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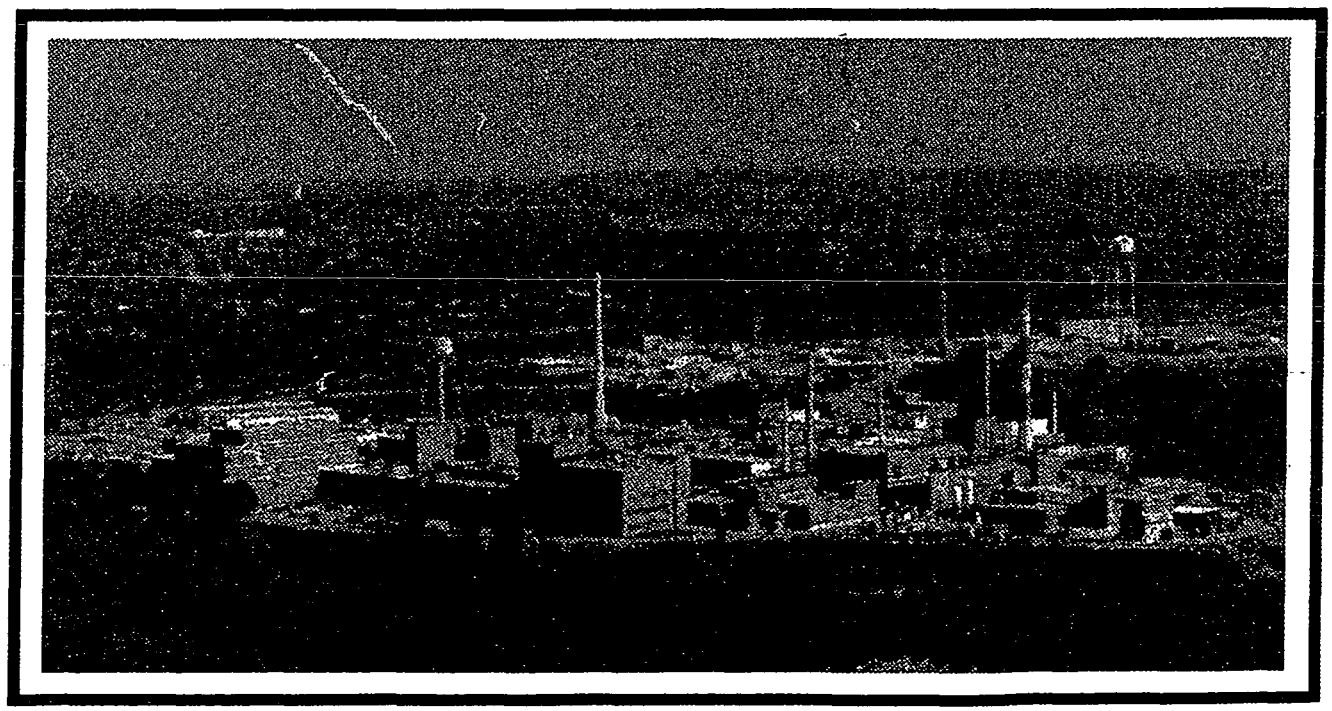
MOUND

Environmental
Restoration
Program

MOUND PLANT

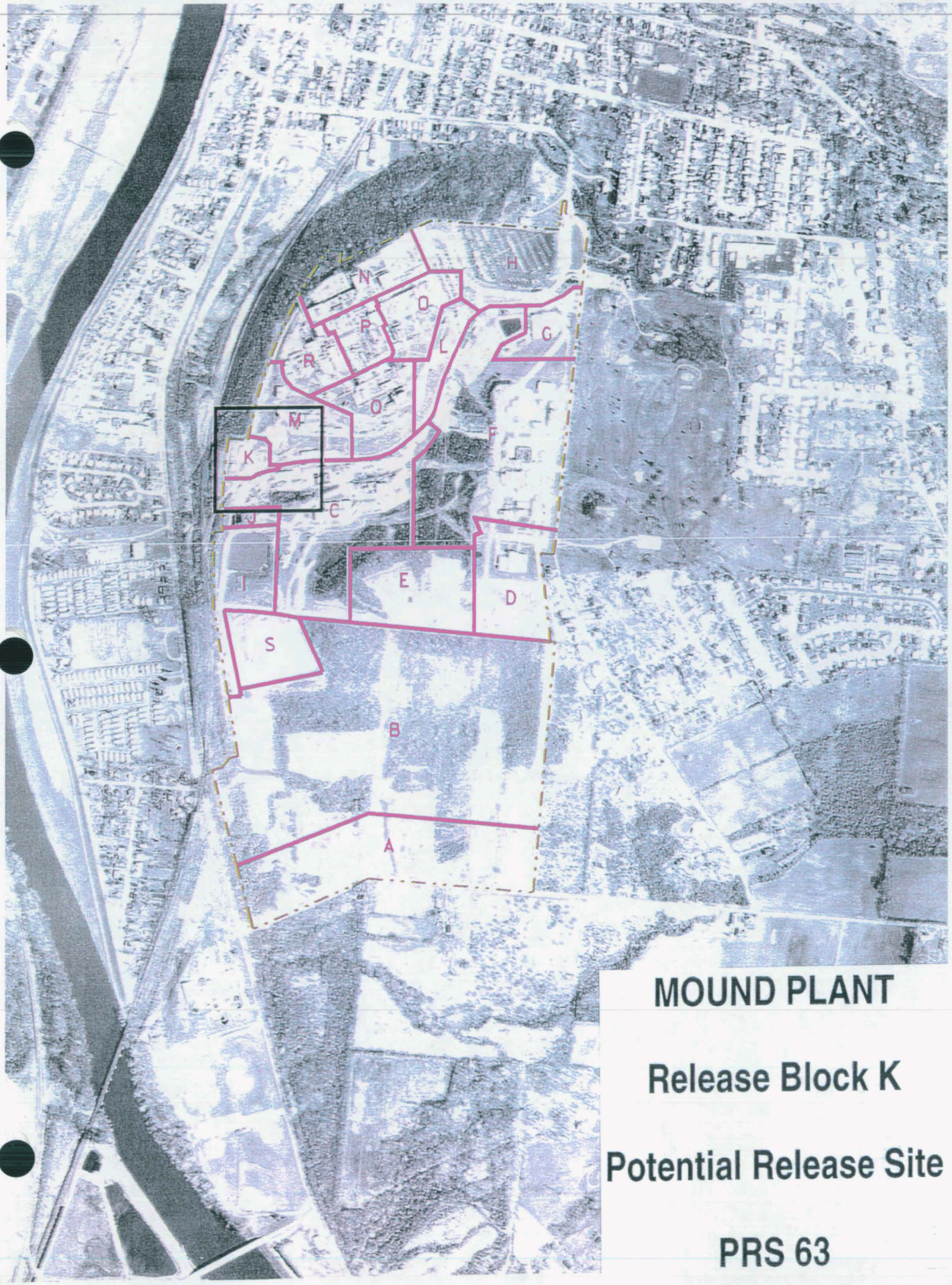
Potential Release Site Package

PRS # 63



PRS 63

REV	DESCRIPTION	DATE
PUBLIC RELEASE 0	Available for comments.	Aug. 25, 1997
FINAL 1		

