

3001-0302250011



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ER-125/02
May 29, 2002

Mr. Brian Nickel
Ohio EPA
401 E. Fifth Street
Dayton, Ohio 45402-2911

Mr. Tim Fischer
U.S. EPA
SRF-5J
77 W. Jackson
Chicago, Illinois 60604

Subject: Contract No. DE-AC24-97OH20044
PRS 422 PACKAGE, PUBLIC REVIEW DRAFT

Dear Sirs:

Attached you will find the following document being submitted to you that incorporates OEPA comments:

PRS 422 Package, Public Review Draft

Authorization for distribution of this document has been received from Mr. Rob Rothman, Miamisburg Environmental Management Project, DOE, and Brian Nickel of OEPA.

If you have any questions, please call me at (937) 865-4543.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Monte A. Williams'.

Monte A. Williams
Project Manager, Environmental Restoration

MAW/KMA:kma

Enclosure

cc: DCC

MOUND



Environmental
Restoration
Program



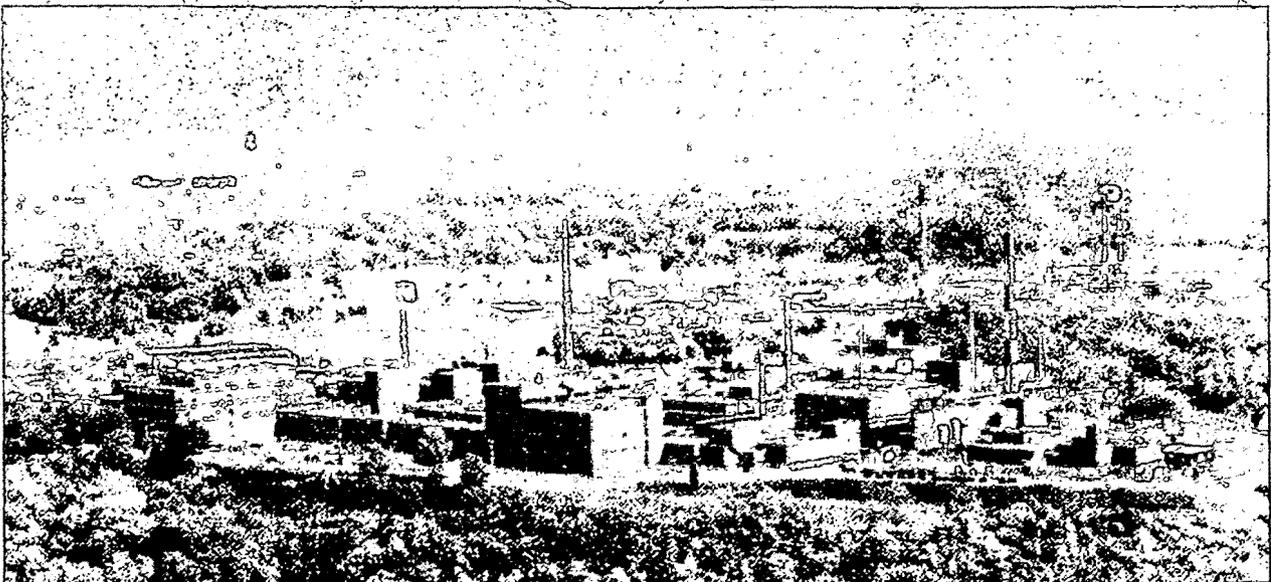
OhioEPA

MOUND PLANT

Potential Release Site Package

PRS #422

PUBLIC REVIEW DRAFT
MAY 2002



MOUND



Environmental
Restoration
Program

**MOUND PLANT
POTENTIAL RELEASE
SITE PACKAGE**

Notice of Public Review Period



The following Potential Release Site (PRS) package is available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio. Public comment on this document will be accepted 29 May 2002 through 27 June 2002.

PRS 422: Elevated Plutonium-238 Location

Questions can be referred to Paul Lucas at (937) 865-4578.

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REFERENCES

- Reference 1: Mound Guideline and Screening Values
- Reference 2: Vistamap Figure and Table
- Reference 3: Excerpts from OU9 Volume 3

REVISION TRACKING PAGE
PRS 422

REV	DESCRIPTION	DATE
WORKING DRAFT	Reviewed by Rakel, Neff, Lucas, Carfagno. Changed the location of PRS from "northeast" to "east" side of the plant. Added that depth of current samples was 0-2' composite. Added note on GV table indicating that current samples were collected prior to generation of Reference 1. Changed version to "Draft" and forwarded to regulators for review.	25 July 2001
DRAFT	Reviewed by USEPA/Fischer. Changed name to "Elevated Plutonium-238 Spot". OEPA changes included adding excerpts from OU9 Vol 3, adding coordinates, define "U" on Table 2. Changed version to "Draft Proposed Final" and forwarded to regulators for review.	31 July 2001
DRAFT PROPOSED FINAL	Binned NFA on 22 August 2001. OEPA comments on May 2002 DPF included: Clarify note on Table 2 from 004732-33 and 004734-36 to 004732 & 004733 and 004734 through 004736. Identify via a hand markup sample C0122 on Table in Reference 3. BW changed version to Public Review Draft and Changed Fig 2 to Fig 3 typo on page 1 of 6.	September 2001
PUBLIC REVIEW DRAFT	Contains signed Recommendation Page and incorporates DPF comments. Available for public review/comment 29 May through 27 June 2002.	May 2002
FINAL		

PRS HISTORY:

Potential Release Site (PRS) 422 is located north of Building 44 near the east edge of the Mound Plant as shown in Figure 1. It was designated as a PRS based on an historic elevated plutonium-238 sample that was collected in 1982^{2,3}. PRS 422 (boring location C0122, sample ID 1298) is a single, isolated instance of contamination at 494 pCi/g plutonium-238 at a depth of 1.5 feet. The location of C0122 is shown on Figure 2 and results from all four intervals sampled in 1982 are presented in Table 1.

