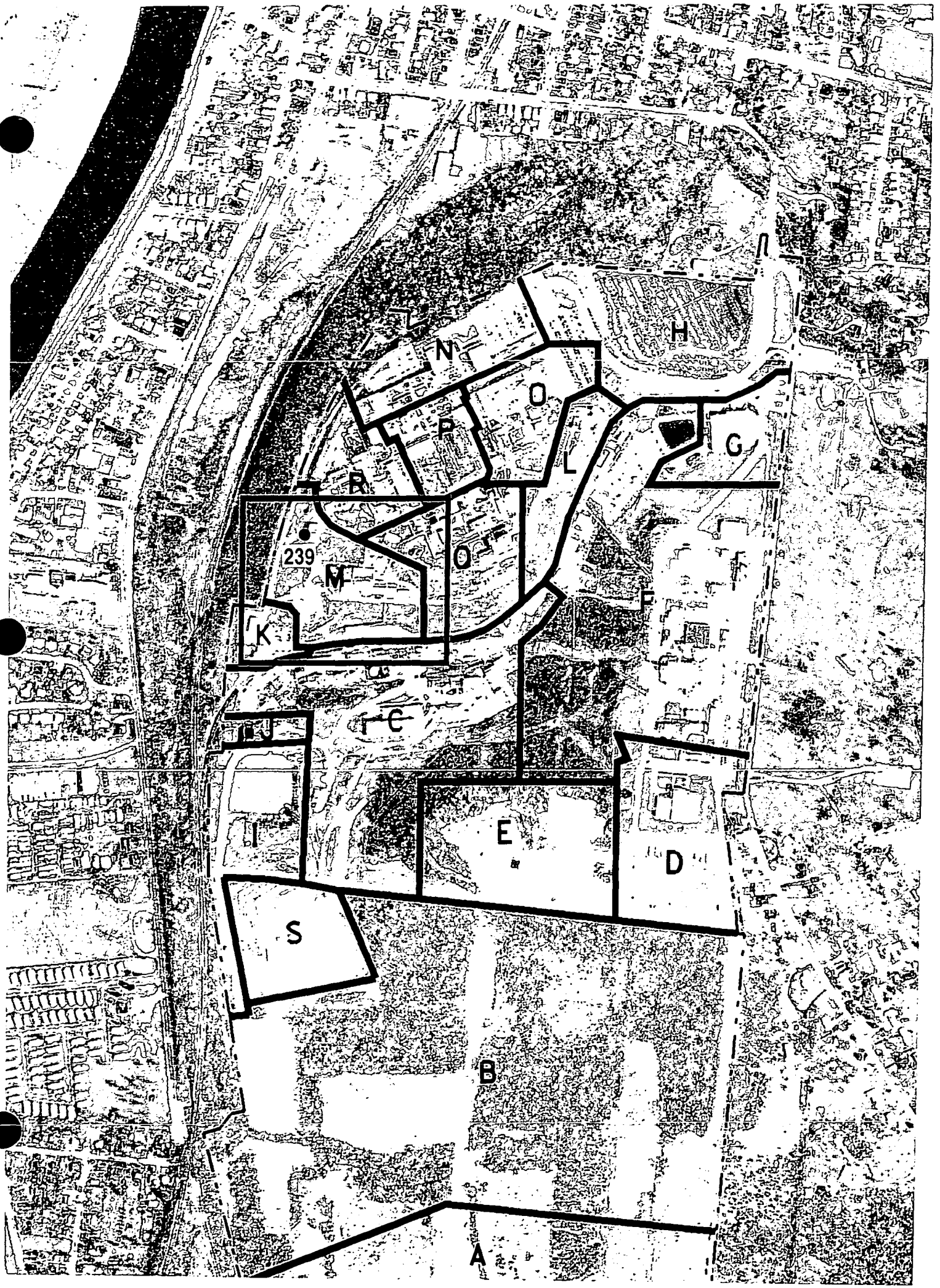


MOUND PLANT

Release Block M

Potential Release Site

PRS 239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