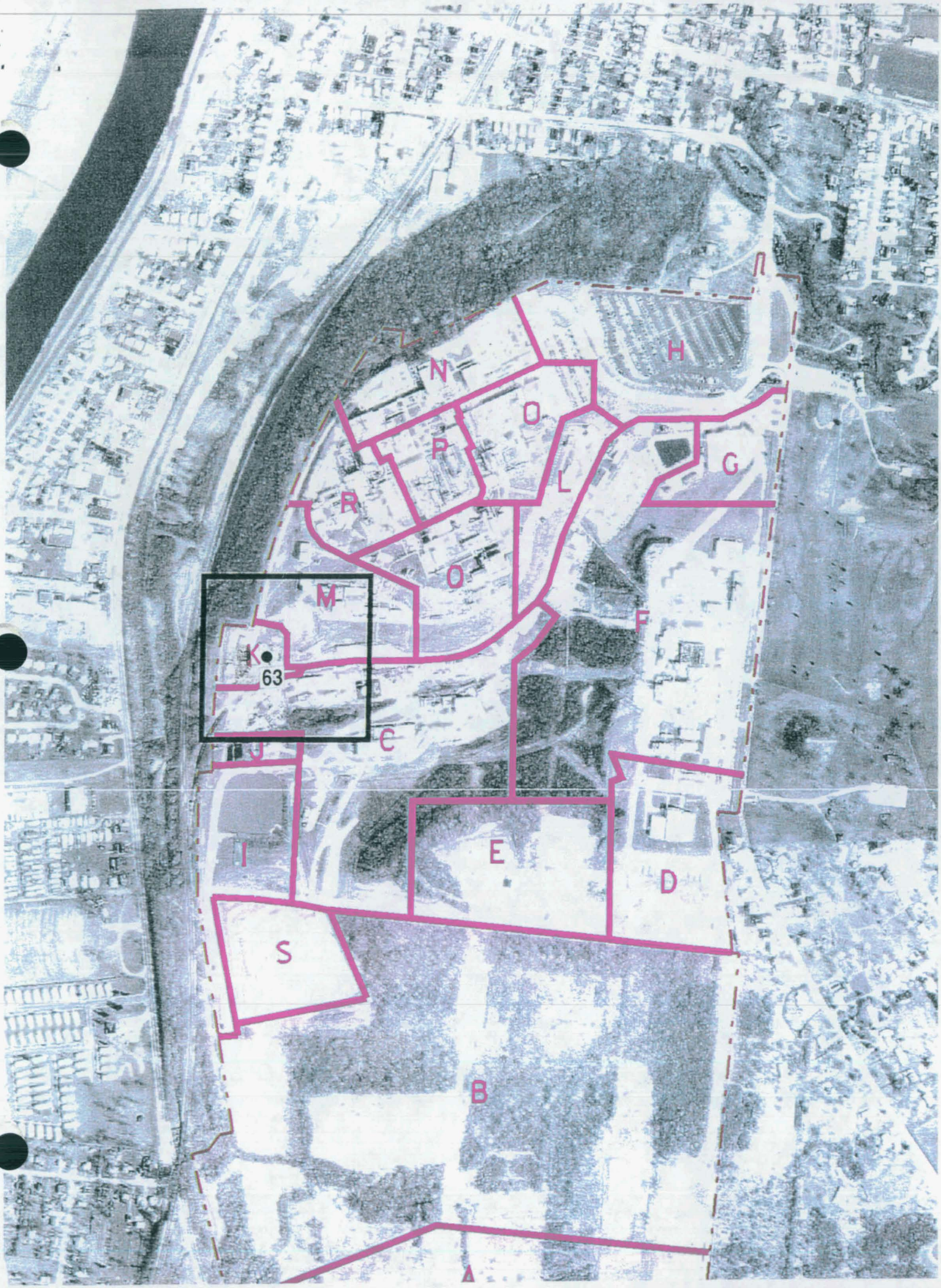


MOUND PLANT

Release Block K

Potential Release Site

PRS 63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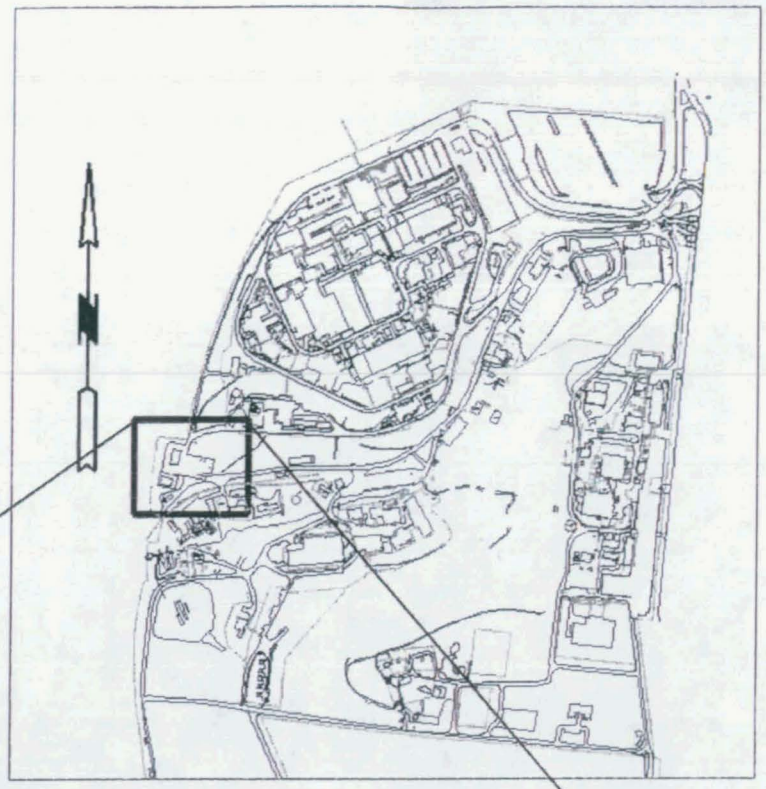
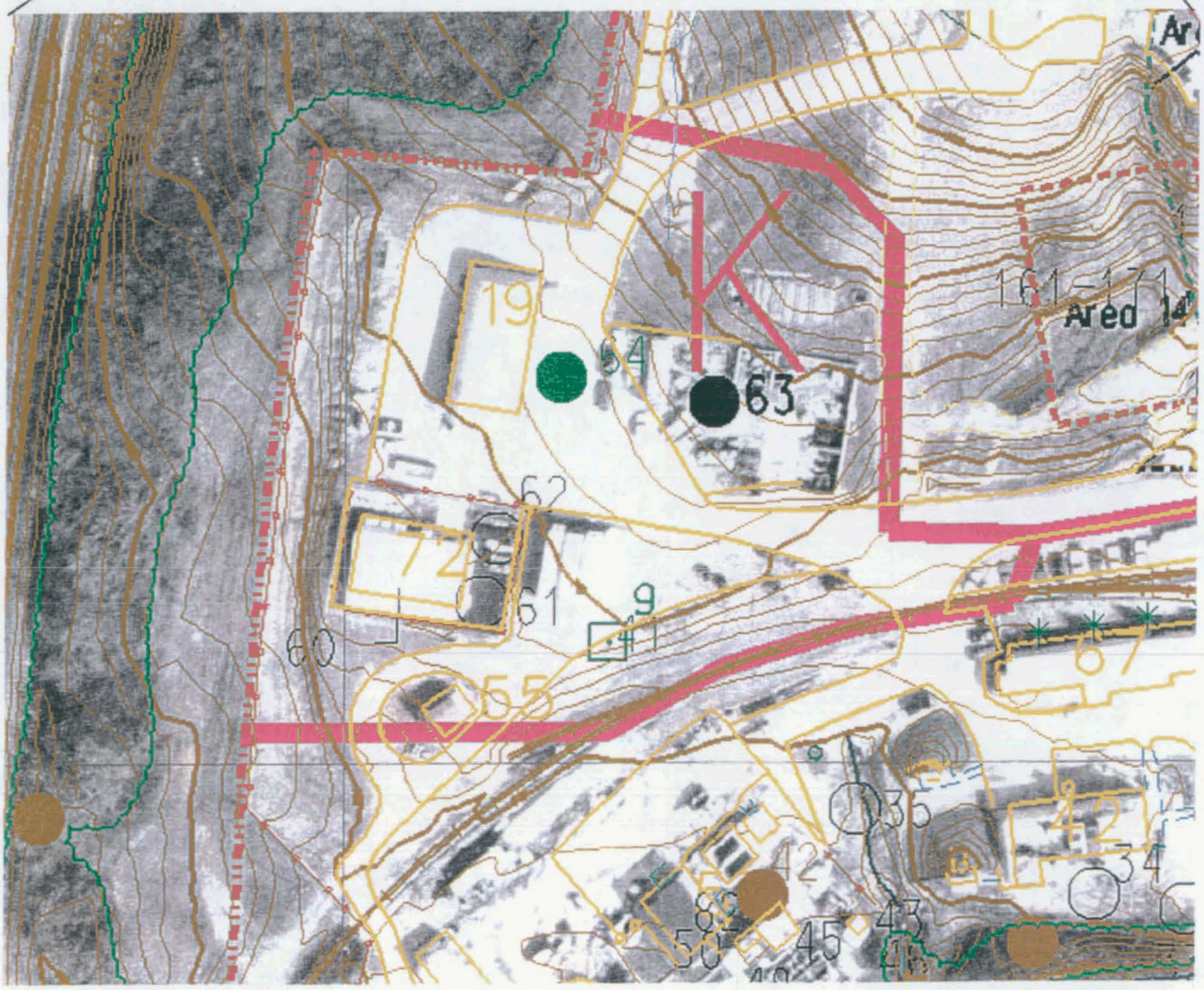
Release Block K

Potential Release Site

PRS 63





63

PRS 63

PRS HISTORY:

PRS 63 is an approximately two square foot area located on the pavement just south of Building 19. This site became a PRS due to cobalt-60 and cesium-137 contamination.[1]

Building 19 was used for storage and redrumming of thorium in the late 1950s and early 1960s. On the evening of May 31, 1984, an incident occurred at this location when a drain pipe, unknowingly contaminated with cobalt-60 and cesium-137, was removed from T Building and placed on the pavement outside of Building 19.[6] Contamination from the pipe was spread over approximately two square feet of pavement.[6] The pavement was decontaminated the following day.[6]

CONTAMINATION:

1) In 1984, the Radiological Site Survey[2] investigated Mound soils for radionuclides via Mound's Soil Screening Facility, radiochemistry and gamma spectroscopy. Fourteen core borings were analyzed from four locations near PRS 63 (C099, C0100, C0101, and C0102). The samples were analyzed for plutonium and thorium. Results showed:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Plutonium-238	32.4 pCi/g [ref 2] (in soil @ 1.5 feet)	25 pCi/g (Mound ALARA in soil)
Thorium-232	less than 2 pCi/g [ref 2] (in soil)	5 pCi/g [ref 4] (in surface soil)

NOTE: pCi = picocuries, g = grams, ALARA = as low as reasonably achievable

2) In 1992, the Reconnaissance Investigation[3] investigated VOCs by soil gas/gas chromatography. Eight types of VOC compounds were investigated at sample 5221 located in the immediate vicinity of PRS 63. Results showed:

Contaminant	Maximum Concentration Detected	Calculated Guideline Criteria
TCE	66 ppb [ref 3]	2,400 ppb [ref 8]
Freon 11	21 ppb	730,000 ppb
Freon 113	131	No criteria available

READING ROOM REFERENCES:

1) OU9 Site Scoping Report: Volume 12 - Site Summary Report September 1994. (pages 25-34)
2) OU9 Site Scoping Report: Volume 3 - Radiological Site Survey June 1993. (pages 5-17)
3) Reconnaissance Sampling Report Soil Gas Survey and Geophysical Investigations, Main Hill and SM/PP Hill Report, Appendix A, February 1993. (pages 18-21)
4) OU9, Site Scoping Report: Volume 11 - Spills and Response Actions. (pages 22-24)
5) OU5, Operational Area Phase I Investigation Non-AOC Field Report: Volume II, Final Revision 0, June 1995). (pages 35-41)

OTHER REFERENCES:

6) MRC No. 84-11, Investigation of T-16 Drain Piping Incident, June 15, 1984. (pages 42-45)
7) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.41.
8) Comparison of Actual Soil Gas Values with Calculated Soil Gas Values, March 5, 1996. (pages 46-48)

PREPARED BY:

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

SUPPLEMENT
PRS 63

As a result of the October 2nd binning meeting, it was decided that an additional investigation of PRS 63 was necessary because no quantitative verification documentation existed that verified a successful clean-up. Hence, further assessment was performed to determine if Cs-137 or Co-60 residuals were still present.

On October 10, 1996, a FIDLER scan was performed on PRS 63. The scan found one location of significant FIDLER activity. This location had a FIDLER reading of approximately 50,000 counts per minute (background was approximately 5,000 counts per minute.[9]

On October 16, 1996, a portable intrinsic germanium detector analyzed the FIDLER location referenced above. Although results of the investigation failed to positively identify the isotope(s) present, the analysis did conclude that the radiological activity was due primarily to a continuous gamma spectrum from approximately 20 to 350 kev (no gamma peaks were found in this spectral range). Additionally, the contamination was estimated to be 3 to 5 cm below the surface (paved asphalt) and the area of contamination estimated to be of the order of a few square centimeters.[9]

REFERENCES

9). PRS #63, "*Metal Laydown Area*", electronic mail from Doug Draper to George Liebson, Nov 7, 1996. (Pages 49-51)

MOUND PLANT
PRS 63
Soil Contamination – Building 29

RECOMMENDATION:

This site became a PRS because of potential Cobalt-60 and Cesium-137 contamination. On May 31, 1984, a drainpipe, contaminated with these radionuclides, was removed from T Building and placed in a salvage area near Building 19. Contamination from the pipe was spread over a two square foot area of pavement outside Building 19. The pavement was decontaminated the following day.

In October 1996, a FIDLER detector indicated elevated gamma ray emissions. Subsequent measurements using a germanium detector confirmed these elevated readings, but could not confirm which isotopes were present.

The Core Team originally recommended Further Assessment for PRS 63. Subsequently, the cost of further investigation versus the cost of removing the potentially contaminated soils was evaluated. Cost estimates indicate that the cost of removal is not significantly greater than the cost of further assessment at PRS 63. Additionally Further Assessment findings may indicate the need for a Response (removal) Action, resulting in costs associated with both Further Assessment and Response Action. Therefore, the Core Team recommends a RESPONSE ACTION as a more cost-effective course of action for PRS 63.

CONCURRENCE:

DOE/MEMP: Arthur W. Kleinrath, Remedial Project Manager — 8/13/97 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager — 8/18/97 (date)

OEPA: Brian K. Nickel, Project Manager — 8/13/97 (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from _____ to _____

☐ No comments were received during the comment period.

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

REFERENCE MATERIAL
PRS 63

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 undocumented areas of soil

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.

2.1.4.5. *In Situ* Gamma Spectroscopy

In situ gamma spectroscopy was performed mainly at Areas 1 and 8, at two locations in Area 12, and at two locations not associated with a defined area, to determine subsurface thorium-232 concentrations. The *in situ* spectroscopy was performed by driving pipes to bedrock and lowering a sodium iodide detector down the pipes. The detector was coupled to a multichannel analyzer that was calibrated to thorium-232 with a measurement system sensitivity of about 1 pCi/g, or 0.5 pCi/g ±50 percent, at a confidence level of 95 percent. This procedure was performed by Radiation Management Corporation (RMC) and the pipes were put in place by Bowser-Morner, Inc., a local drilling contractor. The reports submitted to Mound Plant on this procedure are included in Appendix C. The logs of these borings are provided in Appendix B.1. The pipes were left in place at the completion of the Site Survey Project. A review of the data in Appendix B.1 and Appendix C indicates a lack of correlation between the depth of gamma surveys and borehole depths.

2.1.4.6. Tritium in Soil Moisture

Tritium has also been used at Mound Plant for many years, mainly at the SW Building. To evaluate possible tritium in soils, liquid scintillation analysis was performed by the Site Survey Project on approximately 5 percent of the soil samples collected. The soil moisture was distilled from the soil samples and then analyzed for tritium using the same method used for the analysis of tritium in urine. The procedure was capable of detecting 1.0 picocuries per milliliter (pCi/mL) of tritium. Soil samples that appeared to contain sufficient soil moisture were selected for tritium analysis.

The procedure for measuring tritium in urine samples is included in Appendix A. A review of this procedure reveals two potential problems:

- the quench curves used for urine may not be applicable to environmental (soil) samples, and
- if the soil moisture was distilled using a typical open system, the samples would have been prone to cross-contamination, which would have resulted in reduction or elimination of any quality control measures.