Table 1: Historic Contamination at PRS 422 (pCi/g)

Analyte	Sample depth (feet)	Result & Data Qualifier	Guideline Value ¹	Background ¹
Plutonium-238	1.5	494	55	0.13
Thorium-232	1.5	2U	1.49	1.4
Plutonium-238	3	0.68	55	0.13
Thorium-232	3	2U	1.49	1.4
Plutonium-238	4.5	0.25	55	0.13
Thorium-232	4.5	2U	1.49	1.4
Plutonium-238	6	0.39	55	0.13
Thorium-232	6	2U	1.49	1.4

U: not detected

CONTAMINATION:

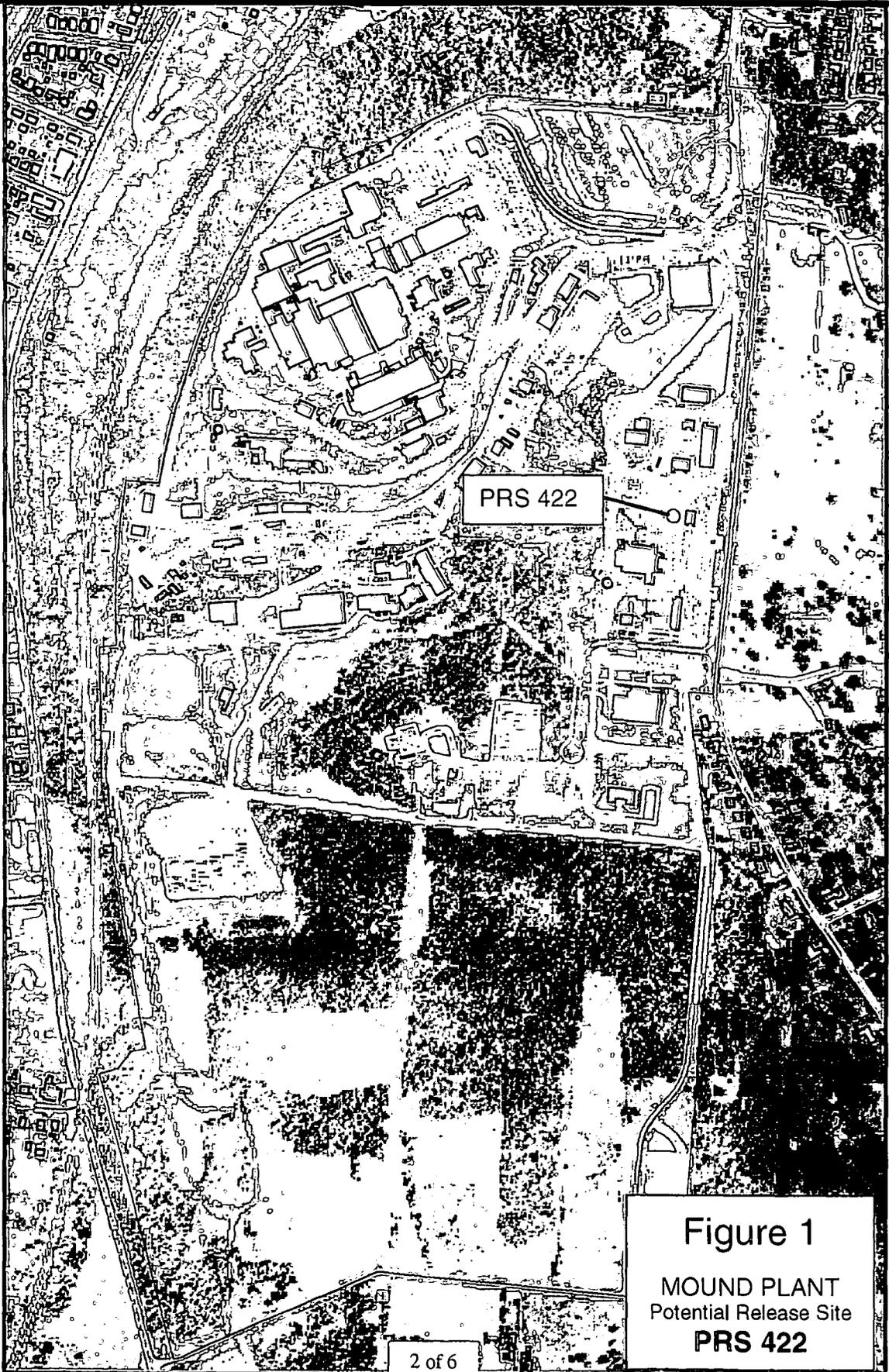
To confirm or deny the validity of this historic sample, an additional five samples were collected in August 2000 at and around the location surveyed as C0122. All five samples were composites collected from 0-2 feet below ground surface and analyzed by onsite gamma spec with results presented in Table 2. None of the results exceeded current Guideline Values¹. The additional sample locations are shown in Figure 3. Pre-sample RadCon scans of the ground surfaces where samples were collected yielded no detects. All direct readings on auger and shovels were below instrument detection limits.

REFERENCES:

- 1) Mound Guideline & Screening Values for Soil/Sediment, Draft, March 2001.
- 2) Vistamap Figure and Table
- 3) Excerpts from Operable Unit 9, Site Scoping Report Volume 3 – Radiological Site Survey, June 1993, Final.

PREPARED BY:

Karen M. Arthur, BWXT of Ohio, ER QA



PRS 422

Figure 1

MOUND PLANT
Potential Release Site
PRS 422

Figure 2: Location of C0122 Boring

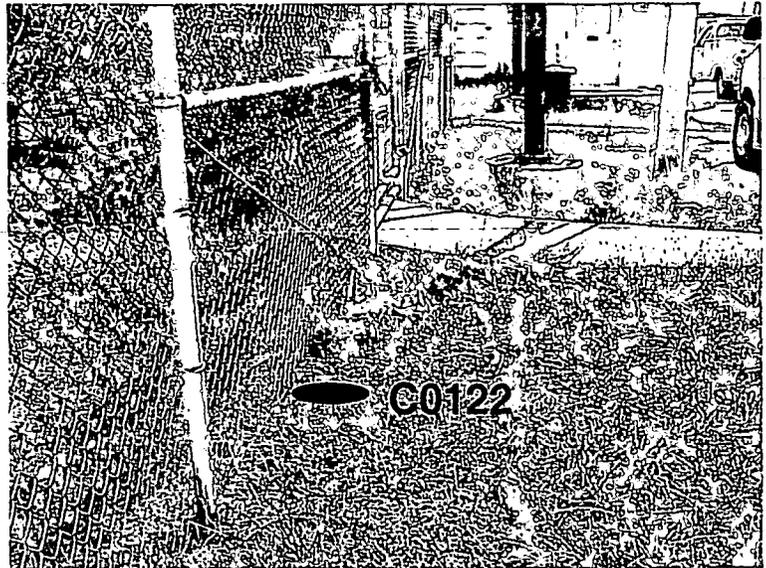


Figure 3: Additional Sample Locations

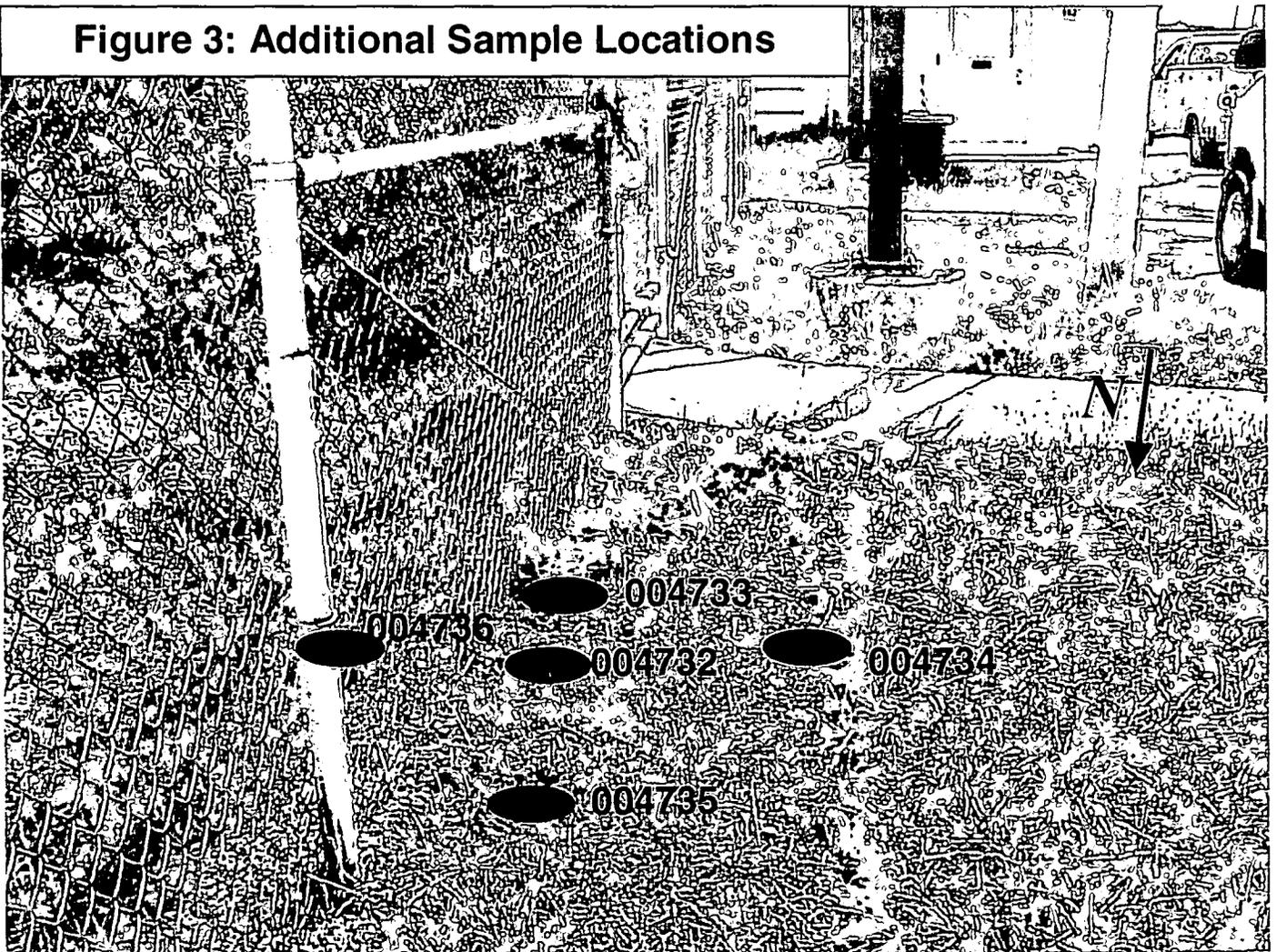


Table 2: Additional Sample Results (pCi/g)

Sample ID	Analyte	Result	Detection Limit	Lab Qualifier
4732	Actinium-227	0.1	0.1	U
4732	Americium-241	0.03	0.03	U
4732	Cesium-137	0.1	0.01	
4732	Cobalt-60	0.02	0.02	U
4732	Lead-210	0.85	0.29	
4732	Plutonium-238	8.5	8.5	U
4732	Radium-226	1.44	0.37	
4732	Thorium-230	3.36	3.36	U
4732	Thorium-232	0.84	0.05	
4732	Uranium-238	1.02	0.33	

4733	Actinium-227	0.13	0.13	U
4733	Americium-241	0.04	0.04	U
4733	Cesium-137	0.13	0.02	
4733	Cobalt-60	0.02	0.02	U
4733	Lead-210	1.27	0.4	
4733	Plutonium-238	11.36	11.36	U
4733	Radium-226	1.95	0.44	
4733	Thorium-230	4.08	4.08	U
4733	Thorium-232	0.95	0.06	
4733	Uranium-238	0.74	0.41	

4734	Actinium-227	0.27	0.27	U
4734	Americium-241	0.07	0.07	U
4734	Cesium-137	0.08	0.04	
4734	Cobalt-60	0.08	0.08	U
4734	Lead-210	0.65	0.65	U
4734	Plutonium-238	15.37	15.37	U
4734	Radium-226	1.89	0.73	
4734	Thorium-230	6.62	6.62	U
4734	Thorium-232	0.42	0.26	

Table 2: Additional Sample Results (cont.)