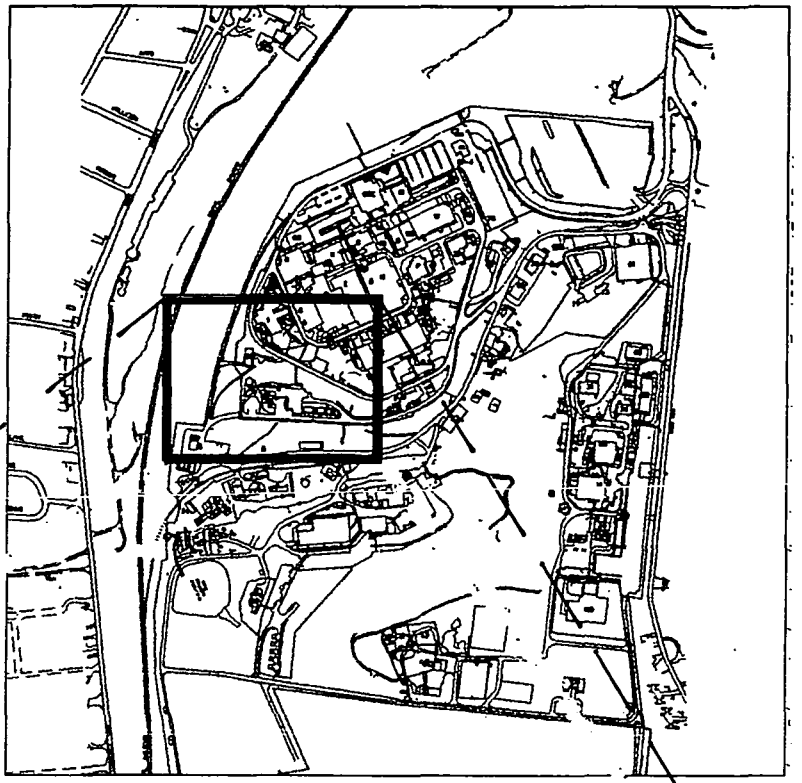
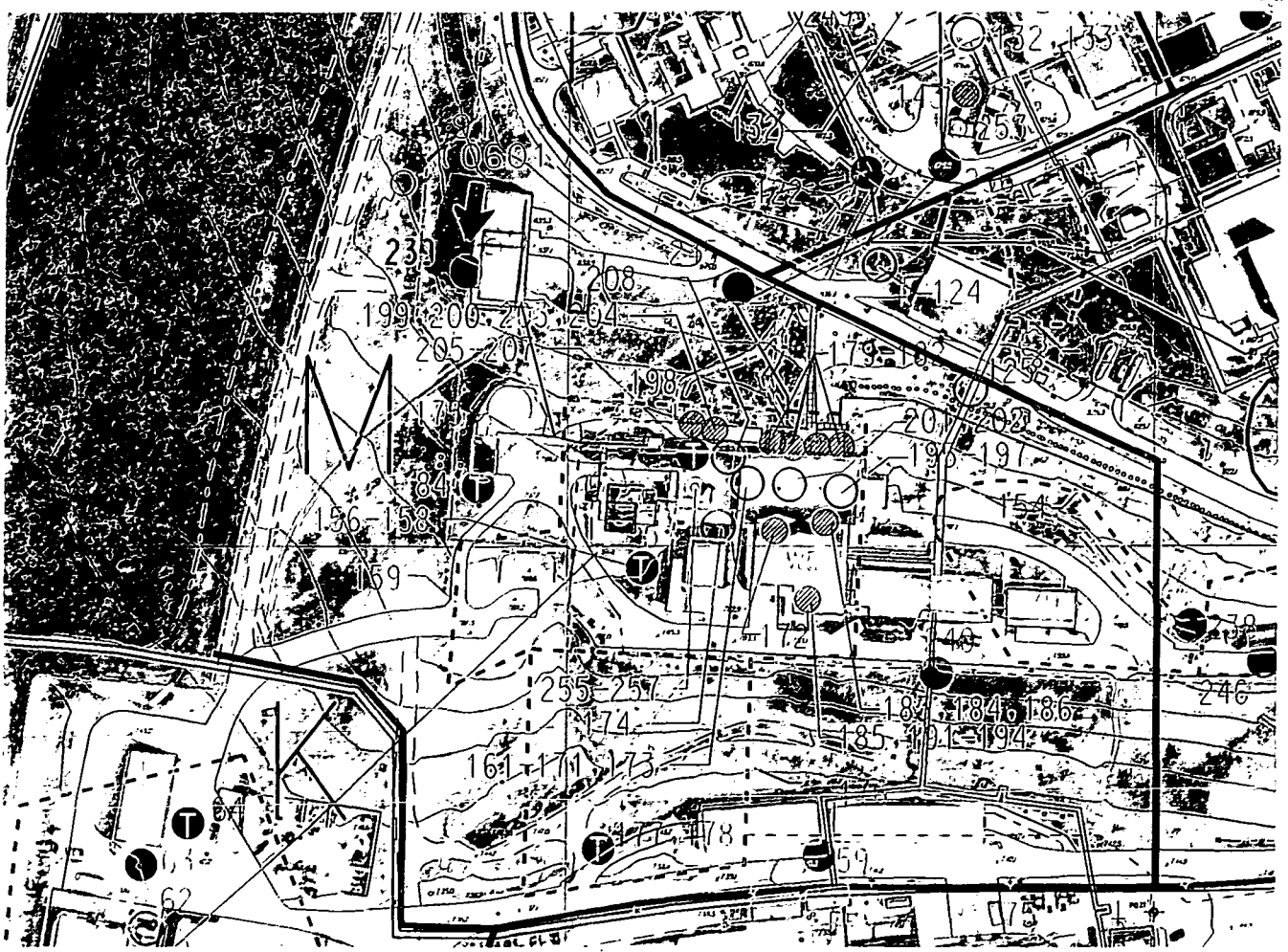
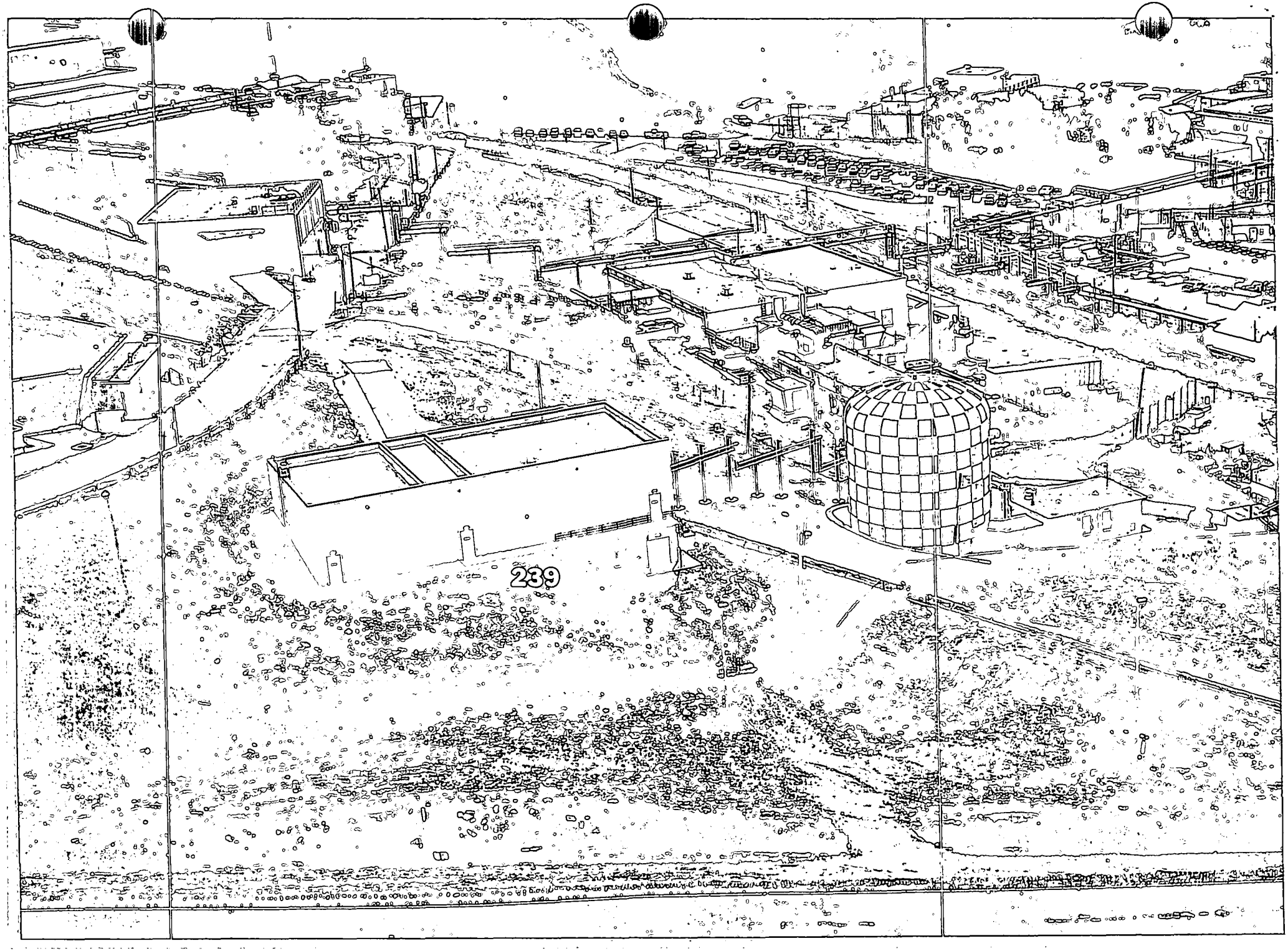
Release Block M