2.2. SUMMARY OF MEMORANDA DOCUMENTING FIELD ACTIVITIES

The memoranda prepared by Mound Plant concerning the Site Survey Project field activities and sample analyses are presented in Appendix A of this report. These memorandums include the following:

Area 2 do not provide any information concerning the historic disposal trenches. The elevated thorium concentration detected in a sample collected from core location 0191 at a depth of 108 inches may be indicative of some subsurface elevated thorium activity. It is not clear that C0190 was not deep enough to sample the buried thorium drums directly. Corehole 0190 was positioned in the right place to sample the area of drum burial, but it was only 36 inches deep.

5.4. AREA 3

Area 3, located in the area surrounding Buildings 19 and 72 on the western border of Mound Plant, was used for storage and redrumming of thorium in the late 1950s and early 1960s (MRC, 1973). As with Area 1, Area 3 has a varied and complex history. A photo interpretive history of the historic landfill and Area 2 is provided in the Site Scoping Report: Volume 6 - Photo History (DOE 1992b). In 1965, thorium-contaminated soil was reportedly scraped, and the area was graded (MRC, 1985; Stought et al., 1988). The excavated area was then backfilled with clean soil. No documentation of this activity was found during the research for the scoping reports. A small section of Area 3, near Building 19, may have been contaminated by either the 1969 plutonium-238 waste line break that created Area 14, or by the cleanup operations that followed the break. This event also resulted in the contamination of an offsite area, known as the runoff hollow, west of the fenceline at the western edge of Area 3 (Rogers 1975). Because the runoff hollow is outside the boundary of Mound Plant and was sampled as part of the Miami-Erie Canal investigation (Rogers 1975), it was not addressed by the Site Survey Project. The Miami-Erie Canal is not addressed in this report.

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The extent of Area 3 shown on Plate 1 was determined by an evaluation of the site survey data conducted in preparation for this report, and appears to be in agreement with the Area 3 shown in the original Site Survey Project Report. Similarly, both this report and the original report show most of the elevated plutonium-238 activity as being present near Building 19 (core locations 0099, 0100, 0101, 0102, and 0104 on Plate 1; C099, C0100, C0101, C0102, and C0104 on Table V.2) and in the southwest corner of the area (surface locations 0547, 0548, 0550, 0552 on Plate 1; S0547, S0548, S0550, and S0552 on Table V.2). The maximum plutonium-238 concentration reported for samples collected from Area 3, 50.60 pCi/g, was detected in the sample collected from core location C0104 at a depth of 18 inches. Only five samples contained plutonium-238 concentrations greater than 25 pCi/g. These plutonium-238 concentrations were used to develop the isoconcentration lines shown on Plate 4.

PRS

PRS

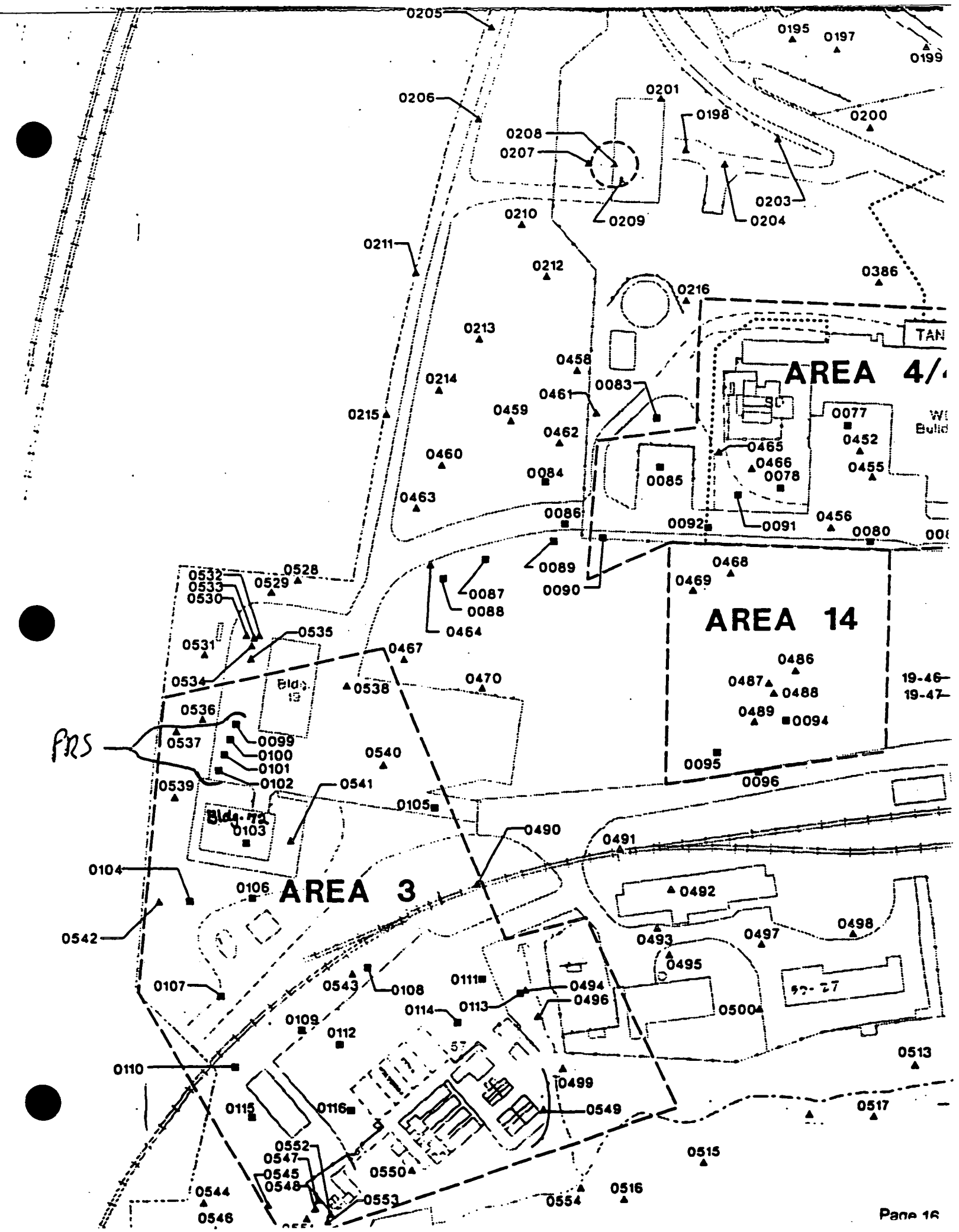
Only four of the samples collected in Area 3 contained levels of total thorium in excess of 2 pCi/g. The maximum concentration, 5.30 pCi/g, was detected in a surface sample collected from location 0547 (S0547 on Table V.2). Review of the data for this report indicates that the summary provided

Table V.2. Mound Site Survey Project - Area 3

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)
C0099	1965	4265	10419	08-85	18	31.4	b
			10420	08-85	36	14.7	b
C0100	1975	4275	10421	08-85	18	32.4	b
			10422	08-85	36	17.7	b
			10423	08-85	54	12.4	b
			10424	08-85	72	10.1	b
C0101	1985	4285	10425	08-85	18	22.0	b
			10426	08-85	36	0.90	b
			10427	08-85	54	0.34	b
			10428	08-85	72	0.71	b
C0102	1995	4295	10429	08-85	18	10.4	b
			10430	08-85	36	6.44	b
			10431	08-85	54	2.16	b
			10432	08-85	72	0.93	b
C0103	2060	4300	1624	04-83	18	0.26	3.95
			1625	04-83	36	0.50	b
C0104	2085	4365	1622	04-83	18	50.80	b
			1623	04-83	36	5.28	b
C0105[c]	2100	4140	7804	10-84	90	0.47	b
			7805	10-84	180	0.01	b
C0106	2105	4315	1628	10-84	18	0.41	b
			1626	10-84	36	0.13	b
C0107	2170	4375	1620	04-83	18	0.69	b
			1621	04-83	36	0.07	2.56
C0108	2200	4250	1632	04-83	18	0.25	b
			1633	04-83	36	0.14	b
C0109	2225	4325	1658	04-83	18	2.30	b
			1659	04-83	36	0.66	b
			1660	04-83	54	0.47	b
C0110	2230	4390	1628	04-83	18	0.48	b
			1629	04-83	36	0.14	b
C0111	2250	4165	1636	04-83	18	0.82	b
			1637	04-83	36	0.21	b
C0112	2250	4300	1640	04-83	18	0.02	b
			1641	04-83	36	0.03	b
C0113[c]	2275	4140	7759	09-84	90	2.83	b
			7760	09-84	180	0.03	b
C0114	2275	4200	1638	04-83	18	0.16	b
			1639	04-83	36	0.01	b

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
S0525	2675	4010	5891	07-84	0	0.59[c]	b					
S0526	2700	3860	2687	09-83	0	4.46	b					
S0527	2700	3935	5890	07-84	0	0.20	b					
S0528	1875	4165	7165	09-84	0	0.27	b					
S0529	1875	4190	7166	09-84	0	0.51	b					
S0530	1900	4225	10497	08-85	0	0.41	b					
S0531	1900	4265	2662	10-83	0	1.27	b					
S0532	1905	4215	10498	08-85	0	0.48	b					
S0533	1905	4220	10496	08-85	0	1.84	b					
S0534	1910	4225	10495	08-85	0	1.13	b					
S0535	1920	4230	10494	08-85	0	0.51	b					
S0536	1950	4290	7167	09-84	0	2.20	b					
S0537	1950	4315	2683	10-83	0	0.17	b					
C0099	1965	4265	10419	08-85	18	31.40	b ← PRS					
			10420	08-85	36	14.70	b					
S0538	1975	4165	7165	09-84	0	5.94	b					
C0100	1975	4275	10421	08-85	18	32.40	b ← PRS					
			10422	08-85	36	17.70	b					
			10423	08-85	54	12.40	b					
			10424	08-85	72	10.10	b					

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
PRS→ C0101	1985	4285	10425	08-85	18	22.00	b					
			10426	08-85	36	0.90	b					
			10427	08-85	54	0.34	b					
			10428	08-85	72	0.71	b					
PRS→ C0102	1995	4295	10429	08-85	18	10.40	b					
			10430	08-85	36	6.44	b					
			10431	08-85	54	2.16	b					
			10432	08-85	72	0.93	b					
S0539	2000	4340	7168	09-84	0	10.20	b					
S0540	2050	4165	2685	10-83	0	36.94	b					
C0103	2060	4300	1624	04-83	18	0.26[c]	3.95[c]					
			1625	04-83	36	0.50	b					
S0541	2075	4265	2688	10-83	0	0.64	b					
S0542	2075	4390	2684	10-83	0	0.83	b					
C0104	2085	4365	1622	04-83	18	50.60	b					
			1623	04-83	36	5.28	b					
C0105	2100	4140	7804	10-84	90	0.47	b					
			7805	10-84	180	0.01	b					
C0106	2105	4315	1626	04-83	18	0.41	b					
			1626	04-83	36	0.13	b					
(Both samples from this core location were assigned MRC ID 1626.)												
C0107	2170	4375	1620	04-83	18	0.69	b					
			1621	04-83	36	0.07[c]	2.56					
C0108	2200	4250	1632	04-83	18	0.25	b					
			1633	04-83	36	0.14	b					


AREA 4/
AREA 14
AREA 3
Bldg. 13
Bldg. 72
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19-46
19-47
PRS
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0206
0195
0197
0199
0201
0198
0200
0208
0207
0203
0204
0209
0210
0211
0212
0386
0216
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0458
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0083
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0452
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ER PROGRAM

MOUND PLANT

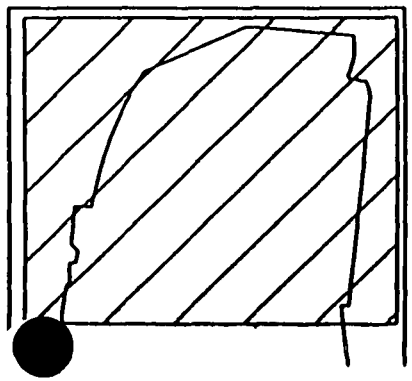
Miamisburg, Ohio

PLATE 1
(1 of 2)

Site Survey Project Sampling Locations

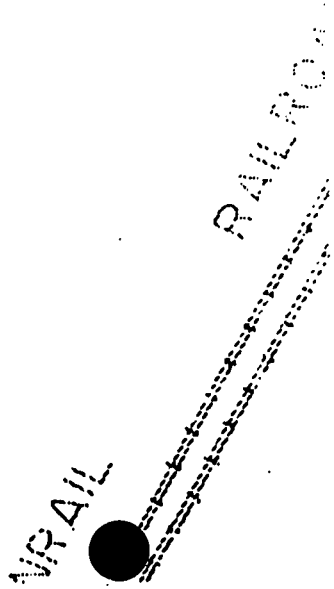
Prepared for

Site Scoping Report: Volume 3,
Radiological Site Survey



Legend

- Structure
- Paved road
- Dirt road
- Water
- Mound Plant Boundary
- 0015 Surfa[illegible] Location



Environmental Restoration Program

RECONNAISSANCE SAMPLING REPORT SOIL GAS SURVEY AND GEOPHYSICAL INVESTIGATIONS, MOUND PLANT MAIN HILL AND SM/PP HILL

REPORT
APPENDIX A

MOUND PLANT
MIAMISBURG, OHIO

February 1993

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

Table II.11 summarizes the Area 7 blank samples which contained VOC concentrations. Toluene was detected in various trip, ambient, and field blank samples associated with the Area 7 sampling effort at concentrations ranging from 3 to 186 ppb.