Sample ID	Analyte	Result	Detection Limit	Lab Qualifier
4735	Actinium-227	0.35	0.35	U
4735	Americium-241	0.11	0.11	U
4735	Cesium-137	0.11	0.05	
4735	Cobalt-60	0.04	0.04	U
4735	Lead-210	0.98	0.98	U
4735	Plutonium-238	29.93	29.93	U
4735	Radium-226	1.28	0.97	
4735	Thorium-230	10.03	10.03	U
4735	Thorium-232	0.8	0.13	
4735	Uranium-235	0.15	0.06	

4736	Actinium-227	0.32	0.32	U
4736	Americium-241	0.13	0.13	U
4736	Cesium-137	0.08	0.08	U
4736	Cobalt-60	0.06	0.06	U
4736	Lead-210	1.18	1.18	U
4736	Plutonium-238	37.04	37.04	U
4736	Radium-226	1.36	1.36	U
4736	Thorium-230	12.34	12.34	U
4736	Thorium-232	0.8	0.22	

U: not detected at the specified detection limit

Note: samples 004732 & 004733 collected 1 Aug. 2000

samples 004734 through 004736 collected 9 Aug. 2000

Table 3: Coordinates

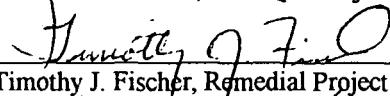
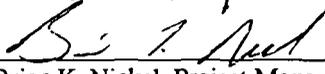
Sample ID	Easting	Northing
C0122	1466487	598258.5
4732	1466486	598258.4
4733	1466485	598256.4
4734	1466483	598258.6
4735	1466486	598260.4
4736	1466488	598258.2

**MOUND PLANT
PRS 422
"Elevated Plutonium-238 Spot"**

RECOMMENDATION:

PRS 422 was designated as a PRS based on an historic elevated plutonium-238 sample that was collected in 1982. Five samples were collected in 2000 at and around PRS 422 with all results below guideline criteria. Based on the re-sampling results, the Core Team recommends NO FURTHER ASSESSMENT (NFA) for PRS 422.

CONCURRENCE:

DOE/MEMP:	 Robert S. Rothman, Remedial Project Manager	<u>8/22/01</u> (date)
USEPA:	 Timothy J. Fischer, Remedial Project Manager	<u>8/22/01</u> (date)
OEPA:	 Brian K. Nickel, Project Manager	<u>8/22/01</u> (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 422

REFERENCE 1

Mound Guideline & Screening Values

DRAFT March 2001

Mound Guideline and Screening Values (pCi/g) for Soil/Sediment			
RADIONUCLIDE	BKGD.	Guideline Value 10 ⁻⁶	Screening Level ⁽⁶⁾
Actinium ^{227+D}	0.11 ⁽³⁾	1 ⁽¹⁾	1.11
Americium ²⁴¹	ND	4.95 ⁽¹⁾	4.95
Cesium ^{137+D}	0.42	0.42 ⁽¹⁾	0.84
Cobalt ⁶⁰	NC	.09 ⁽¹⁾	.09
Lead ^{210+D}	1.2 ⁽³⁾	1.65 ⁽²⁾	2.85
Plutonium ²³⁸	0.13	5.5 ⁽¹⁾	55 ⁽⁴⁾
Protactinium ^{231+D}	.11 ⁽³⁾	0.69 ⁽²⁾	7 ⁽⁴⁾
Radium ^{226+D}	2.0	0.13 ⁽¹⁾	2.13
Thorium ^{230+D}	1.9	0.12 ⁽²⁾	⁽⁵⁾
Thorium ^{232+D}	1.4	0.09 ⁽²⁾	1.49
Uranium ²³⁴	1.1	0.13 ⁽²⁾	⁽⁶⁾
Uranium ²³⁵	0.11	3.18 ⁽²⁾	3.29
Uranium ²³⁸	1.2	11 ⁽¹⁾	12.2
Uranium ^{238+D}	1.2	0.12 ⁽²⁾	1.32

NOTES:

⁽¹⁾ These guideline values are based on the more restrictive of the Construction Worker and Site Employee Values from Risk-Based Guideline Values, Mound Plant, Miamisburg, Ohio, March 1997, Final (Revision 4), Appendix B, Tables 4B & 5B.

⁽²⁾ These guideline values are based on the more restrictive of the Construction Worker and Site Employee Values. These values were calculated using the methodology contained in Risk Based Guideline Values, March 1997, Final but were performed subsequent to its publication.

⁽³⁾ These radionuclides have comparatively short half-lives and are deduced to be in secular equilibrium with the parent nuclide. Thus the background value measured for the parent is considered to be the appropriate value for these as well. The validity of using this method for background determination for other radionuclides will be assessed on a case by case basis.

⁽⁴⁾ These values represent 1E-5 risk value

⁽⁵⁾ In areas where Th-230 is not a contaminant of potential concern, Mound will use our normal sample analysis process through gamma spectroscopy and will assure that the result and MDA are less than 10 pCi/g. If the detected value for Th-230 is greater than MDA, Mound will reanalyze the sample. If Th-230 is a Contaminant of Potential Concern the detection limits of the analysis will be at or below the listed guideline value of 0.12 pCi/g above background.
NOTE THAT THIS PRS 422 SAMPLING WAS CONDUCTED PRIOR TO ESTABLISHMENT OF THIS CRITERIA.

⁽⁶⁾ The Screening Level is reflective of onsite Gamma Spec Laboratory capabilities and will be used to determine if additional characterization or removal may be necessary. Soil Screening is not an appropriate technique for U-234. However, detection of U-235 or U-238 is anticipated in conjunction with U-234 contamination. Positive detection of either U-235 or U-238 (above guideline values) will trigger alpha spectroscopic analysis of the sample.

Radionuclides labeled with a D indicate that pertinent daughters are included within the the risk calculation.

U-238 may be assessed for secular equilibrium and appropriate GV used.