Potential Release Site

PRS 239






239

PRS 239

PRS HISTORY:

Potential Release Site (PRS) 239 is designated as a potential Hot Spot, discovered as part of the 1983 Mound Site Survey Project.[2] This survey detected plutonium-238 at surface soil sample S0208. Sample point S0208 is located immediately west of Building 89. Building 89 was a former storage facility for non-nuclear weapon parts. There is no history of any hazardous or radiological process or activity taking place in this area.[2]

CONTAMINATION:

Plutonium-238 was reported in a single surface sample at 61 pCi/g.[2] This is below the off-site Miami-Erie Canal clean-up criteria of 75 pCi/g.

In the summer of 1995, PRS 239 and its surrounding soil was sampled as part of the Other Soils Characterization. PRS 239 and four soil locations located 10 feet north, south, east and west of PRS 239 were sampled for organics (organic vapor analyzer), metals (x-ray fluoroscope) and radionuclides (field detection via fidler and lab analysis via Mound soil screening). Sample depth was 0 to 2 feet. Sample results were:

1) No organics or radioactive contamination was detected.[3,4]
2) Chromium III was detected at 229 mg/kg. This is above the Other Soils field action level for Chromium III (164 mg/kg) but 4,000 times less than the risk based soil screening guideline for Chromium III ($1x10^6$ mg/kg).[3,5]

READING ROOM REFERENCES:

1) OU9, Site Scoping Report, Volume 12 - Site Summary Report, September 1994 (pages 5-6).
2) OU9, Site Scoping Report, Volume 3 - Radiological Site Survey, June 1993 (pages 7-16).

OTHER REFERENCES:

3) "Draft" Other Soils Characterization Report, January 1996 (pages 17-23).
4) Other Soils Field Sampling Data (pages 24-26).
5) Risk Based Guideline Values, Dec. 1995, Final, Revision 3 (pages 27-28).

PREPARED BY:

Eric Horstman, Member of EG&G Technical Staff
John Nichols, Member of EG&G Technical Staff

MOUND PLANT
PRS 239
SOIL CONTAMINATION - BUILDING 89

RECOMMENDATION:

This site was identified as a Potential Release Site (PRS) due to detectable plutonium-238 levels at surface soil samples, however no history of radiological processes occurred at the location of PRS 239. Additional verification sampling resulted with a plutonium-238 reading of 61 pCi/g which was below the DOE clean-up standard of 100 pCi/g. In addition, the stakeholders have been involved in developing a plutonium clean up level for the OU4 canal (which is based on a conservative recreational land use scenario) and have agreed on a clean up level of 75 pCi/g. The initial concentration was less than the offsite canal standard, therefore, PRS 239 requires NO FURTHER ASSESSMENT.

CONCURRENCE:

DOE/MB: Arthur W. Kleinrath, Remedial Project Manager — 2/29/96 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager — 3/4/96 (date)

OEPA: Brian K. Nickel, Project Manager — 3/4/96 (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 4/15/96 to 5/15/96.

☒ No comments were received during the comment period.

☐ Comment responses can be found on page_____ of this package.

Document Control No. _____

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

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
231	T Building, Corridor 8 Alpha Wastewater Sump (Tank 233)	F-7	Historical Filled with concrete 1982	Alpha wastewater from process area floor drains	3, 4	Unknown - filled with concrete			No Data		
232	T Building, Corridor 7 Alpha Wastewater Sump (Tank 234)	F-7	Historical Filled with concrete 1982	Alpha wastewater from process area floor drains	3, 4	Unknown - filled with concrete			No Data		
233	Room T-63 Alpha Wastewater Sump (Tank 235)	F-7	Historical Filled with concrete 1982	Alpha wastewater from process area floor drains	3, 4	Unknown - filled with concrete			No Data		
234	Building 58 Diesel Fuel Storage Tank (Tank 242)	E-6	Historical	Diesel fuel	3	Tank Removed			No Data		
235	Area of Possible Elevated Thorium Activity	E-8	Grounds	Thorium	6	Possible fugitive dust		4, 6	1 14, 15	SGS[b] Table B.3 Locations 2021, 2148 and 2149 Table B.1	12 6
236	Site Survey Project Potential Hot Spot Location S0166	F-6	Grounds	Plutonium-238	6	Isolated activity from unknown sources			13	Table B.9 (Appendix E in Ref. 6)	
237	Site Survey Project Potential Hot Spot Location S0175	E-5 E-6	Grounds	Cobalt-60, Cesium-137	6				14, 15	Table B.9 (Appendix E in Ref. 6)	6
238	Site Survey Project Potential Hot Spot Location S1092	G-7	Grounds	Thorium	6				14	Table B.9 (Appendix E in Ref. 6)	6
239	Site Survey Project Potential Hot Spot Location S0208	F-5	Grounds	Plutonium-238	6				13	Table B.9 (Appendix E in Ref. 6)	6
240	Site Survey Project Potential Hot Spot Location S0472	G-6	Grounds	Thorium	6				14	Table B.9 (Appendix E in Ref. 6)	6

ENVIRONMENTAL RESTORATION PROGRAM

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

MOUND PLANT
MIAMISBURG, OHIO

June 1993

DEPARTMENT OF ENERGY
ALBUQUERQUE FIELD OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

FINAL

2. SITE SURVEY PROJECT INVESTIGATION

The objectives of the Site Survey Project were to conduct a systematic radiological survey of the exposed land areas at Mound Plant, concentrating on the original 182 acres, and to provide the DOE with a basis for estimates of the cost and time required to stabilize or remove contaminated soils. To achieve these objectives, the project included

- screening using a sodium iodide detector (FIDLER) to identify areas of suspected radioactivity contamination;
- sampling of surface and subsurface soil; and
- analysis of soil samples using one or more of the following methods: radiochemical analysis for plutonium-238 and the thorium isotopes, gamma spectroscopy, *in situ* gamma spectroscopy, and liquid scintillation for tritium.

The above activities are discussed in the following sections.