2.3.5. Main Parking Lot and Southwest of Main Hill

The contingency sampling effort conducted during the final week of the soil gas survey included the collection of five Main Parking Lot soil gas samples and six soil gas samples southwest of the Main Hill. All were collected from a depth of 5 feet. Table II.12 summarizes the detections from the Main Parking Lot and southwest of Main Hill sampling efforts.

At the Main Parking Lot only toluene was detected. Samples 2216 and 2219 contained toluene at 104 and 11 ppb, respectively (Figure 2.37). Toluene was detected in an ambient blank sample at location 2220 at a concentration of 8 ppb, but this sample was collected one day after the detections described above. No other blanks contained measurable concentrations of target compounds.

Southwest of the Main Hill four of the target compounds were detected. Most of these occurred in sample 5221, which was collected adjacent to Building 19. Freon 11, Freon 113, and TCE were detected in sample 5221 at concentrations of 21, 131, and 66 ppb, respectively. Figures 2.38 through 2.40 illustrate these detections. Toluene was detected at four locations southwest of the Main Hill, at concentrations ranging from 11 to 82 ppb (Figure 2.41); however, all of these samples had an associated ambient blank sample containing 8 ppb toluene (Table II.13). Figure 2.42 shows the sum of total VOCs detected at sample location 5221. P1

2.4. SUMMARY AND CONCLUSIONS

2.4.1. Summary of Results

Table II.14 summarizes the range of detections from each study area for the eight target compounds. As shown, peak Main Hill detections for the eight target compounds ranged from 247 to 131,000 ppb, with the highest being Freon 113. Peak Area J detections ranged from 11 to 46 ppb, with the highest being Freon 11. Peak Building 51 detections ranged from 18 to 89 ppb, with the highest being Freon 11. Peak Area 7 detections ranged from 7 to 825 ppb, with the highest being Toluene. Peak detections from the Main Parking Lot and southwest of Main Hill ranged from 21 to 131 ppb, with the highest being Freon 113.

TABLE II.12. SUMMARY OF POSITIVE DETECTIONS–MAIN PARKING LOT AND SOUTHWEST OF MAIN HILL
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN–12DCE	CIS–12DCE	111TCA	PCE	TCE	TOLUENE
MND–01–2216–0005	26 SEP 92	---	---	---	---	---	---	---	104
MND–01–2219–0005	26 SEP 92	---	---	---	---	---	---	---	11
PRS→ MND–01–5221–0005	27 SEP 92	21	131	---	---	---	---	68	16 *
MND–01–5222–0005	27 SEP 92	---	---	---	---	---	---	---	11 *
MND–01–5222–1005	27 SEP 92	---	---	---	---	---	---	---	16 *
MND–01–5225–0005	27 SEP 92	---	---	---	---	---	---	---	13 *
MND–01–5226–0005	27 SEP 92	---	---	---	---	---	---	---	82 *

Notes:

Only sample locations having positive detections are shown.

PRS → *: Associated trip, ambient, equipment or field blank contained specified compound.

B: Indicates blank sample.

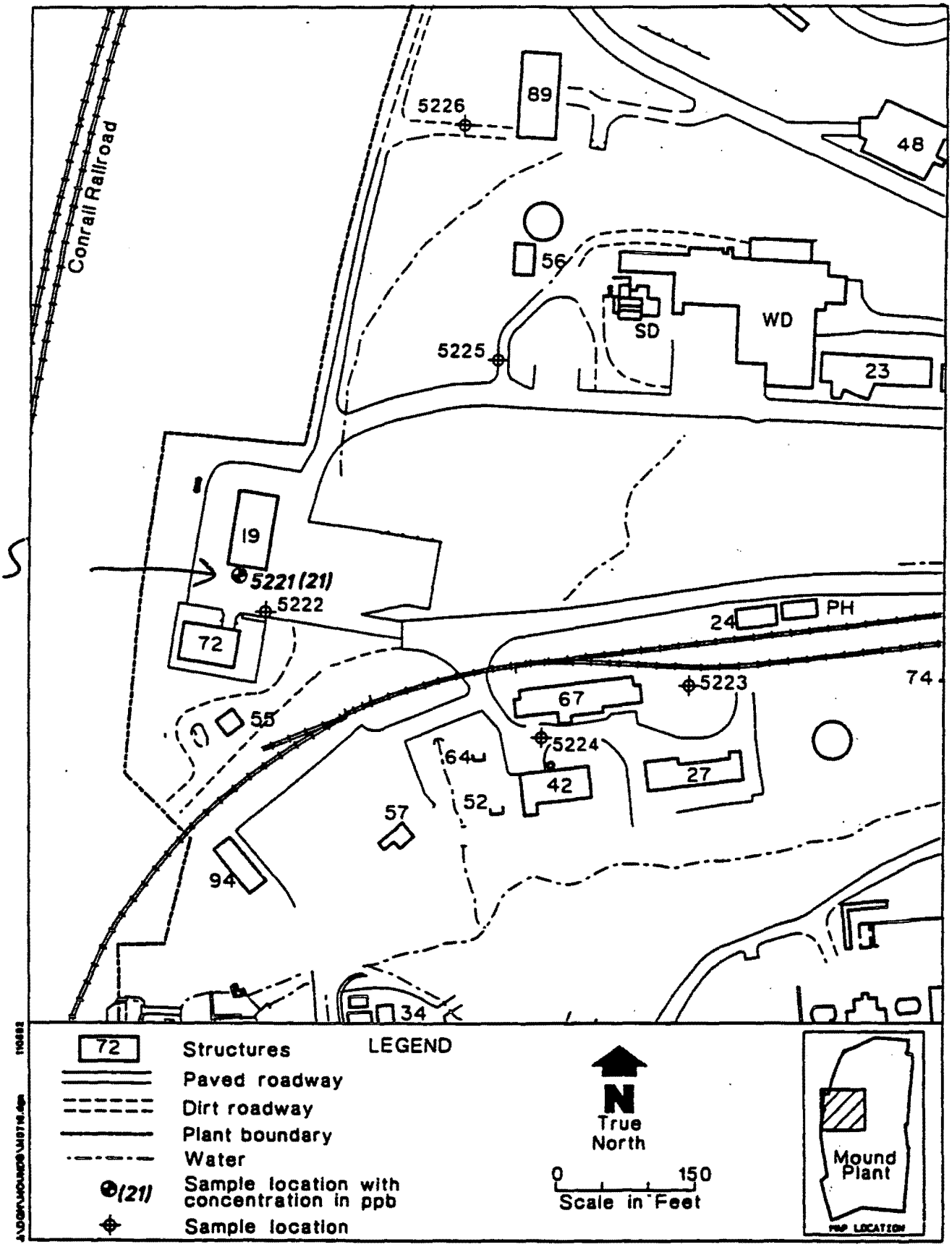


Figure 2.38. Freon II detection map for southwest of Main Hill.

ENVIRONMENTAL RESTORATION PROGRAM

OPERABLE UNIT 9,
SITE SCOPING REPORT
VOLUME 11 - SPILLS AND RESPONSE ACTIONS

MOUND PLANT
MIAMISBURG, OHIO

January 1992

DEPARTMENT OF ENERGY
ALBUQUERQUE OPERATIONS OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
TECHNICAL SUPPORT OFFICE
LOS ALAMOS NATIONAL LABORATORY

DRAFT FINAL
(Revision 0)

2. SUMMARY OF SPILLS AND ENVIRONMENTAL RELEASES

2.1. RECORDS OF THE SAFETY OFFICE

As a government-owned, contractor-operated facility, Mound Plant must operate in compliance not only with Executive Orders and Orders of the DOE, formerly the Atomic Energy Commission (AEC), under the Atomic Energy Act (AEA) (42 U.S.C. 2201 et seq.), but with federal and state statutes and regulations, and corporate safety policies. EG&G-MAT has been the operational contractor since 1988, MRC was the operator from 1948 to 1988 (DOE 1991a). Under orders from the AEC and DOE, MRC and EG&G-MAT have conducted accident and incident investigations and maintained records of these investigations.

DOE Order 5484.1 establishes the requirements and procedures for the reporting of information concerning environmental protection, safety, and health protection for all DOE facilities. Three types of investigations are defined by DOE Order 5484.1: 1) Type A board investigations in which a conflict of interest or sensitive issue may permit only DOE personnel to be appointed; 2) Type B board investigations in which all contractor employees or both DOE and contractor employees may be appointed; and 3) Type C non-board investigations conducted by DOE contractor personnel when their operations are involved. Type A investigations typically involve a fatal accident or an incident so severe that an in-depth investigation is justified. At the other end of the spectrum, a "near miss" incident is defined by the operating contractor as one that meets minimum criteria for which an investigation will be conducted. An "unusual occurrence" is defined by DOE Order 5000.3 as an unplanned event that has programmatic significance such that it adversely affects, or potentially affects the performance, reliability or safety of a facility.

Table II.1 is a summary of data compiled by review of accident and incident investigation reports maintained in the plant safety office. Only incidents that apparently resulted in a spill or an environmental release are included in the compilation. By and large, the majority of spills and releases listed in Table II.1 qualified as Type C investigations, unusual occurrences or near misses. Investigation and reporting of the latter was handled by MRC and EG&G-MAT in much the same manner as Type C investigations, although they did not truly qualify as such.