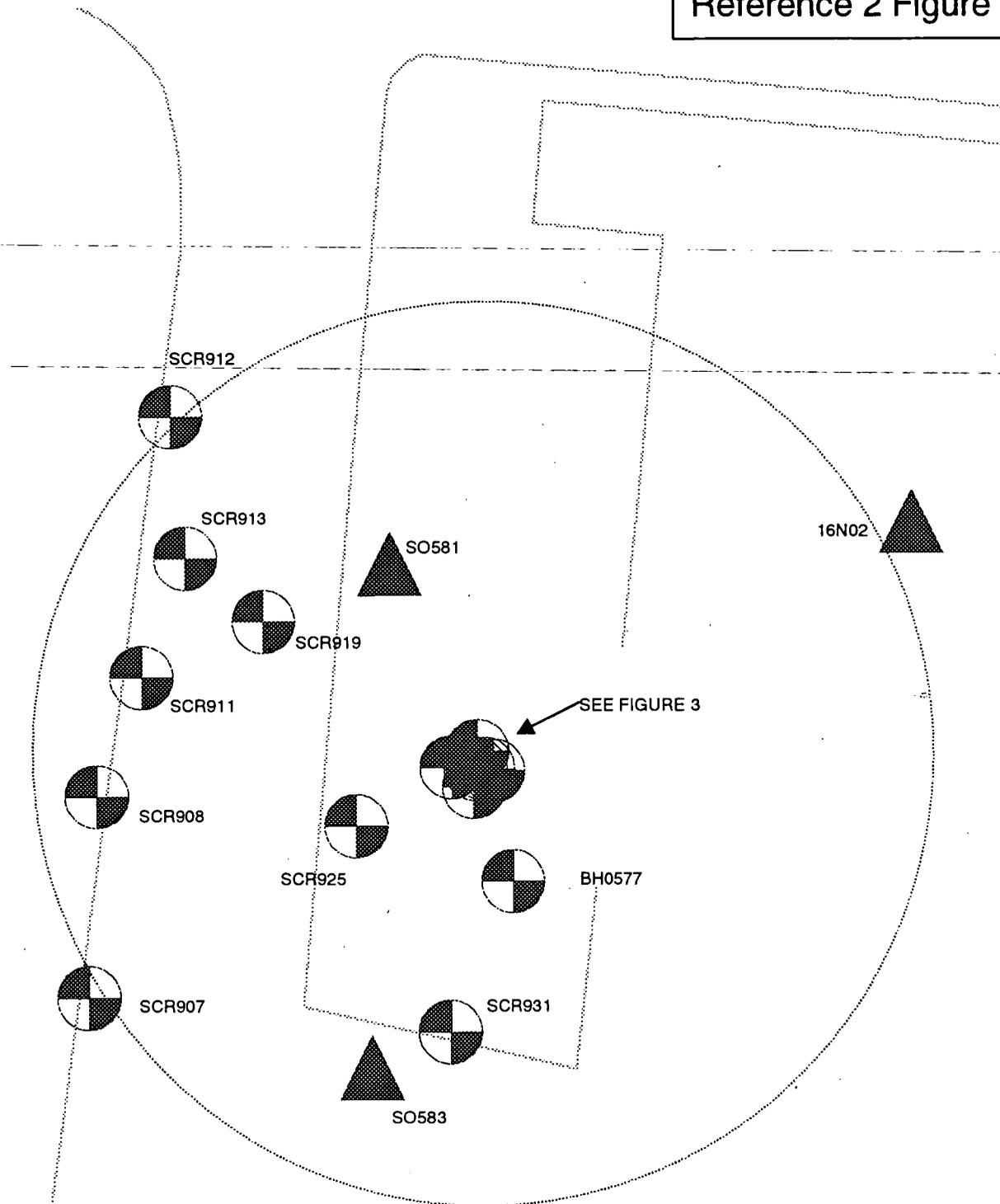
NC = Not Calculated

ND = Not detected

REFERENCE 2

Vistamap Figure and Table

Reference 2 Figure



NOTE: CIRCLE REPRESENTS SEARCH RADIUS OF 50' FROM CO122

REFERENCE 2 TABLE

Location	Type	Project	Date	Start_depth	End_depth	Analyte	Result	Unit	DL	LQ
C0122	Borehole	RSS	19821201	3	3	Plutonium-238	0.68	PCI/G	0.01	
C0122	Borehole	RSS	19821201	4.5	4.5	Plutonium-238	0.25	PCI/G	0.01	
C0122	Borehole	RSS	19821201	1.5	1.5	Plutonium-238	494	PCI/G	0.01	
C0122	Borehole	RSS	19821201	6	6	Plutonium-238	0.39	PCI/G	0.01	
C0122	Borehole	RSS	19821201	3	3	Thorium-232	2	PCI/G	2	U
C0122	Borehole	RSS	19821201	4.5	4.5	Thorium-232	2	PCI/G	2	U
C0122	Borehole	RSS	19821201	1.5	1.5	Thorium-232	2	PCI/G	2	U
C0122	Borehole	RSS	19821201	6	6	Thorium-232	2	PCI/G	2	U
S0583	Surface location	RSS	19831001	0	0	Plutonium-238	7.96	PCI/G	0.01	
S0583	Surface location	RSS	19831001	0	0	Thorium-232	2	PCI/G	2	U
S0581	Surface location	RSS	19840801	0	0	Plutonium-238	10.1	PCI/G	0.01	
S0581	Surface location	RSS	19840801	0	0	Thorium-232	2	PCI/G	2	U
SCR907	Borehole	SCRDATA	19931029	0	0	Plutonium-238	0	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Plutonium-238	4	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Plutonium-238	17	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Plutonium-238	0	PCI/G		U
SCR908	Borehole	SCRDATA	19931029	0	0	Plutonium-238	3	PCI/G		U
SCR908	Borehole	SCRDATA	19931029	0	0	Plutonium-238	0	PCI/G		U
SCR908	Borehole	SCRDATA	19931029	0	0	Plutonium-238	11	PCI/G		U
SCR911	Borehole	SCRDATA	19931029	0	0	Plutonium-238	9	PCI/G		U
SCR913	Borehole	SCRDATA	19931029	0	0	Plutonium-238	0	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Thorium-232	0.5	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Thorium-232	0.5	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Thorium-232	1.1	PCI/G		U
SCR907	Borehole	SCRDATA	19931029	0	0	Thorium-232	0.5	PCI/G		U
SCR908	Borehole	SCRDATA	19931029	0	0	Thorium-232	1.1	PCI/G		U
SCR908	Borehole	SCRDATA	19931029	0	0	Thorium-232	0.8	PCI/G		U
SCR908	Borehole	SCRDATA	19931029	0	0	Thorium-232	0.6	PCI/G		U
SCR911	Borehole	SCRDATA	19931029	0	0	Thorium-232	1.1	PCI/G		U
SCR913	Borehole	SCRDATA	19931029	0	0	Thorium-232	0.6	PCI/G		U
SCR931	Borehole	SCRDATA	19931101	0	0	Plutonium-238	5	PCI/G		U
SCR931	Borehole	SCRDATA	19931101	0	0	Plutonium-238	9	PCI/G		U
SCR919	Borehole	SCRDATA	19931101	0	0	Plutonium-238	0	PCI/G		U
SCR919	Borehole	SCRDATA	19931101	0	0	Plutonium-238	8	PCI/G		U
SCR925	Borehole	SCRDATA	19931101	0	0	Plutonium-238	15	PCI/G		U
SCR925	Borehole	SCRDATA	19931101	0	0	Plutonium-238	5	PCI/G		U
SCR912	Borehole	SCRDATA	19931101	0	0	Plutonium-238	7	PCI/G		U
SCR912	Borehole	SCRDATA	19931101	0	0	Plutonium-238	2	PCI/G		U
SCR912	Borehole	SCRDATA	19931101	0	0	Plutonium-238	11	PCI/G		U
SCR931	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.6	PCI/G		U