2.1. FIELD ACTIVITIES

2.1.1. Gamma Surveys

The initial phase of the Site Survey Project consisted of a systematic gamma survey. The most commonly occurring soil contaminants at Mound Plant have been plutonium-238 and thorium-bearing materials (Stought et al. 1988). Because of this, a FIDLER was used during screening to detect the low-energy gamma radiations emitted by plutonium-238 and thorium. The window settings of the FIDLER also permitted the detection of other gamma-emitting radionuclides, such as cobalt-60 and cesium-137, although the detection of these higher-energy gamma emitters would have been less efficient. (Some of the photons would possess sufficient energy to pass completely through the thin sodium iodide crystal of the FIDLER.) The presence of these other radionuclides could be identified by comparing the results of soil sample screening and radiochemical analyses (Stought et al. 1988).

To perform the survey, Mound Plant was divided into the grid blocks shown in Plates 2 and 3. The grid blocks were approximately 380 ft by 300 ft, with the blocks that overlapped the plant boundaries being smaller. The surveys were conducted in order to obtain a general idea of the location of contaminated areas, especially areas that had not been previously documented by historical records. Intensive surveys were conducted at the areas of known or suspected soil contamination (Areas 1 through 19 on Plate 1) to verify the existence of soil radioactivity contamination and to approximate the areal extent of radioactivity contamination. Less intensive surveys were conducted at the remaining portions of Mound Plant in order to identify any previously ur

radioactivity contamination. These surveys of the remaining portion of exposed soils at Mound Plant resulted in the identification of Areas 20, 21, and 22 (Plate 1).

The gamma surveys were performed based on a mainly rectilinear pattern (Stought 1990). However, several biases were introduced during the surveying, as follows:

- areas covered by dense brush and woods were not thoroughly surveyed;
- areas covered by asphalt or buildings were not surveyed; and
- the grid blocks shown in Plates 2 and 3 were approximated by the field team, resulting in possible location errors.

Approximately 16,000 gamma survey readings were recorded: 12,000 on the original Mound Plant property and 4,000 on the new property. However, some problems were noted in the evaluation of these survey data for this report, including the following:

- the FIDLER is only accurate in detecting plutonium/thorium in the very near-surface soils because of attenuation of the low-energy gamma rays by the soils.
- there is no real documentation describing the pattern of the survey, such as the distance between transverses, or of the procedure for taking and recording readings, such as where the detector was held.
- there is no information available concerning instrument calibration.
- it is not known where readings were taken within each grid block.
- no actual data, other than the summaries presented in Plates 4 and 5, were available for the preparation of this report.
- the accuracy of the grid block summaries given in Plates 4 and 5 is suspect; because, the positions were estimated and not measured or surveyed by the field team.

2.1.2. Surface Soil Sampling

Surface soil samples were taken at Mound Plant as part of the Site Survey Project during 1983 and 1984. Five surface samples were taken in each of the grid blocks or strata, 300 ft by 380 ft, shown in Plates 2 and 3. The number of samples was chosen arbitrarily based on cost considerations, and the locations were chosen arbitrarily by the field team. The resulting locations are shown on Plate 1. Approximately 1,100 surface soil samples were taken: 1,000 on the original Mound Plant property and 100 on the new (south) property. Fewer samples were taken on the new property, which was purchased in 1981, because the gamma survey did not show significantly elevated levels in this area, and Mound Plant has not developed the area.

The positions of the surface sample locations were estimated by the field team relative to the grid system shown in Plates 2 and 3. Because the locations were not surveyed, the accuracy of the positions shown in Plate 1 has been estimated by Mound Plant to be ±25 ft. No samples were taken inside buildings or at paved areas, resulting in sampling within a limited space in many of the grid blocks. Surface locations shown on Plate 1 inside buildings or on roads are incorrect and probably result from errors by the field team in estimating positions and the assignment of digital coordinates.

The surface samples were collected using a sample collection tool capable of extracting a soil plug with a depth of 2 inches and a diameter of 3.5 inches. Two plugs were collected at each location, resulting in a total surface sample depth of approximately 4 inches. A hammer was used to facilitate driving the sample collection tool when necessary. The sample was then placed in an EPA sample dish with a 4-inch-diameter and a depth of 2.5 inches. Large rocks, twigs, and other non-earth matter were removed. Each dish was at least 80 percent full in order to obtain sufficient soil for analysis. The sampling tool was screened with an alpha scintillometer (zinc sulfide) detector after use, and excess soil was brushed out. However, no standard decontamination was performed.

2.1.3. Subsurface Soil (Core) Sampling

During the Site Survey Project, core samples were taken at locations of elevated gamma activity, as shown by the FIDLER surveys, or at locations where spills, leaks, or the disposal of radioactive materials was known or suspected to have occurred. The core sampling was, therefore, based on a biased sampling approach. A Mound Plant memorandum (Appendix A), providing a statistical evaluation of the project sampling strategy, notes that the absence of statistically based core locations (systematic or random) prevents adequate characterization of many areas. FIDLER screening at the ground surface would not provide information concerning subsurface radioactivity contamination due to attenuation of the gamma radiation. However, biased core sampling at selected locations where subsurface contamination is suspected is often used in RI/FS investigations to obtain data in a cost-efficient manner.

Approximately 1,200 core samples were collected: 1,000 on the original Mound Plant property and 200 on the new property. The majority of the core locations were sampled to a depth of about 8 ft to 10 ft, with some sampled as deep as 20 ft. In general, the depths of core locations on the Main and SM/PP Hills were limited by the presence of shallow bedrock; while in the valley, the depths of the core samples were limited by the capabilities of the drill rig, which encountered problems drilling and sampling below about 25 ft (Stought 1990). The boring logs that are available are included in Appendix B and additional boring logs are presented in the Scoping Report: Volume 2 Addendum (DOE 1992f).

The drilling and sampling were performed using an auger drill rig and a 2-ft, split-barrel sampler. As the split-barrel sampler was removed from the borehole, it was monitored for radioactivity contamination by Mound Plant health physics personnel using a FIDLER to detect radioactivity contamination that would pose a hazard to the workers present. After the soil was removed from the sampler and placed in sample containers, field team members wearing gloves brushed the remaining soil out of the sampler. The gloves were then monitored with an alpha scintillometer before the split-barrel sampler was used again. However, no standard decontamination was performed.

The core locations are shown in Plate 1. The core locations were surveyed by a licensed surveyor after drilling was completed. The available reports submitted to Mound Plant by the drilling subcontractors are presented in Appendix B.