Only one incident in this record was observed to have qualified to trigger a Type A investigation board. This was the tritium release of November 8, 1989, in which over 38,000 curies of tritium were accidentally released to the atmosphere. This incident resulted in a formal DOE review panel, a news release and a public press conference. The incident investigation report was completed January 1990 (Table II.1) A smaller tritium release of 132 curies on March 13, 1973, also resulted in a formal

Table II.1. (page 7 of 10)

Date	Location	Material	Amount	Incident	Response
03/28/78	SW Bldg.	H-3	Unknown	Apparent atmospheric release from vane pump failure.	Informal Committee Report 5/3/78 - records incomplete.
06/15/78	SW Bldg.	H-3	805 Ci	Release occurred while connections were being made between a secondary storage container to proper containment.	MRC memo to file 6/16/78 of unusual occurrence. Total amount of tritium released was calculated to be 805 Ci with 99% of this as elemental tritium.
03/24/83	M Bldg.	Copper cyanide	8 gals	About half of tank of bath solution (800 gms copper cyanide in water $Cu(CN)_2$) lost into floor drains to dilution tank; no visible evidence of dilution drainage.	MRC Incident Investigation Report No. 83-5 (4/13/83). No measurable impact to Sanitary Treatment Facility; the dilution tank observed to be losing water somewhere other than the exit drain; trace of copper found at sanitary waste treatment plant; no data values reported.
04/13/83	M Bldg.	Silver cyanide	4.2 gals (2 lbs cyanide)	Unused plating solution released by accident to floor drains and sanitary sewer.	MRC Incident Investigation Report No. 83-5A (5/5/83). No measurable impact to Sanitary Treatment Facility; no data values reported.
08/18/83	Powerhouse	No. 2 Fuel Oil	10 gals	Leak from oil pump drained to trench in floor and to storm sewer, the plant drainage ditch, and the Great Miami River.	MRC Incident Investigation Report No. 83-15 (8/23/83). OEPA inspected spill site.
05/31/84	Bldg. 19	Cobalt-60 Cesium-137	Unknown	About 20 linear ft of steel and iron pipes removed from sump in Room 16 of T Bldg. spread contamination to truck and pavement at Bldg. 19 during salvage operations.	MRC Incident Investigation Report No. 84-11 (6/15/84). About one-half pound of dirt removed from floors of T Bldg.; small section of asphalt removed at Bldg. 19 and some of the bed of the truck used was removed and boxed for disposal.
04/17/85	SW Bldg.	Zinc chromate Brine solution	300 gals	During turning on new pipeline, drain plug left off; brine ran onto floor and out onto driveway on west side of bldg.	MRC Incident Investigation Report No. 85-10 (4/29/85). Below EPA reportable volume; investigation report recommended replacing zinc chromate, a suspected carcinogen, with another substance.
04/11/85	Powerhouse	Refrigerant	1,000 lbs	Loss of refrigerant occurred over period of time; released to atmosphere.	MRC Incident Investigation Report No. 85-11 (5/1/85). No environmental impact noted.

PRS

OU9
SITE SCOPING REPORT
VOLUME 12-SITE SUMMARY REPORT
SEPT 94

Potential exposure routes for terrestrial biota are ingestion of contaminated surface water, including water from seeps, and ingestion of biota from contaminated surface water. Exposure of aquatic biota can occur through contact with contaminated water and sediments and through bioaccumulation from other organisms lower in the food chain.

5. CONCLUSIONS

Through a systematic investigation of the points of current and historic waste handling and contaminant emissions, 325 potential releases sites are identified. These include regulated units, solid waste management units and other areas of suspected contamination. Details of each site are tabulated in Tables A.1 and A.2 in Appendix A of this report. Plate 1 depicts their locations. Not all of the 325 PRSs will be addressed by the ER Program. As Mound is an operating facility, other laws and regulatory programs are relevant and applicable. The complex interaction of the CERCLA RI/FS at Mound Plant within an operational facility requires an integration of effort for active units that may require remedial actions for historic activities, as well as closure activities for units currently in service, but which may be inactivated during the period of performance of the FFA. Any releases of hazardous substances that could threaten human health and the environment are subject to the jurisdiction of the FFA which require CERCLA compliance for all such releases. However, DOE, EPA, and OEPA believe corrective action at Mound Plant should be taken under whatever authority allows for the most expeditious or economical cleanup, while maintaining effective coordination and consistency (e.g., cleanup standards) among the different authorities. Therefore, DOE has determined that releases from active PRSs will be addressed under an applicable statutory or regulatory program rather than the FFA.

PRS→ Table V.1 lists the PRSs recommended for inclusion into the ER Program. Sites are listed according to the recommended operable unit, but maintain the site number from Table A.1 for reference purposes. Figure 5.1 depicts the operable unit boundaries as currently defined. The PRSs listed include those recommended for further action, as well as PRSs recommended for No Further Action. Table V.1 does not include PRSs currently in Operable Unit 6, as these are discussed below.

Table V.2 lists the PRSs recommended for exclusion from the ER program as they are currently in service or are inactive and may be reactivated. The further action recommended is that facility operations and maintenance provide for the proper administration and closure of these facilities. Two PRSs (the cooling tower basins and Building 28 solvent storage shed) listed in Table V.1 are currently in service, but exhibit evidence of release that will be addressed under the FFA. These two sites are included in both Tables V.1 and V.2.

Table V.1. (page 4 of 5)

PRS→

No.	Site Name	Evidence of Release[a]	Further Action Recommended[a]	FFA OU
58	Dredge Spoil Drying Beds	Yes	Yes	5
59	Contaminated Soil Box Storage Area	No	Yes	5
63	Building 19 Soils	Yes	Yes	5
64	Building 19 Historic Gasoline Tank (Tank 238)	No	Yes	5
65	Building 61 Area, Former Heavy Equipment Area	Yes	Yes	5
66	Area 7, Throium and Polonium Wastes (AKA old septic tank)	Yes	Yes	5
71	Building 85 Waste Solvent Tank (Tank 136)	No	No	5
72	Area 13, Polonium-Contaminated Wood from Dayton Unit IV	Yes	Yes	5
73	Evaporator Storage Area	No	No	5
74	Quonset Hut (former)	No	No	5
76	Warehouse 9	Yes	Yes	5
77	Warehouse 10	Yes	Yes	5
79	Warehouse 15	Yes	Yes	5
80	Warehouse 15A	Yes	Yes	5
81	Drilling Mud Drum Storage Areas (3 locations)	No	No	5
261	Trash Burner	No	No	5
269	Building 36 Historic Gasoline Tanks (Tanks 239 and 240)	No	No	5
274	Area 21 Old Bunker	Yes	Yes	5
275	Area 21 Detonator Shack	Yes	Yes	5
276	Area 22, Orphan Soil from Other Areas	Yes	Yes	5
277	Area J, Hillside Disposal Area (AKA Dredged Material Disposal Area 11a)	Yes	Yes	5
278	Area J, Hillside catch basin	No	Yes	5
279	Old Firing Range Drum Storage Area	Yes	Yes	5
280	Waste Oil Drum Field Area	Yes	Yes	5
281	Area E, Waste Oil Spill	Yes	No	5
282	Spoils Disposal Area/Construction Spoils Area	Yes	Yes	5
304	Excavated Materials Disposal Area (AKA Rader's Hill)	No	Yes	5
306	SM/PP Hill Seep 0609	No	Yes	5

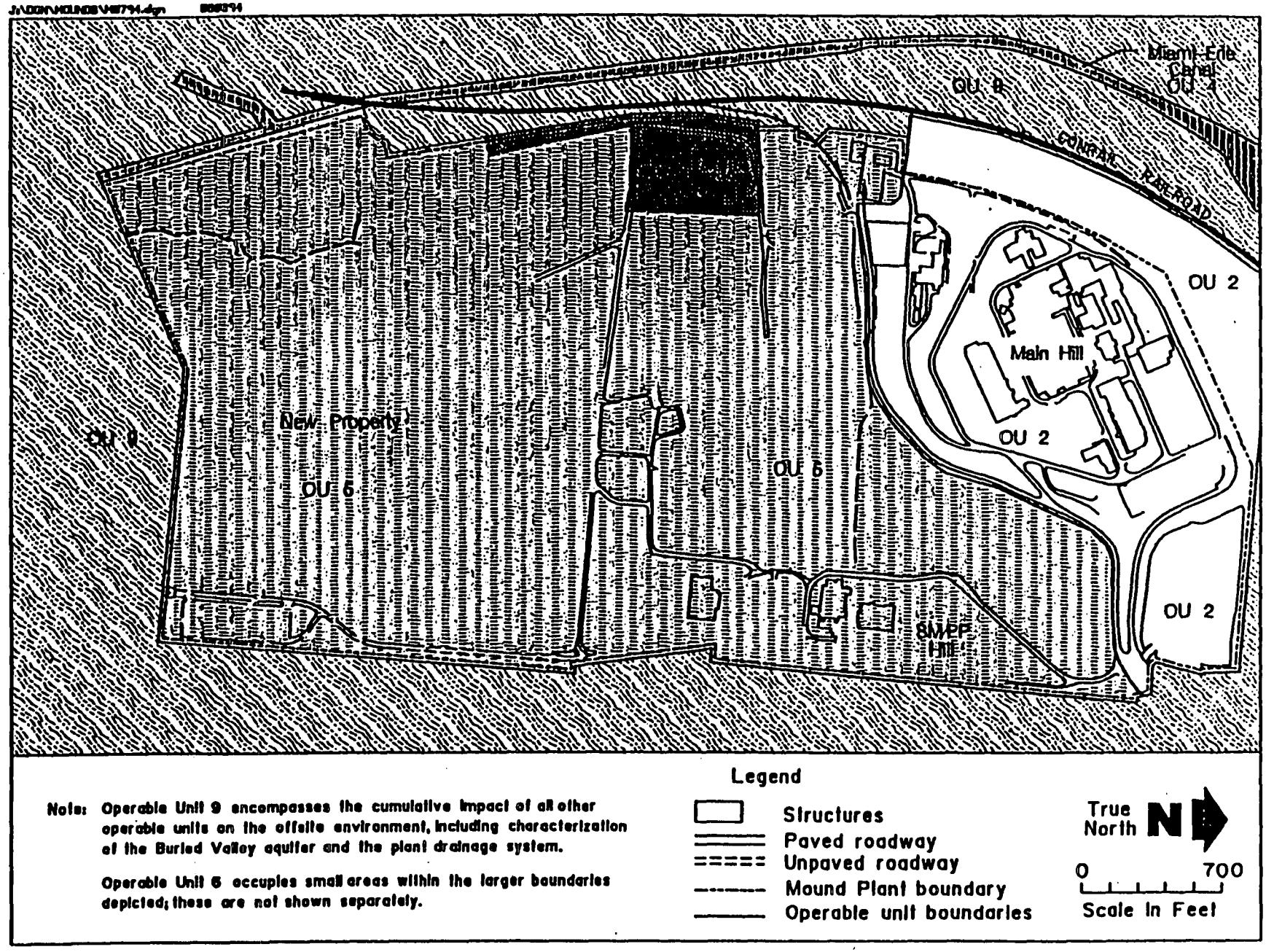


Figure 5.1. Mound Plant operable unit boundaries

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
63	Building 19 Soils PRS	G-5	Grounds	Cobalt-60	10	Cobalt-60	S	10	1 14, 16	SGS[b] Table B.5 Location 5221 Table B.9 RSS[c] Locations C0099, C0100, S0530, S0532, S0533, S0534, S0535, S0538 (Appendix E in Ref. 6)	12 6
64	Building 19 Historic Gasoline Tank (Tank 238)	G-5	Historical	Gasoline	3	No information on when tanks were removed			No Data		
65	Building 61 Area, Former Heavy Equipment Area	E-10	Historical	Waste oil	1, 5, 7, 18	Suspected	S	7, 10	3, 4, 5, 6, 8 1 14	Tables B.6, B.7, B.8, and B.9 SGS[b], Table B.3 Locations 2216 and 2217 RSS[c] Locations S0233, S0234, S0235, S0236, S0237, S0240 (Appendix E in Ref. 6)	7 12 6
66	Area 7, Thorium and Polonium Wastes	E-8 E-9 F-8 F-9	Historical	Plutonium-238, Thorium-232 and -238, Polonium-210, Actinium-227, Radium-226, Cesium-137	1, 4, 5, 18	Suspected	S	4, 12, 18	14, 15, 16 1	Table B.1 (Table III.5 in Ref. 6) SGS[b] Table B.3	6 12