REFERENCE 2 TABLE

Location	Type	Project	Date	Start_depth	End_depth	Analyte	Result	Unit	DL	LQ
SCR931	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.8	PCI/G		U
SCR919	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.7	PCI/G		U
SCR919	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.6	PCI/G		U
SCR925	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.7	PCI/G		U
SCR925	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.8	PCI/G		U
SCR912	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.7	PCI/G		U
SCR912	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.9	PCI/G		U
SCR912	Borehole	SCRDATA	19931101	0	0	Thorium-232	0.6	PCI/G		U
16N02	Surface location	2680	19940922	0	1.5	Total Aromatic H	1747145	IC		
16N02	Surface location	2680	19940922	0	1.5	Total C5 TO C11	2189497	IC		
16N02	Surface location	2680	19940922	0	1.5	Total Semivolatil	1958	IC		
4732	Borehole	PRS422	20000801	0	2	Actinium-227	0.1	PCI/G	0.1	U
4733	Borehole	PRS422	20000801	0	2	Actinium-227	0.13	PCI/G	0.13	U
4732	Borehole	PRS422	20000801	0	2	Americium-241	0.03	PCI/G	0.03	U
4733	Borehole	PRS422	20000801	0	2	Americium-241	0.04	PCI/G	0.04	U
4732	Borehole	PRS422	20000801	0	2	Cesium-137	0.1	PCI/G	0.01	
4733	Borehole	PRS422	20000801	0	2	Cesium-137	0.13	PCI/G	0.02	
4732	Borehole	PRS422	20000801	0	2	Cobalt-60	0.02	PCI/G	0.02	U
4733	Borehole	PRS422	20000801	0	2	Cobalt-60	0.02	PCI/G	0.02	U
4732	Borehole	PRS422	20000801	0	2	Lead-210	0.85	PCI/G	0.29	
4733	Borehole	PRS422	20000801	0	2	Lead-210	1.27	PCI/G	0.4	
4732	Borehole	PRS422	20000801	0	2	Plutonium-238	8.5	PCI/G	8.5	U
4733	Borehole	PRS422	20000801	0	2	Plutonium-238	11.36	PCI/G	11.36	U
4732	Borehole	PRS422	20000801	0	2	Radium-226	1.44	PCI/G	0.37	
4733	Borehole	PRS422	20000801	0	2	Radium-226	1.95	PCI/G	0.44	
4732	Borehole	PRS422	20000801	0	2	Thorium-230	3.36	PCI/G	3.36	U
4733	Borehole	PRS422	20000801	0	2	Thorium-230	4.08	PCI/G	4.08	U
4732	Borehole	PRS422	20000801	0	2	Thorium-232	0.84	PCI/G	0.05	
4733	Borehole	PRS422	20000801	0	2	Thorium-232	0.95	PCI/G	0.06	
4732	Borehole	PRS422	20000801	0	2	Uranium-238	1.02	PCI/G	0.33	
4733	Borehole	PRS422	20000801	0	2	Uranium-238	0.74	PCI/G	0.41	
4734	Borehole	PRS422	20000809	0	2	Actinium-227	0.27	PCI/G	0.27	U
4735	Borehole	PRS422	20000809	0	2	Actinium-227	0.35	PCI/G	0.35	U
4736	Borehole	PRS422	20000809	0	2	Actinium-227	0.32	PCI/G	0.32	U
4734	Borehole	PRS422	20000809	0	2	Americium-241	0.07	PCI/G	0.07	U
4735	Borehole	PRS422	20000809	0	2	Americium-241	0.11	PCI/G	0.11	U
4736	Borehole	PRS422	20000809	0	2	Americium-241	0.13	PCI/G	0.13	U
4734	Borehole	PRS422	20000809	0	2	Cesium-137	0.08	PCI/G	0.04	
4735	Borehole	PRS422	20000809	0	2	Cesium-137	0.11	PCI/G	0.05	
4736	Borehole	PRS422	20000809	0	2	Cesium-137	0.08	PCI/G	0.08	U

REFERENCE 2 TABLE

Location	Type	Project	Date	Start_depth	End_depth	Analyte	Result	Unit	DL	LQ
4734	Borehole	PRS422	20000809	0	2	Cobalt-60	0.08	PCI/G	0.08	U
4735	Borehole	PRS422	20000809	0	2	Cobalt-60	0.04	PCI/G	0.04	U
4736	Borehole	PRS422	20000809	0	2	Cobalt-60	0.06	PCI/G	0.06	U
4734	Borehole	PRS422	20000809	0	2	Lead-210	0.65	PCI/G	0.65	U
4735	Borehole	PRS422	20000809	0	2	Lead-210	0.98	PCI/G	0.98	U
4736	Borehole	PRS422	20000809	0	2	Lead-210	1.18	PCI/G	1.18	U
4734	Borehole	PRS422	20000809	0	2	Plutonium-238	15.37	PCI/G	15.37	U
4735	Borehole	PRS422	20000809	0	2	Plutonium-238	29.93	PCI/G	29.93	U
4736	Borehole	PRS422	20000809	0	2	Plutonium-238	37.04	PCI/G	37.04	U
4734	Borehole	PRS422	20000809	0	2	Radium-226	1.89	PCI/G	0.73	
4735	Borehole	PRS422	20000809	0	2	Radium-226	1.28	PCI/G	0.97	
4736	Borehole	PRS422	20000809	0	2	Radium-226	1.36	PCI/G	1.36	U
4734	Borehole	PRS422	20000809	0	2	Thorium-230	6.62	PCI/G	6.62	U
4735	Borehole	PRS422	20000809	0	2	Thorium-230	10.03	PCI/G	10.03	U
4736	Borehole	PRS422	20000809	0	2	Thorium-230	12.34	PCI/G	12.34	U
4734	Borehole	PRS422	20000809	0	2	Thorium-232	0.42	PCI/G	0.26	
4735	Borehole	PRS422	20000809	0	2	Thorium-232	0.8	PCI/G	0.13	
4736	Borehole	PRS422	20000809	0	2	Thorium-232	0.8	PCI/G	0.22	
4735	Borehole	PRS422	20000809	0	2	Uranium-235	0.15	PCI/G	0.06	

DL: detection limit

LQ: lab qualifier

U: not detected at the specified detection limit

REFERENCE 3

Excerpts from OU9 Volume 3

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

This method is inadequate for decontamination and may have resulted in significant cross-contamination, considering the probable detection capabilities of the field screening. This cross-contamination probably resulted in substantial blurring of the variation between samples at each area.