2.1.4. Sample Analyses

2.1.4.1. FIDLER Screening

In order to identify samples with concentrations of plutonium-238 exceeding 25 pCi/g and total thorium exceeding 2 pCi/g, all of the soil samples collected were pulverized and then screened using a Bicron® FIDLER at the Mound Plant Soil Screening Facility, known as trailer 15 at the time of the Site Survey Project. The Soil Screening Facility is now located in the H Building at Mound Plant (Plate 1). The minimum detectable activity at which plutonium-238 can be reliably detected at the Mound Plant screening facility is estimated to be 25 pCi/g (Draper 1986b). The detection of plutonium-238 at lesser concentrations (12-25 pCi/g) was unreliable and had an estimated error of ±75 percent. The estimated error decreased with increasing sample activity; for samples with 25 to 100 pCi/g of plutonium-238, the estimated error was ±35 percent, and for samples with >100 pCi/g, the estimated error was ±30 percent (Casella and Bishop 1984). The minimum detectable activity for thorium from FIDLER screening was estimated to be about 2 pCi/g (Stought et al. 1988). The Mound Plant procedure for screening soil samples is provided in Appendix A.

2.1.4.2. Radiochemical Analysis for Plutonium-238

Because of the high error (±75 percent) involved in the FIDLER screening of samples containing less than 25 pCi/g of plutonium-238, all soil samples were radiochemically analyzed by Mound Plant for plutonium-238. The lower detection limit (LDL) for plutonium-238 by this method was estimated to be 0.01 pCi/g, with a relative precision (two standard deviations) of 25 percent. The overall precision of the plutonium-238 measurements was reported to be about 18 percent (DOE 1991b). The Mound

Plant procedure for the radiochemical analysis of soil samples for plutonium-238 is provided in Appendix A.

2.1.4.3. Radiochemical Analysis for Thorium

Samples with thorium concentrations in excess of 2 pCi/g by FIDLER screening were also radiochemically analyzed for thorium, resulting in the radiochemical analysis of about 12 percent of the samples. The LDLs for the thorium isotopes using radiochemical procedures were estimated to be

- 0.3 pCi/g for thorium-228, with a relative precision of 60 percent;
- 0.3 pCi/g for thorium-230, with a relative precision of 30 percent; and
- 0.1 pCi/g for thorium-232, with a relative precision of 70 percent.

The overall precision for the thorium measurement was reported to be about 25 percent. The thorium results were reported in pCi of total thorium per gram of soil, isotopes were not identified. The Mound Plant procedure for the radiochemical analysis of soil samples for thorium is provided in Appendix A.

2.1.4.4. Gamma Spectroscopy

Gamma spectroscopy was performed by Mound Plant on approximately 350 (18 percent) of the soil samples in order to verify the identity of the radionuclides present when screening indicated the presence of gamma-emitting radionuclides, but little excess plutonium or thorium was identified by radiochemical analysis. Gamma spectroscopy is capable of detecting a variety of gamma-emitting radionuclides; the radionuclides detected in samples collected during the Site Survey Project included cobalt-60, cesium-137, radium-226, actinium-227, and americium-241. No other gamma-emitting radionuclides with gamma energies below 1.5 millielectron volts (MeV) were detected, although the project report stated that subsequent sampling and analysis in some areas indicated bismuth-207 and bismuth 210m. No polonium-210 peaks were detected in the Site Survey Project samples, confirming that polonium-210, which was used at Mound Plant in the 1950s, is no longer present due to radioactive decay (half-life of 138.4 days). The LDLs for cesium-137, cobalt-60, and americium-241 were given with the original data, and were estimated to be 0.5 pCi/g for each. The LDLs for radium-226 and actinium-227 were estimated to be 1.0 pCi/g for both (Stought 1990). The Mound Plant procedure for gamma spectroscopy is provided in Appendix A.

4.1.10. Building 66 Lot Site

A note in the Site Survey Project Report (Table 2.1 in Stought et al. 1988) indicated that elevated levels of plutonium-238 were discovered in an area designated as Block 33. The area of concern is actually located adjacent to Building 66 just south of Building 51 along the upper reach of the plant drainage ditch (Plate 1). This area is referred to as the Building 66 lot site in this report. The Building 66 lot site is enclosed within the boundaries of Area 7 (Plate 1). Internal Mound Plant memoranda reviewed for this report substantiate the note in the project report (Stought et al. 1988) that plutonium-238 concentrations are as high as 7 nCi/g (MRC 1986). Plutonium-238 concentrations, however, ranged widely from less than 25 pCi/g to 7 nCi/g, suggesting very spotty contamination. The data report is included in Appendix E. The levels of plutonium-238 encountered required that the construction project be abandoned at the Building 66 lot site, so the initial holes were simply backfilled and the contamination left in place.

4.1.11. Locations With Elevated Plutonium-238

The evaluation of the Site Survey Project data for the compilation of this report indicated that three potential hot spots contained levels of plutonium-238 in excess of 25 pCi/g. These are all surface locations, numbered S0166, S0208, and S0706 on Table ~~IV.9~~ V.7. These areas indicated plutonium-238 values of 34.5, 61.0, and 28.9 pCi/g, respectively. Surface location 0166 is located near the SW and R Buildings on the Main Hill; surface location 0208 is located northwest of the WD Building; and surface location 0706 is located north of the Area 1 runoff channel that goes west toward Area 2 (Plate 1). The Area 1 runoff channel is located in a ditch, and location 0706 is either on the embankment or in the woods above Area 1. The review of process history indicates that the elevated plutonium-238 activity in the three potential hot spot locations cannot be easily associated with process information. Areas 3, 4 and 4a, 7, 8, 12, and J also indicated elevated levels of plutonium-238. The elevated concentrations are not directly ascribed to process history, but may be due to spills, runoff, or other unknown processes. Descriptions of these areas are provided in companion sections of this report. Areas 3, 7, 8, and 12 are included in section 5; additional descriptions of Area 7 are provided in section 7; areas 4 and 4a are included in section 3; and Area J is described in section 10.

As with several hot spots and other local areas of contamination described in this report, elevated levels of plutonium-238 were discovered in Area 3 during routine surveys conducted during construction activities. The surveys of construction activities have been conducted routinely since 1985, required partly by the specifications for soil destined for the spoils disposal area. In August 1988, during survey of the dismantling of a portion of the sludge drying beds adjacent to the wastewater treatment facility, elevated levels of thorium and plutonium were fr

Table V.7. Isolated Locations of Elevated Activity

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
C0007[c]	1800	1860	8352	11-84	54	0.39	41.63					
			8353	11-84	108	0.06	5.14					
C0028	2375	1765	1245	12-82	18	1.40	5.61					
			1246	12-82	48	NR	109.00					
			1247	12-82	66	NR	100.00					
			1248	12-82	102	NR	58.00					
			1250	12-82	156	NR	97.00					
			1251	12-82	216	0.20	29.45					
			1252	12-82	234	0.06	b					
			1253	12-82	252	0.03	b					
S0166	1750	3350	4000	10-83	0	34.50	b					
S0175	1375	3580	9845	06-85	0	NR	NR		82	10	0.8	LDL
S0208	1660	3765	3085	10-83	0	61.00	b	0.72				
S0307	2175	2060	2821	10-83	0	5.36	6.46					
S0425	2500	2945	4108	10-83	0	1.08	5.74					
S0472	2175	3505	9701	08-84	0	1.2	7.50					