TABLE A.2. ASSIGNMENT OF REGULATORY AUTHORITIES TO POTENTIAL RELEASE SITES AND RECOMMENDATIONS FOR FURTHER ACTION

PRS

No.	Site Name	Location	Status	Operational Jurisdiction: Regulated Units	Operational Jurisdiction: Regulatory Authority	Operational Jurisdiction: Spill Response	SWMU	Historic Activities: Evidence Of Release	Historic Activities: Response Authority	Further Action Recommended	FFA OU
51	Building 57 Aeration Basin (Tank 108)	(Cont.)	(Cont.)	(Cont.)	(Cont.)	(Cont.)	SWMU	No	NA	OM	
52	Building 57 Clarifier (Tank 109)						SWMU	No	NA	OM	
53	Building 57 Clarifier (Tank 110)						SWMU	No	NA	OM	
54	Building 57 Sand Filters (2 units)						SWMU	No	NA	OM	
55	Building 57 Chlorine contact chamber (Tank 111)						SWMU	No	NA	OM	
56	Building 57 Chlorine contact chamber (Tank 112)						SWMU	No	NA	OM	
57	Sludge Drying Beds	H-5	Historical		NA		SWMU	Yes	CERCLA	Yes	5
58	Dredge Spoil Drying Beds	H-5	Surplus		NA		SWMU	Yes	CERCLA	Yes	5
59	Contaminated Soil Box Storage Area	G-6	Historical		NA			No	CERCLA	Yes	5
60	Hazardous Waste Storage Area (Building 72)	G-5	In service	HWMU included in Part B application	RCRA	RCRA	SWMU	No	NA	OM	
61	Building 72 Outdoor Hazardous Waste Storage Area		Inactive		RCRA	RCRA	SWMU	No	NA	OM	
62	Building 72 Empty Drum Storage Area		In service		RCRA	RCRA	SWMU	No	NA	OM	
63	Building 19 Soils	G-5	Grounds		AEA	AEA		Yes	CERCLA	Yes	5
64	Building 19 Historic Gasoline Tank (Tank 238)	G-5	Historical		NA			No	CERCLA	Yes	5
65	Building 61 Area, Former Heavy Equipment Area	E-10	Historical		AEA	AEA		Yes	CERCLA	Yes	5
66	Area 7, Thorium and Polonium Wastes	E-8 E-9 F-8 F-9	Historical		NA			Yes	AEA	Yes	5
67	Plant Drainage Ditch	F-4 F-5 F-6 F-7 F-8 G-4 G-5 G-6 G-7 G-8 H-4 H-5 H-6 H-7	Waters of the U.S.	Effluent permitted to discharge under NPDES (outfall 002)	CWA	AEA	SWMU	Yes	CERCLA	Yes	9
	Asphalt-Lined Pond	E-9	Waters of the U.S.				SWMU	No	CERCLA	Yes	9

TABLE II.12. SUMMARY OF POSITIVE DETECTIONS–MAIN PARKING LOT AND SOUTHWEST OF MAIN HILL
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN-12DCE	CIS-12DCE	111TCA	PCE	TCE	TOLUENE
MND-01-2218-0005	26 SEP 92	---	---	---	---	---	---	---	104
MND-01-2219-0005	26 SEP 92	---	---	---	---	---	---	---	11
MND-01-5221-0005	27 SEP 92	21	131	---	---	---	---	66	16 *
MND-01-5222-0005	27 SEP 92	---	---	---	---	---	---	---	11 *
MND-01-5222-1005	27 SEP 92	---	---	---	---	---	---	---	16 *
MND-01-5225-0005	27 SEP 92	---	---	---	---	---	---	---	13 *
MND-01-5226-0005	27 SEP 92	---	---	---	---	---	---	---	62 *

PRS →

Notes:

Only sample locations having positive detections are shown.

*: Associated trip, ambient, equipment or field blank contained specified compound.

B: Indicates blank sample.

Table B.5.

Table B.9. Summary of Radiological Data[a,b]

Site Name	Radiological Contaminants															
	Potassium-40	Plutonium-239	Plutonium-238	Cesium-137	Thorium-Total	Tritium	Thorium-232	Cobalt-60	Radium-224, -226, -228	Radon-222	Americium-241	Actinium-227	Uranium-233, -234, -238	Bismuth-210m	Bismuth-207	Reference
21. Building 1 Leach Pit Area (Area I)	NA	NA	0.18	NA	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7
32. Underground Sewer Line G12						ND										7
33. Underground Sewer Line G14 East						ND										7
34. Underground Sewer Line G14 West						ND										7
35. Underground Sewer Lines G19 and G14						ND										7
36. Underground Sewer Line G15						ND										7
57. Sludge Drying Beds			1235				63									6
59. Contaminated Soil Box Storage Area			133.9													6
60. Hazardous Waste Storage Area (Building 72)			0.5		3.95											6
61. Building 72 Outdoor Hazardous Waste Storage Area			0.64		<2											6
PRS 63. Building 19 Soils	NA	NA	32.4	NA	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6
65. Building 61 Area, Former Heavy Equipment Area	NA	NA	10.35	NA	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6
67. Plant Drainage Ditch	NA		635	LDL	<2			LDL	1.2	NA	LDL	NA		NA	NA	6
68. Asphalt-Lined Pond	7.21		160	0.25		29										18
69. Overflow Pond	22.5		34.2	0.395	266											18
70. Retention Basins and Weir Basin	23		14.6		<2	7.09			1.62							18
72. Area 13, Polonium Contaminated Wood			5.74													6
73. Evaporator Storage Area	NA	NA	2.5	1.3	<2	0.15	NA	LDL	0.9	NA	LDL	NA	NA	NA	NA	6
74. Quonset Hut (former)	NA	NA	0.6	NA	<2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

VOLUME II - APPENDICES A-F

December 1994

Working Draft

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

ENVIRONMENTAL RESTORATION PROGRAM

OPERABLE UNIT 5 DISCUSSION PAPER
IDENTIFICATION OF ADDITIONAL PHASE 1 RECONNAISSANCE SAMPLING LOCATIONS

MOUND PLANT
MIAMISBURG, OHIO

PREPARED UNDER THE DIRECTION OF:

U.S. DEPARTMENT OF ENERGY BY
EG&G MOUND APPLIED TECHNOLOGIES

BY:
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

JULY 1994

1. PURPOSE OF DOCUMENT

EG&G Mound Applied Technologies (EG&G) has requested a document search to identify sites located within the defined boundary of Operable Unit (OU) 5 that may require additional Remedial Investigation (RI) Phase 1 Reconnaissance efforts. This discussion paper summarizes the findings based on review of the following documents:

1. Table V.2 and Figure 1, OU9 Site Scoping Report: Volume 12 - Site Summary Report (Weston, 1993).
2. Table I.3, OU5 RI/FS Work Plan
3. Active Underground Storage Tank Plan (Dames & Moore, 1994)
4. OU9 Site Scoping Report, Volume 7 - Site Summary Report (Weston, 1993)

The identified sites of interest within OU5 are shown in Figure 1 and summarized in Table 1. Based on the proposed sampling for the RI Phase 1 Reconnaissance and the potentially hazardous substances that may be present at the identified sites, recommendations for additional sampling has been made, as appropriate.

2. RESULTS

Table 1. summarizes the identified sites of interest and provides the following information on each site:

- Location number - corresponds to the location of the site within OU5 as shown in Figure 1. Coordinates have been provided to assist in locating a site on Figure 1. For example Location #1 has been given coordinates 9/10N, 20/21W. This means the site of interest is located in the grid bounded by 9 North and 10 North coordinate lines and 20 West and 21 West coordinate lines.
- Site name - provides a brief description of the site based on document research.
- Reference code - provides the corresponding site number (where applicable) to Appendix A, and Figure 1 in Operable Unit 9, Site Scoping Report: Volume 12 (Weston, 1993) which were used to provide a site description, potential hazardous substance at the site, and the size of site/location for most of the identified sites.

- Source - references the source used to identify the sites. Initially, all sites listed in Table V.2, Operable Unit 9, Site Scoping Report: Volume 12 (Reference 1) were identified. Then, any additional sites identified in either Table II.3, OU5, RI/FS Work Plan (Reference 2) or Figure 1, Revised Draft, Active Underground Storage Tank Plan (Reference 3) Figure 1, Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report (Reference 4) or OU9 Site Scoping Report, Volume 7 - Site Summary Report (Reference 5).

- Potential Hazardous Substance - identifies the potential contaminants that may be present at a site. The potential hazardous substance identified for each site are based on the data provided in Appendix A, Operable Unit 9, Site Scoping Report: Volume 12 (Weston, 1993).

- Comments - provides recommendation on whether additional sampling radiological and/or chemical is required based on the location of a site in relation to the existing soil gas sampling grid established for OU5 RI/FS Site Reconnaissance Survey and the nature of the potential contamination at a site. The sites have been classified into the following categories.

A Recommend additional soil gas survey and Mound Screening Facility sample(s). Potential location of sample(s) is shown in Figure 1. However, the final determination of whether sampling is required and the exact location of the sample should be based on a site inspection.

PRS

B No additional sampling is required since the site is located at or near an established soil gas survey sample or is covered under other on-going site activities (e.g., D&D activities in Area 1 which eliminates Sites #41, 42, and #125 from further sampling under this investigation).

C Recommend sampling on one side or around the building for sites that are located either inside a building or clustered around the building (e.g, tanks). The potential side(s) of buildings that may require sampling have been identified in Figure 1. However, the final determination of the sides of the building, if any, that should be sampled will be made based on site inspection.

D Recommend surface soil sample(s) for Mound Screening Facility analysis be taken at identified locations(s) based on the potential for radiological contamination at these locations. The proposed locations for the sample(s) are shown in Figure 1. However, the final determination of whether an additional sample is required will be based on a site inspection.

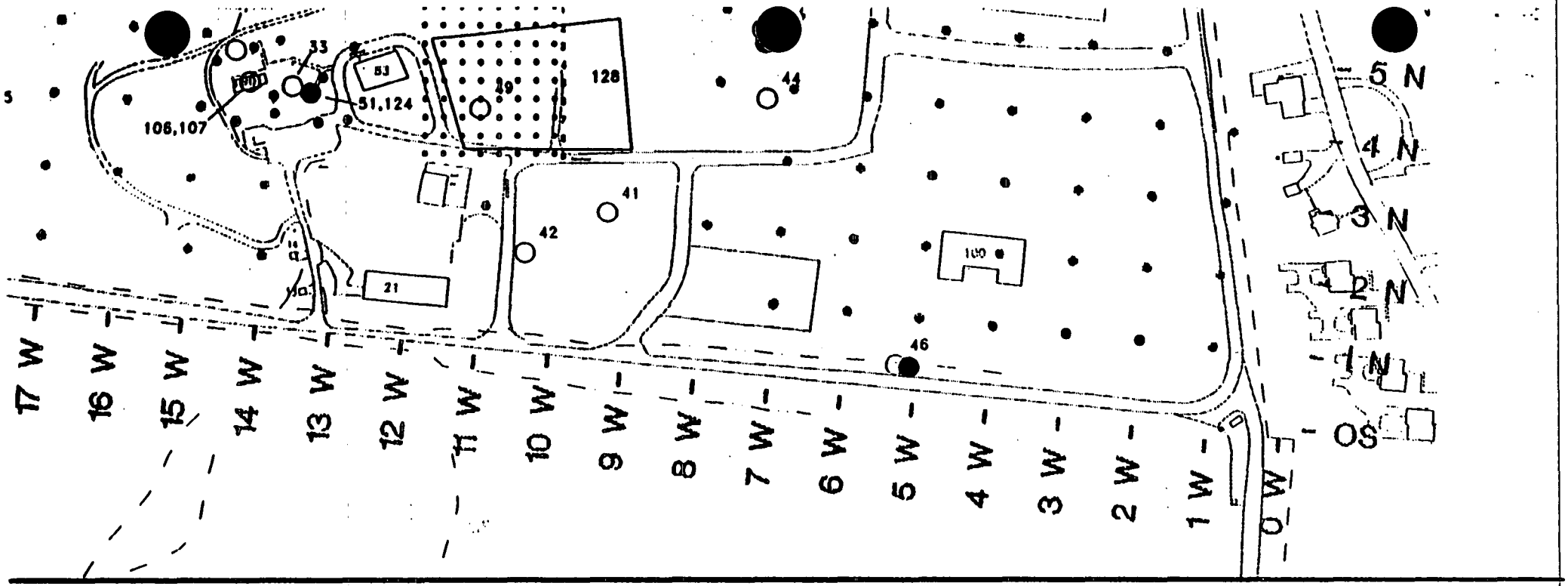
E No additional sampling is recommended for the site, since it has not been historically used in hazardous material activities.