2.3.2.4. Sample Handling and Documentation

It appears that chain-of-custody forms were not completed when samples were transferred from the field site to either the onsite analytical laboratories or to the offsite verification laboratories. In addition, other than a short memo (Stought 1984) describing the placement of surface samples in an EPA sample dish and the grinding of samples, there are no procedures available that describe how the samples were containerized, labeled, or logged at the onsite laboratory.

Because there are several samples with the same MRC ID, it is evident that errors in assigning sample numbers occurred. Other errors noted in the data include different sets of sample results with the same coordinates.

The memorandum describing surface sampling also stated that non-soil matter, such as rocks and twigs, was removed from the sample dish (Stought 1984). This was probably performed to remove items that would interfere with the sample preparation/grinding procedure. However, the EPA recommends that non-soil items be either retained in the sample, or collected in a separate sample for analysis (EPA 1984). The non-soil portions must also be considered as part of the site under investigation, and eliminating this portion may result in the loss of information.

2.3.2.5. Sampling Locations and Depth of Core Locations

As discussed below, the south and west coordinates of the surface locations shown on Plate 1 were estimated by the field team, based on the observed position relative to the grid block and known landmarks, such as buildings. Mound Plant has estimated that the resulting error in the coordinates of the surface locations is ± 25 ft. However, the basis for this estimate is unknown, and it is possible that the error is much greater. The core locations were surveyed by a licensed surveyor.

With the exception of the drilling logs given in Appendix B, there is currently no documentation included in this report that discusses the strata observed during drilling, or whether bedrock was encountered at most of the drilling locations. Based on the depths to bedrock indicated by Mound Plant drawing #FSE16472, Mound Plant Site Plan Test Borings, reproduced in Site Scoping Report: Volume 2 Addendum (DOE 1992f), it appears that drilling/sampling at many of the core locations on

the Main and SM/PP hills may have reached bedrock. The majority of the locations in the valley area appear not to have reached bedrock.

2.3.3. Sample Analyses and Reporting

The original Site Survey Project Report (Stought, et al. 1988) stated that all samples collected were radiochemically analyzed for plutonium-238 and FIDLER screened for thorium. However, plutonium and thorium results are not reported for many of the samples, usually the samples that were analyzed by gamma spectroscopy. It is not known if the plutonium-238 and thorium analyses were not performed, or if they were performed and not reported. Although it was stated that gamma spectroscopy was performed if the activity screened exceeded the estimated amounts of plutonium and thorium, these initial results were not always available.

The evaluation of the Site Survey Project data for this report was not performed using the raw (laboratory) data. The data evaluated were already tabulated, and are reproduced in a similar fashion in Appendix E. The exceptions to this are the gamma spectroscopy data included at the end of Appendix E and the *in situ* gamma spectroscopy data given in Appendix C, which was performed at the locations given in Table II.4. These *in situ* data were checked against the tabulated data received, and any errors noted were corrected in the tabulated data. Not all of the results listed for the radionuclides analyzed by gamma spectroscopy, such as cobalt-60, cesium-137, radium-226, actinium-227, and americium-241, were included in the gamma spectroscopy printout in Appendix E. These data could not be verified and a note is included for the appropriate samples.

The estimated LDLs for the radionuclides detected are available, either from the original Site Survey Project Report, or from Mound Plant personnel, as follows:

- the LDL for tritium was approximately 1.0 pCi/mL of soil moisture, varying slightly depending on the amount of soil moisture present in the sample;
- the LDL for plutonium-238, using radiochemical analysis, was 0.01 pCi/g with a relative precision (2 standard deviations) of 25 percent;
- the LDLs and relative precisions (2 standard deviations) for the thorium isotopes were 0.3 pCi/g and 60 percent for thorium-228, 0.3 pCi/g and 30 percent for thorium-230, and 0.1 pCi/g and 70 percent for thorium-232 (however, thorium results were reported as total thorium, not isotopically);
- the LDLs for cobalt-60, cesium-137, and americium-241, using gamma spectroscopy, were 0.5 pCi/g (precisions for individual measurements are included in the gamma spectroscopy printout at the back of Appendix E); and
- the LDL for radium-226 and actinium-227 is estimated to be 1.0 pCi/g (Stought 1990).

location C0056 on Plate 1 (Table IV.5). The maximum thorium concentration measured was 3.46 pCi/g in the sample taken 36 inches deep at core location C0058 on Plate 1 (Table IV.5).

Thirteen samples collected in Area 16 were analyzed by gamma spectroscopy (samples from locations C0059, C0060, C0061, SO348, and SO349 on Table IV.5). Radium-226 was the only radionuclide detected above the LDLs, at a maximum concentration of 1.2 pCi/g.

During core sampling performed in Area 16 in 1989, bedrock was encountered at depths ranging from 108 to 162 inches (9 to 13.5 ft) (Price 1989). The core locations sampled in the area as part of the Site Survey Project were sampled to depths from 72 to 126 inches. Because the boring logs for the Site Survey Project coring are not available, it is not known if individual Area 16 boreholes were sampled to bedrock, although this appears to be possible.

4.1.5. Area 17

Area 17 is located on the SM/PP Hill, under and surrounding the SM Building (Plate 1). The SM Building served as the central point of plutonium-238 processing in the early to mid-1960s (DOE 1992c). Plutonium processing operations in the SM Building and the storage of plutonium materials in tanks on the southwestern side of the building resulted in the release of plutonium to the soils under the concrete floor of the building and to the soils surrounding the building. Sampling performed in 1972 indicated that about 11.2 curies of plutonium-238 were present under or around the SM Building (Flanagan 1976). The SM Building is currently being decommissioned by the Mound Plant D&D Program. The concrete floor, contaminated soil, and drains with contamination in excess of 10 nCi/g, have been removed. In addition, the northern portion of the structure, known as the SM annex, has been removed. The cleanup level for this effort was 100 pCi/g. Since the D&D of Area 17 is an ongoing project, the Area 17 boundaries (Plate 1) are, by design, similar to the boundaries depicted in the original Site Survey Project Report (Stought et al. 1988).