Table V.7. (page 2 of 2)

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
S0647[d]	3349	2610	2778	10-83	0	NR	NR		LDL	270	LDL	LDL
S0706	3325	4035	4021	07-84	0	28.90	b					
S0971	4075	3025	5958	07-84	0	0.15	5.02					
S0982	3625	3025	5944	07-84	0	0.43	14.94					
S1092	3185	3362	8413	12-84	e	231	323.5[f]					

[a]Map locations are given using a "C" to designate core locations and an "S" to designate surface locations.
[b]A "b" indicates that the total thorium concentration was less than the background level of 2 pCi/g, using FIDLER screening. Therefore, radiochemical analysis was not performed.
[c]The boring log for this location indicates that sampling was not performed to bedrock (Appendix B).
[d]Contaminated soil was excavated from this location in 1984. Post-cleanup soil concentrations of cesium-137 were less than 2 pCi/g (Draper 1984).
[e]The depth given for this sample was "SS." For mapping purposes (Plate 1), this is assumed to be a surface sample.
[f]Isotopic results are available for this sample and include 0.99 pCi/g of thorium-228; 321 pCi/g of thorium-230, and 1.5 pCi/g of thorium-232, for a total of 323.5 pCi/g of thorium.
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.
MRC ID - Monsanto Research Corporation identification
NR - No result given
pCi/g - picocuries per gram
pCi/mL - picocuries per milliliter

MANAGERS — DESIGNERS/CONSULTANTS

ER PROGRAM

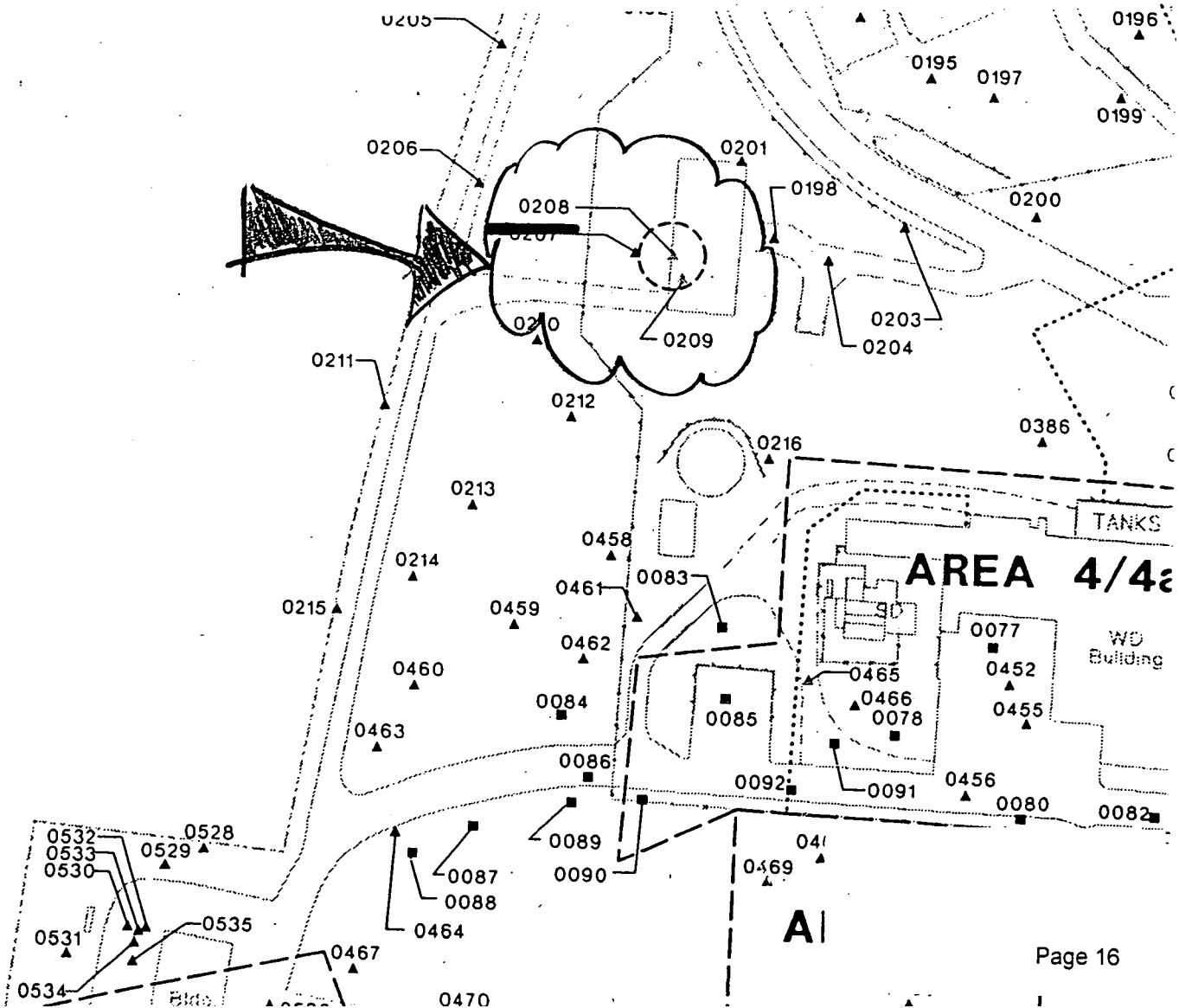
MOUND PLANT

Miamisburg, Ohio

PLATE 1
(1 of 2)

Site Survey Project Sampling Locations

Prepared for
Site Scoping Report: Volume 3,
Radiological Site Survey



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

Table 3.1 Area Designations

Location	Designation	Location	Designation
Area 5	05	Hot Spot S0166	80
Area 8	08	Hot Spot S0425	81
Area 8 (continued)	88	Hot Spot S0971	83
Area 9	09	Hot Spot S0982	84
Area 9 (continued)	99	Hot Spot S0175	85
Area 10	10	Hot Spot S0647	86
Area 12	12	Hot Spot C0028	87
Area 12 (continued)	72	Hot Spot S0307	90
Area 20	20	Hot Spot S0472	91
Area 23	23	Hot Spot S1092	92
Plant Drainage Ditch	66	Hot Spot S0208	93
Plant Drainage Ditch (cont.)	67	Hot Spot C0007	94

Based on field and Mound Rad Lab data, specific locations were targeted for resampling and offsite analysis. Generally, areas exhibiting the highest observed radionuclide concentrations, or the highest field instrument readings were targeted. Soil collected from these locations were split into representative samples and shipped to both Quanterra Environmental Services, Inc. (Quanterra) for alpha, beta, and gamma spectroscopy, and to Thermo Analytical, Inc. (TMA) for VOC, SVOC, TCLP metals, and cyanide analyses as defined in Section 5.4. All samples were packaged and shipped according to current International Air Transport Association (IATA) regulations. All containers provided for these samples were certified as clean according to US Environmental Protection Association (EPA) standards. The certifications are on file for each lot of containers.