F Recommend additional shallow soil sample(s) be taken at the identified locaitons(s) and tested for Total Analyte List (TAL) Metals based on the potential hazardous substance that may be present at the site.

G Recommend no further sampling at the site. Although site has been listed as a part of OU5 in the researced documents, it falls outside the established OU5 boundary.

Table 1. Location of Potential Sites of Contamination Within OU5
Page 2 of 13

Location Number as Shown in Figure 1	Potential Release Site		Source	Potential Hazardous Substances	Comments
	Site Name	Reference Code			
13 (1 IN, 21W)	Building 27 Settling Sump (Tank 218) (inactive since 1985)	27	1	Organic solvents (primarily acetone)	C
14 (10/12N, 14/15W)	Building 27 Solvent/Drum Storage Area	28	1	Organic solvents (primarily acetone)	C
15 (20/21N, 9/10W)	Building 51 Waste Solvent Storage Tank (Tank 220)	37	1	Organic solvents, paints, waste oils	C
16 (20/21N, 10/10W)	Building 51 Waste Incinerator	38	1	Organic solvents, paints, waste oil	C
17 (20/21N, 9/10W)	Building 51 Waste Incinerator Scrubber	39	1	Combustion products from Building 51 incinerator	C
18 (8/14N, 22/27W)	Area 3, Thorium Drum Storage and Redrumming Area	41	1	Thorium 232 and daughters	B
PRS → 19 (9/10N, 24/25W)	Area A, Construction Soils from T Building	42	1	Construction soils from T-Building	B
20 (14N, 20/21W)	Contaminated Soil Box Storage Area	59	1	Putonium-238	B
PRS → 21 (12/13N, 26/27W)	Building 19 Soils	63	1	Cobalt-60	B
22 (13N, 26W)	Building 19 Historic Gasoline Tank (Tank 238)	64	1	Gasoline	B
23 (24N, 3W)	Building 61 Area, Former Heavy Equipment Area	65	1	Waste Oil	B
24 (8/9N, 20/21W)	Building 85 Waste Solvent Tank (Tank 136)	71	1	None (never used)	E
25 (11/12N, 14/16W)	Area 13, Polonium-Contaminated Wood from Dayton Unit IV	72	1	Polonium-210	B



MOUND PLANT OPERABLE UNIT 5

RI/FS OPERATIONAL AREA SAMPLING AND LOCATION OF POTENTIAL SITES OF CONTAMINATION

Structures

Plant Boundary

Paved/Unpaved Roadway

Ephemeral Stream

Site Locations

Tank Locations

Non-AOC Operational Area Sampling and Survey Locations: Soil Gas Samples, Mound Soil Screening Facility Radiological Samples, and FIDLER Survey (Proposed)

AOC Sampling and Survey Locations: Soil Gas Samples, Mound Soil Screening Facility Radiological Samples, and FIDLER Survey (Proposed)

1 N – 1 W – Grid Lines

Contaminated Areas

Warehouses

Proposed Locations for Soil Gas Samples and Mound Soil Screening Facility Radiological Samples

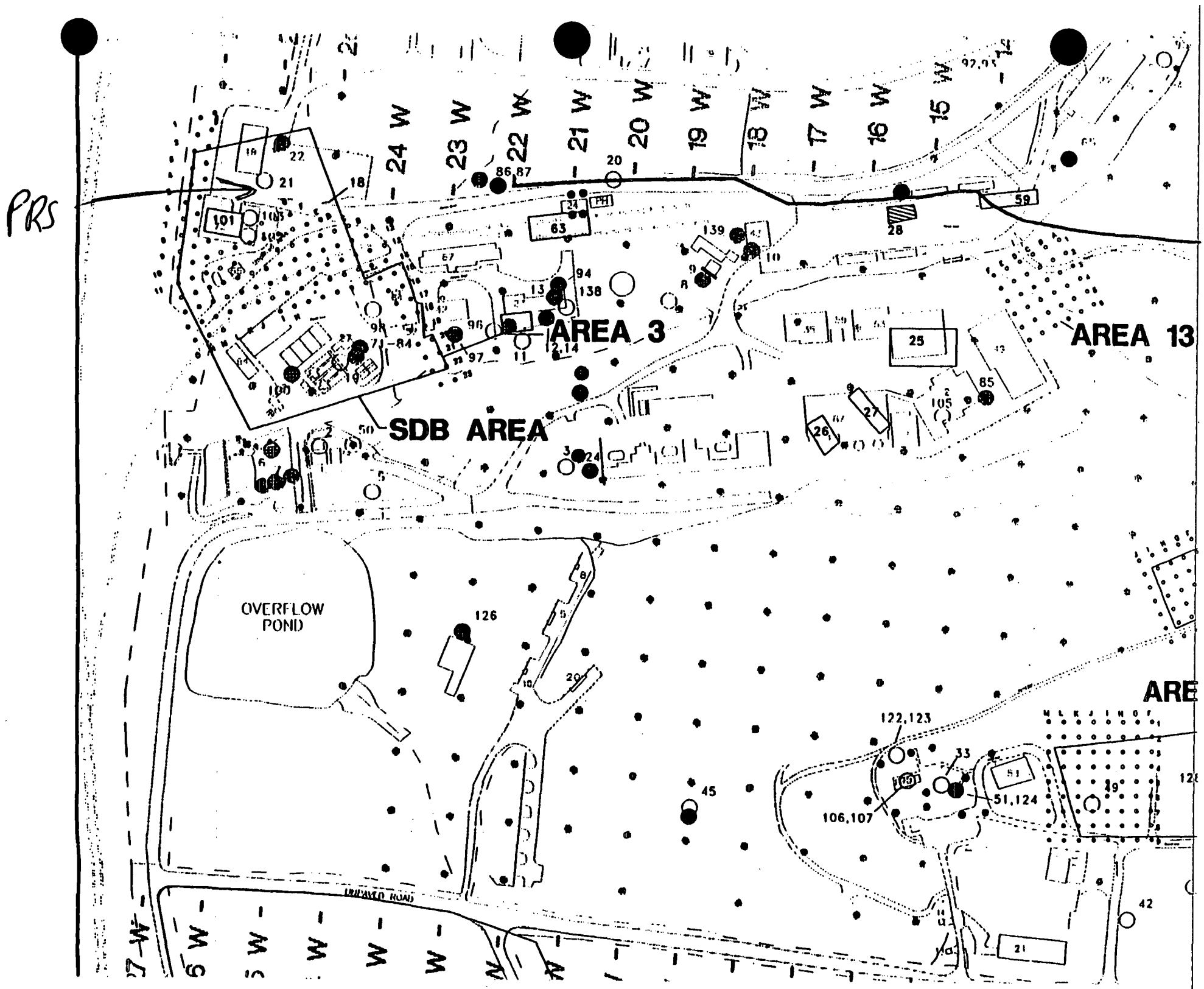
Proposed Building Walls for Soil Gas Samples and Mound Soil Screening Facility Radiological Samples

Proposed Locations of Mound Soil Screening Facil Radiological Samples

Proposed Locations for Total Analyte List (TAL) Metals Soil Samples

Proposed Locations for Explosives Soil Samples

Surface and Subsurface Soil Sample Locations (Building 24)


PRS
AREA 3
AREA 13
SDB AREA
OVERFLOW POND
UNPAVED ROAD
24 W
23 W
22 W
21 W
20 W
19 W
18 W
17 W
16 W
15 W

FILE COPY

MOUND

Inter-Office Correspondence

From : K. J. Bole, Nuclear Engineering, OS-235

Date : June 15, 1984

Subject : Investigation of T-16 Drain Piping Incident

Reference : No. 84-11

TO : V. E. Castleberry, A-218
H. L. Turner, A-221A

cc : P. C. Adams, A-157
R. E. Bernheisel, E-105C
R. T. Braun, A-225
J. E. Caldwell, A-241
R. C. Herman, M-45
W. B. Hogeman, A-231
B. R. Kokenge, OS-102
D. F. Luthy, OS-235
T. M. McGavick, A-147
L. W. Metcalf, BD 91
H. E. Meyer, E-105C
T. K. Mills, T BD
R. A. Neff, A-223
T. E. Prugh, OS-235
J. D. Yonko, A-234
File

Summary

At approximately 10:00 pm on May 31, dismantled drain piping from the T-16 sump was transported to the salvage area at Building 19 resulting in a release of radioactive Cobalt-60 and Cesium-137.

Based on a thorough Health Physics survey, there was minor contamination (surface) on the floor of T-16, a four-wheel transport cart, T Building freight elevator, Dock 075, transportation vehicle truck bed and pavement at Building 19. There was no contamination detected on the employees (29) and no spread of contamination in T Building or other plant areas. It was necessary to remove about a four-sq ft section of the transportation truck, but the other contaminated areas noted were decontaminated under the usual methods. There was no major consequence resulting from the incident. The situation was returned to normal by 2:00 pm on June 1.

Recommendations

1) Improve the training of the reflex action required when a radiation monitor is sounded at the entrance/exit of security islands. Both guards and material carriers should understand and comply with the Security General Order 18 and 18-1. Also, consideration of a training course for the security inspectors concerning the practical use of radiation monitors is recommended.

2) Improve the reliability of the radiation monitor at Post 5 and evaluate the requirements for testing and operating the radiation monitors at the plant entrances/exits. We recommend that portable monitors be available to second and third shifts as a back-up instrument to the radiation monitors at the plant exits.

3) We recommend that material carriers (drivers) be equipped with remote communications capability, at all times, while on the job.

4) Evaluate the need for continuous radiation monitors at exits of areas that have had a previous history of handling radioactive materials.

Rebecca Sweeney and Curtis Cobler remained. The security vehicles were checked, and there was no contamination found. Rebecca and Curtis left about 3:30 am on June 1.

The T Building corridors were surveyed, and the results were negative; no contamination.

Contamination was found in T-16 (about 1 ft^2 area), the four-wheel cart used to transport the piping out of T-16 (about 1 ft^2 area), second floor dock (about 5 ft^2) where some of the dirt and scale from the inside of the pipes had fallen out, an area on the pavement at the Building 19 scrap area (2 ft^2 area), and about a 4 ft^2 area on the bed of the transport truck.

The contaminated areas were sealed off. The areas in T Building were decontaminated by 9:00 am on June 1.

Decontamination of the Building 19 areas proceeded on June 1. Unfortunately, the wood truck bed would not clean up and a portion of the truck bed (about 4 ft^2) had to be removed.

The decontamination of Building 19 area and the transport truck was completed by 2:00 pm on June 1.

Incident Investigation

On June 6, 1984, the incident investigation began.

Statements of the employees directly involved in the incident have been recorded and are located in Appendix A.

The following information was gathered:

1) The T Building had been surveyed prior to the T Building modifications project. A thorough Health Physics survey (ref: L51, J00434 - Remove Contamination - Building Modifications) had been conducted and subsequent construction for the T Building modification project was performed under "cold" working conditions. Miles of abandoned piping in T Building had been removed by the design contractor and the Health Physics survey of the material showed no contamination.

2) The most recent Health Physics survey (fourth quarter 1983) in the T-16 area showed no detectable contamination and the "swimming pool" (concrete basin) was removed from T-16 under "cold" working conditions. Maintenance has had continuous assurance from Health Physics (C. W. Wagner) that the T Building is "cold".

3) On May 22, 1984 and continuing through May 31, drain piping, 3 in. diameter Duriron, 3 in. diameter cast iron, and 4 in. diameter galvanized piping totaling about 70 ft in length had been dismantled from the sump in T-16.

4) The material was transported to the T Building tunnel for loading to a transportation truck for ultimate disposal to the salvage area at Building 19.

5) During the process of moving the pipe from T-16 to the T Building Dock 075, scale and dirt from the inside of the drain piping dislodged and landed on the floor. About a half of a pound of the contaminated dirt and scale was recovered during the decontamination job.