The Site Survey Project sampling locations in Area 17 are shown on Plate 1. No sampling was performed inside the SM Building, potentially where the highest concentrations (10 nCi/g or greater) exist. (No sampling was performed in buildings during the project.) The analytical results of the sampling are given in Table IV.6. The maximum plutonium-238 concentration measured was 494 pCi/g in a sample taken at a depth of 18 inches at core location O122 on Plate 1 (O122 on Table IV.6). The maximum thorium concentration measured was 9.99 pCi/g in the sample taken at a depth of 54 inches at core location C0130 (Table IV.6). The original Site Survey Project Report noted that D&D Program screening in Area 17 showed plutonium-238 concentrations much higher than the Site Survey Project.

Table IV.6. Mound Site Survey Project - Area 17

Plate 1 Location ^a	Coordinates		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)
	South	West										
S0579	2775	2135	6374	08-84	0	3.94	b		LDL	LDL	0.9	LDL
S0580	2775	2160	6373	08-984	0	2.08	b					
C0119	2735	2210	1323	12-82	18	17.81	b					
			1324	12-82	36	1.78	b					
			1325	12-82	54	9.98	b					
			1326	12-82	72	2.29	b					
			1327	12-82	90	17.90	b					
			1328	12-82	120	6.24	b					
C0120	2805	2195	1329	12-82	18	83.70	b					
			1330	12-82	36	32.30	b					
			1331	12-82	54	0.18	b					
			1332	12-82	72	0.29	b					
			1333	12-82	90	83.00	b					
			1334	12-82	120	6.92	b					
			1335	12-82	144	0.56	b					
C0121	2810	2095	1309	12-82	18	5.08	b					
			1310	12-82	36	0.30	b					
S0581	2900	2010	6372	08-84	0	10.10	b					
S0582	2900	2085	2880	10-83	0	146.80	b					
C0122	2925	2010	1298	12-82	18	494.00	b					
			1299	12-82	36	0.68	b					
			1300	12-82	54	0.25	b					
			1301	12-82	72	0.39	b					
S0583	2950	2035	2881	10-83	0	7.96	b					
S0584	2950	2060	6371	08-84	0	18.80	b					



Table IV.6. (page 2 of 2)

Plate 1 Location ^a	Coordinates		MRC ID No.	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)
	South	West									
C0123	2975	2115	1364	12-82	18	2.91	b				
			1365	12-82	36	0.51	b				
			1366	12-82	54	0.23	b				
C0125	3085	2185	1358	12-82	18	0.43	b				
			1359	12-82	36	0.25	3.11				
			1360	12-82	54	33.60	b				
			1361	12-82	72	0.13	3.25				
			1362	12-82	90	1.97	b				
			1363	12-82	108	0.19	b				
C0126	2725	2265	1319	12-82	18	5.57	b				
			1320	12-82	36	79.00	b				
			1321	12-82	54	6.51	b				
			1322	12-82	72	0.37	b				
C0130	2800	2265	1336	12-82	18	48.10	b				
			1337	12-82	36	1.41	b				
			1338	12-82	54	1.25	9.99				
			1339	12-82	90	0.39	b				
			1340	12-82	108	0.37	b				
C0137	2875	2290	1285	12-82	18	4.78	2.38				
			1286	12-82	36	1.24	2.90				

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

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

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

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 of radium-226.

MRC ID - Monsanto Research Corporation identification

pCi/g - picocuries per gram

pCi/mL - picocuries per milliliter

However, it is probable that limited sampling was performed during the Site Survey Project due to the upcoming D&D of the SM Building. Screening during the 1989 reconnaissance indicated plutonium-238 concentrations up to 3,300 pCi/g (DOE 1992d).

The Area 17 sampling results given in Table IV.6 do not agree with the assessment given in the original report. These differences lie in the reported thorium and radium-226 concentrations. The data summary in the original report indicated no measurements of radium in the soil, and showed concentrations of thorium between approximately 100 and 1,000 pCi/g. Table IV.6 presents the actual data which include one surface soil sample that contained 0.9 pCi/g of radium-226 and five core samples that exceeded the background level for thorium of 2.0 pCi/g. Thorium concentrations in the five samples ranged from 2.38 to 9.99 pCi/g, but did not exceed the 100 pCi/g level indicated in the original data summary (Stought et al. 1988). The results for cesium-137 at location S0579 were below the detection limit of 0.5 pCi/g. No other samples in the area are known to have been analyzed by gamma spectroscopy. The potential for cesium-137 contamination does exist in the area, as the SM Building site encloses the historic site of Warehouse 13, used in the 1950s for storage of waste sludges from the Reactor Waste Decontamination Project, described in companion section 9 of this report.

Mound Plant drawing #FSE16472, reproduced in the Site Scoping Report: Volume 2 Addendum (DOE 1992f) indicates the depth to bedrock in this area is 48 to 180 inches (4 to 15 ft). The Area 17 core locations were sampled to a maximum depth of 144 inches, but the total depths ranged from as low as 36 inches (Table IV.6). Therefore, it appears that some of the Area 17 coreholes may have been sampled to bedrock, although the boring logs are not available to confirm this.

4.1.6. Area 18

Area 18 is located adjacent to the overflow pond on the western border of Mound Plant (Plate 1). The area is described in many historical documents as the cover of the Site Sanitary Landfill. Contamination reportedly resulted from contaminated sediments being incorporated into the cover materials. Sediments, containing plutonium-238, from the plant drainage ditch were apparently dumped at the historic landfill in the early 1970s and were then incorporated into the Site Sanitary Landfill when it was built in 1977. It is reasonable to assume that the landfill liner, berms, and cover also received contaminated soils (DOE 1991a). The southwestern portion of Area 18 overlaps Area 2, where crushed thorium drums were buried. The extent of Area 18 shown in Plate 1 and the sample results discussed below appear to be similar to the area and samples given in the original Site Survey Project Report (Stought et al. 1988).