3.1.1.3 Screening

All samples collected in the field were subject to a sequential process of field and onsite laboratory screening in order to determine the extent of contamination. Samples were field screened first for radioactivity, then organic compounds, then were split for radiological compound analyses and PXRF analyses. If health-based action levels were exceeded in the field, then subsequent handling was terminated. These samples were placed in appropriate investigated derived materials (IDM) containers without subsequent handling. Figure 3.1 shows a flow chart for soil screening activities.

S0472

Mound Rad Lab analyses of soil samples collected at S0472 showed elevated Pu238 concentrations at the historic location and 10 feet to the south. After consultation with the Mound Project Engineer, 3 additional locations were sampled to define the extent of contamination.

The north sample location originally identified in the SAP could not be sampled and screened due to overhead and underground utilities. Mound services were required in order to remove two sections of fence north of S0472 to allow safety tie-off of the track rig during sampling operations.

S0647

In order to provide ample sample for Mound Rad Lab and PXRF analyses, the surface sample was incorporated into the 0- to 4-ft. composite sample.

S1092

REFUSAL AT 3 FEET.

Samples from all 5 locations at S1092 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.

S0706

The services of a local contractor were required to remove brush, small trees, dead wood and branches from the S0706 locations. Sampling of S0706 was eliminated 24 July 1995 due to descoping of the project by Mound.

3.2 Laboratory Methods

3.2.1 Onsite Radiological Screening Methods

Onsite screening was initially performed using a bicron detector to determine the concentration of Pu238 and Th232. The analyses were performed by EG&G Mound following procedure 1355 in Manual PD-80030. The estimated minimum detectable activity (MDA) is 25 pCi/g for plutonium and 5 pCi/g for thorium. Approximately 47 percent of the samples were screened by this procedure.

In June 1995, EG&G Mound began performing onsite screening using a gamma spectrometer. A method description for the Gamma scan is included as Appendix B to this report. The gamma spectrometry scans permitted EG&G to report the concentrations of a larger number of radioisotopes. However, while more isotopes could identified, the minimum detectable activity for Pu238 increased to 75 pCi/g. The reduced sensitivity to

Table 5.1 Mound Radiological Laboratory Screening Summary

Sampling Area	*Suspect Contaminants*	*Screening Method*	*Average Minimum Detection Limits (pCi/g)*
Area 90 (S0307)	Plutonium	Gamma Scan	47.26
	Thorium		0.6 minimum
Area 91 (S0472)	Plutonium	Gamma Scan	100.66
	Thorium		0.5 minimum
Area 92 (S1092)	Plutonium	Gamma Scan	140.05
	Thorium		0.43 minimum
Area 93 (S0208)	Plutonium	Gamma Scan	31.79
	Tritium		NA
Area 94 (C0007)	Plutonium	Gamma Scan	27.67
	Thorium		0.15 minimum

Due to the nature of the Bicron method in the early portion of the project, limited information can be derived from early Mound Radiological Laboratory screening of samples from non-Plutonium and non-Thorium areas. This will be discussed in Section 6.0.

The gamma scan method used in the latter portion of the project resulted in a previously unavailable data set for a range of additional radionuclides. Of these, D&D action levels were available for Radium 226, Cesium 137, and Americium 241.

Mound Rad Lab Data was tabulated for a total of 10 radionuclides analyzed by the gamma scan method. The radionuclides which were tabulated are:

Cobalt 60	Actinium 227	Protactinium 231	Americium 241
Cesium 137	Thorium 230	Uranium 238	
Radium 226	Thorium 232	Plutonium 238	

The data presented in this section has been limited to those for which D&D has established action levels. The tabulated values for the radionuclides reported by the Mound Rad Lab have been included as an Appendix G to this report.

Field measurements presented in this section include only those of samples which exceeded established action levels. The action levels adopted for the Other Soils project include:

- D&D reporting levels for FIDLER readings
- instrument detection limits for organic vapor analyzers
- correlated TCLP limits for metals detected by the PXRF
- D&D action levels for radiological compounds found in soil samples by the Mound Radiological Laboratory

Data 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:

S0208

One sample from hot spot S0208 (Area 93) triggered field screening action levels:

- One sample exceeded limits for hazardous compounds

Elevated concentrations of Chromium were detected by the PXRF in soil samples collected from the site.

Table 5.17 shows Hot Spot S0208 field results exceeding action levels. Figure 5.22 graphically represents Hot Spot S0208 field sampling results.

Table 5.17 Hot Spot S0208 Field Sampling Results

	FIDLER		Organics		Rad Laboratory					
Sample ID	Channel 1 (1K)	Channel 2 (5K)	OVA	OVM	Pu 238 (25)		Th 232 (5)	Ra 226 (5)	Cs 137 (15)	Am 241(20)
9301-5002	<1000	<5000	<1	NA	<28	U	0.2	0.9	<0.01	<0.03

	PXRF Metals									
Sample ID	As (102.07)	Ba (1489)	Cd	Cr HI	Cr LO (164.43)		Pb (172)	Hg	Se	Ag (2559)
9301-5002	66.626	132.31	<44.5	<347	229.11	*	<10	<37	<14	58.5042

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

THIS VALUE IS MORE THAN 3 MAGNITUDES LESS THAN THE RISK BASED SOIL GUIDELINE FOR Cr LO (Cr III)

Table 5.18 shows Hot Spot C0007 field results exceeding action levels. Figure 5.23 graphically represents Hot Spot C0007 field sampling results.