6) An analysis of the dirt and scale by Art Campbell (see Appendix B) on June 5, 1984 showed that radioactive Cobalt-60 and Cesium-137 were present. Based on the amount of dirt collected and the analysis by Art Campbell, it is estimated that the total amount of cobalt and cesium released is 0.2-4 micrograms.

7) It is believed that the source of the cobalt and cesium were from the Polonium-210 operations. Cobalt and cesium were impurities in the polonium operation. The polonium operation was shut down in 1969, and the decommissioning and decontamination of the facility was completed in 1973.

8) Areas which had contamination present were in T-16 (about 1 ft^2 area on floor), a four-wheel transport cart ($\sim$1 ft^2 area on bed), T Building Dock 075 ($\sim$5 ft^2 area on floor), Building 19 pavement in salvage area ($\sim$2 ft^2), the drain piping (70 lineal ft) and the truck bed of the transportation vehicle ($\sim$4 ft^2 area).

9) The employees involved in the incident and others working in the area (29 people) were not contaminated nor were the other areas in T Building.

10) The radiation monitor alarm sounded when the transportation truck passed through Post 5 en route to Building 19. This was the first moment when anyone suspected that the drain piping contained radioactive materials.

11) The Driver, Tom Davis, and Guard, Curtis Cobler, heard the radiation monitor at Post 5 sound. The Laborer, Dave Tincher, riding with the driver did not hear the radiation monitor alarm.

12) The driver expected the guard to detain him since the monitor sounded after the truck passed through Post 5. The driver did not see the guard attempt to detain the vehicle so the driver continued to Building 19. The guard realized that the driver was not going to stop and did not see his motions to stop the vehicle so Curtis tried to get the driver by radio to inform Tom that he had set the alarm off. Curtis did not receive a response. The vehicle and driver were not equipped with a radio.

13) The driver and security inspectors involved said that the radiation monitor at Post 5 malfunctioned frequently. The driver continued to Building 19, believing that the instrument had malfunctioned, however, they hesitated at Building 19 in offloading the truck to see if a guard would call them back in response to the monitor sounding off at Post 5.

14) Curtis arrived at Building 19 and stopped the offloading. Security Inspector, Rebecca Sweeney, arrived moments later at Building 19 with a hand monitor. The hand monitor verified that the drain piping contained radioactive material.

15) Both of the security inspectors involved expressed a desire to have additional training in the practical use of the radiation monitors at the plant entrances/exits and the portable radiation monitors.

16) We believe the maintenance crew working on the job had no suspicion that there was radioactive material present in the drain piping, that the security inspectors behaved prudently and exercised good judgment in handling the situation and that the Health Physics response was very thorough and commendable.

Incident Cause

The primary cause for the radioactive cobalt and cesium release from the sump drain pipes in T-16 is that maintenance methods for areas which had been in radioactive service are incompletely developed. Methods for handling maintenance in "cold" and "hot" areas are known. Areas that had been in "hot" service, decontaminated and subsequently declared "cold" areas, do not have maintenance methods defined. In addition, the building or service area history, with respect to radioactive service, is not documented.

There was not enough information to determine if the drain pipes had been surveyed for radioactivity. The most recent Health Physics survey indicated that the area in T-16 was cold and all prior construction in the T Building modification project had been performed under "cold" working conditions. The drain piping was removed from the T Building undetected since, for cold areas, there are no continuous radiation monitors in service.

The contaminated drain piping passed through Post 5 and the radiation monitor sounded. The guard and driver did not appear to have a reflex type response on the action required when a radiation monitor is sounded. The radiation monitor at Post 5 is regarded as being unreliable (high frequency of false trips).

The drain pipes were offloaded at the Building 19 salvage area because the guard was unable to communicate with the driver remotely (by radio).

Extent of Incident

Approximately a half pound of dirt and scale from the inside of the drain piping was recovered. It is estimated that the material contained 0.2 - 4 micrograms of radioactive cobalt and cesium.

There was no contamination of any of the employees (29) involved. There was no contamination of the two security vehicles involved.

Decontamination of about 10 sq ft of plant property was performed by the usual methods. A 4-sq ft section of the truck bed (wooden) was removed and must be replaced.

The contaminated drain piping has been secured and crated.

There was no contamination spread to other areas of the plant and no off-site impact.

COMPARISON OF ACTUAL SOIL GAS VALUES WITH CALCULATED ACCEPTABLE SOIL GAS VALUES

SCREENING POTENTIAL RELEASE SITES BASED ON SOIL GAS READINGS

Soil gas readings can be utilized in the PRS screening process to identify potential release sites that may present a potential soil contamination problem for volatile organics. The soil gas survey that was conducted at Mound as part of the "Reconnaissance Sampling Report–Soil Gas Survey and Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill" investigated 8 volatile compounds. The concentrations of these compounds in the in the vapor phase within the pore spaces of the soil can be correlated to the actual soil contaminant concentrations by utilizing a method developed by ICF Kaiser Engineers. This technique has been used with US EPA Region IX approval at a large Superfund site contaminated with many of the same chemicals found at relatively low levels in soils at the Mound Plant.

The soil concentration can be estimated from the soil gas values by the following equation:

$$Ct = (Cg/Pb)*[[Pb * Kd / H] + [pw / H] + [pt - pw]]$$

where

Cg	concentration of volatile chemical concentrations as soil vapor in ng/ml
Pb	Bulk density of the soil in g/ml
Kd	soil/water partition coefficient in ml/g
H	Dimensionless Henry's Law Constant
pw	water filled porosity
pt	total porosity
Ct	target soil concentration in ng/g or ug/kg (ppb)

The technique that Mound Plant will use for screening a PRS, is to compare the soil gas values obtained at a PRS with soil gas concentrations that are known to be below any regulatory or health based level of concern. The risk based guideline values for the Mound Plant (DOE, December 1995) soils are based upon 10^{-6} risk levels or a hazard index of 1. These values correspond to direct soil exposure to persons who's activities place them at the highest risk, in particular inhalation and ingestion by a Mound Plant construction worker.

Another potential exposure path must be considered, however. The potential for some of the organic contaminants to leach into ground water must be considered in developing protective soil screening levels. A "Mound Plant Soil Screening Level" paper explains the calculation of soil screening levels. For all of the chemicals that the soil gas survey identified, the calculated soil screening level soil concentrations are below the standard guideline values, therefore they are more conservative and are appropriate to be used as the basis for the soil gas calculations.

By re-arranging the equation, and using either the soil guideline values or the soil screening levels as the target soil concentration, a soil gas concentration can be calculated; this calculated soil gas concentration can be compared to the actual observed soil gas values:

$$Cg = (Pb*Ct)/[[Pb*Kd/H] + [pw/H] + [pt-pw]]$$

The values of the soil specific and chemical parameters for this equation are summarized as follows:

Pb	1.6	Bulk density of the soil in g/ml
pw	0.15	water filled porosity
pt	0.43	total porosity
foc	0.02	fraction organic material in soil (used in developing the SSL values)

Typical chemicals that are detected with soil gas sampling are					
NAME	Henry's	Kd's	Calculated Acceptable	Calculated Acceptable	Calculated Acceptable
			Soil Screening Level Values	Soil Gas Reading	Soil Gas Reading
		ml/g	mg/kg (ppm)	ng/l	ppb
Toluene	2.52E-01	3.42	22.06	1.56E+03	614600
Trichloroethene (TCE)	4.35E-01	2.24	0.07	1.26E+01	2400
111 Trichloroethane (TCA)	7.63E-01	2.2	3.01	9.46E+02	173400
Trans-1,2 Dichloroethene (DCE)	2.29E-01	1	0.70	1.41E+02	35700
cis-1,2 Dichloroethene (DCE)	1.85E-01	2.78	0.31	1.97E+01	5600
Freon 11	NA	NA			
Freon 113	NA	NA			
Tetrachloroethene (PCE)	7.09E-01	2.78	0.09	2.13E+01	3100

na not available

IF THE SOIL GAS READING IS BELOW THE VALUES IN THE CALCULATED SOIL GAS READING COLUMN (SHADED), THEN THERE IS NO THREAT TO GROUNDWATER FROM THIS PRS.

The soil screening level values are calculated using the Soil Screening Methodology. The Potential Release Site is assumed to be more than 100 meters from a potential drinking water source with an aquifer thickness of 15 meters and a source size of 10 meters. The hydraulic gradient is assumed to be 0.01 which is conservative for most of the Mound Plant PRSs. In special instances where the PRS lies less than 100 meters from a potential drinking water source, or the hydraulic gradient is much less than 0.01, new SSL values and new acceptable soil gas values will be calculated for that particular PRS.

PRS 63 METAL LAYDOWN AREA

e-mail from Doug Draper to George Liebson

From: Douglas Draper
To: LIEBGN
Date: 11/7/96 8:03am
Subject: PRS #63, Metal Laydown Area Survey

George,

At the October 2, 1996 meeting on PRS # 63, the following plan of action was proposed:

1. Rad Protection would conduct a FIDLER survey of the Bldg 19 area to determine if indications of Cs-137/ Co-60 contamination could be found.

2. If there was no positive FIDLER reading, an estimated MDA for the FIDLER in dpm/ 100 sqcm would be provided and compared to the surface contamination limits for beta- gamma emitters from DOE 5400.5.

3. If a positive FIDLER reading was detected, the location would then be scanned with an intrinsic germanium detector to determine qualitatively what isotope(s) were present.

The FIDLER scan was performed with assistance from Roy Mowen on October 10, 1996. Three areas of increased activity were discovered. Instrument background was approximately 5,000 cpm. Two areas at 6,000 cpm (gross count rate) were found near the old scrap metal storage bins emanating from the blacktop surface; a third area of approximately 50,000 cpm was also discovered there.

On October 16, 1996 Jeff Stapleton prepared the portable intrinsic germanium detector for field use. The two areas of 6,000 cpm were too low in activity to obtain a qualitative analysis. The 50,000 cpm location was sufficiently high to obtain a spectrum. After three analyses, with different energy regions, it was concluded that the gamma activity was due primarily to a continuous spectrum from approximately 20 kev to 350 kev. Except for minor peaks from naturally occurring Bi-214, there were no gamma peaks from 15 kev to 3000 kev. This indicates the presence of a relatively long- lived, high- energy, pure beta- emitting isotope located perhaps 3 to 5 cm below the surface of the ground. I estimate the potential activity to be at least 50 microCi and the area to be on the order of a few sqcm. Please note that Sr-90, a pure beta emitter has a high energy beta (2.2 Mev) from its ingrowth daughter Y-90, its half-life is 28 years, and its maximum estimated Bremsstrahlung is approximately 300 kev.

12
1.6
72
12
1.92

On October 31, 1996 Jeff Stapleton and I collected data on Phil Ryan's FIDLER to estimate the MDA for Co-60, Cs-137 and Am-241. Based on this effort, the estimated MDAs are:

Estimated Minimum Detectable Activity

	Isotope	Ch 1	Ch 2	Ch Out
	Co-60	ND	ND	35k dpm/100sqcm
Shield	313.9 mg/sqcm	ND	ND	34k dpm/100sqcm
	1809 mg/sqcm	ND	ND	35k dpm/100sqcm

density of earth moist, packed = 1.6 g/cm³
3-5 cm
assume 3 cm² area 4 cm deep
= 12 cm³
50 uCi/19.2g = 2.6 uCi/g

	8851	mg/sqcm	ND	ND	45k dpm/100sqcm
	Cs-137		ND	ND	37k dpm/100sqcm
Shield		313.9 mg/sqcm	ND	ND	41k dpm/100sqcm
	1809	mg/sqcm	ND	ND	61k dpm/100sqcm
	Am-241		ND	ND	12k dpm/100sqcm
Shield		313.9 mg/sqcm	ND	ND	18k dpm/100sqcm
	1809		ND	ND	530k dpm/100sqcm
	Pu-238		12k dpm/100sqcm		

Based on the preoperational checks for this particular FIDLER, I have a question about the Ch 1 window setting which may cause a Ch-1/Ch-2 ratio inaccuracy. However, the Ch Out reading should not be affected by the Ch-1 window setting. SinceGeorge,