Table 5.18 Hot Spot C0007 Field Sampling Results

	FIDLER		Organics		Rad Laboratory					
Sample ID	Channel 1 (1K)	Channel 2 (5K)	OVA	OVM	Pu 238 (25)		Th 232 (5)	Ra 226 (5)	Cs 137 (15)	Am 241(20)
9404-5004	<1000	<5000	<1	<1	<35.9	U	0.4	1.3	<0.01	<0.03
9404-5008	<1000	<5000	<1	<1	80.7	*	0.23	0.78	<0.05	<0.05

	PXRF Metals									
Sample ID	As (102.07)	Ba (1489)	Cd	Cr HI	Cr LO (164.43)		Pb (172)	Hg	Se	Ag (2559)
9404-5004	86.687	137.26	<44.5	<347	253.88	*	<10	<37	<14	30.4994
9404-5008	72.676	261.32	<44.5	<347	<80.7	*	<10	<37	<14	58.6747

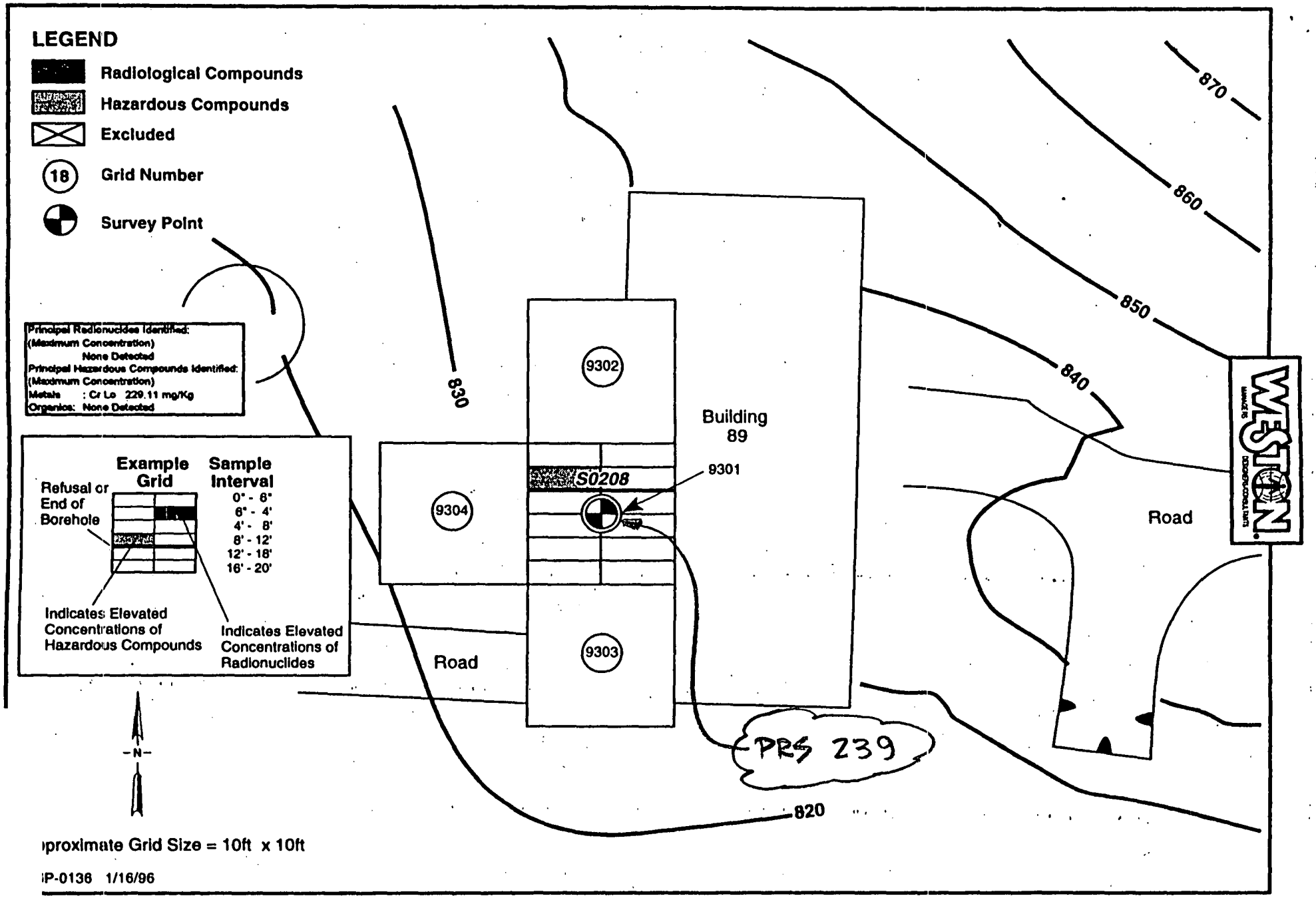


FIGURE 5.22 HOT SPOT S0208

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
- 01 = Historical Hot Spot Location
- 02 = Approx 10 feet north of historical location
- 03 = Approx 10 feet south of historical location
- 04 = Approx 10 feet west of historical location
- 05 = Approx 10 feet east of historical location

ZZ = Sample Type
- 50 = Soil

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

WESTON

SHEET ____ of ____

CLIENT/SUBJECT S0208 93xx W.O. NO. ____

TASK DESCRIPTION ____ TASK NO. ____

PREPARED BY ____ DEPT ____ DATE ____

MATH CHECK BY ____ DEPT ____ DATE ____

METHOD REV. BY ____ DEPT ____ DATE ____

APPROVED BY ____ DEPT ____ DATE ____

Sample ID	Rad Laboratory (25) Plutonium	(5) Thorium	Fidler (1K) Channel 1	(5K) Channel 2	α	β	Organics OVA	OVM	Metals
9301-5002	U	—	—	—	—	—	—		
9302-5002	U	—	—	—	—	—	—		
9303-5002			—	—	—	—	—		
9304-5002	U	—	—	—	—	—	—		
OTH → 9303-5001	U	—	—	—	—	—	—		

OTHER SOILS FIELD SAMPLING DATA

Blank entry	Sample results not currently available.
U	Sample resolution undistinguishable from preset Field Action Levels.
-	Sample results less than preset Field Action Levels.

RISK-BASED GUIDELINE VALUES

MOUND PLANT
MIAMISBURG, OHIO

December 1995

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and the
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U.S. DEPARTMENT OF ENERGY

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FINAL
(REVISION 3)

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
High Explosives												
HMX				5.50e+04								
PETN												
RDX	2.70e+03	2.70e+02	2.70e+01	3.20e+03								
Inorganics												
Aluminum												
Antimony				4.25e+02								
Arsenic				3.20e+02	6.00e+05	6.00e+04	6.00e+03					
Barium				7.50e+04				1.55e+07				7.50e+04
Beryllium	7.00e+01	7.00e+00	7.00e-01	5.50e+03	3.65e+06	3.65e+05	3.65e+04		7.00e+01	7.00e+00	7.00e-01	
Cadmium (Diet)				1.05e+03	5.00e+06	5.00e+05	5.00e+04					
Chromium III				1.05e+06								
Chromium VI				5.50e+03	7.50e+05	7.50e+04	7.50e+03					
Cobalt												
Copper												