3001 0406080002

BWX Technologies, Inc.
a McDermott company

BWXT of Ohio, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

ER-364/02
December 18, 2002

Mr. Richard B. Provencher, Director
Miamisburg Closure Project
U. S. Department of Energy
P. O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Robert S. Rothman

SUBJECT: Contract No. DE-AC24-97OH20044
PRS 274/275 PACKAGE, PUBLIC REVIEW DRAFT

REFERENCE: Statement of Work Requirement C.7.1e - Regulator Reports

Dear Mr. Provencher:

Rob Rothman from your office has approved the release of the following documents for public review:

- PRS 274/275 Package, Public Review Draft
- Response to OEPA Comments on Draft Addendum 1

USEPA had no comments on the draft Addendum 1 to this PRS Package. The public review period is 18 December through 17 January 2003. Any public comments will be addressed in the final document.

If you or members of your staff have any questions regarding the documents, or if additional support is needed, please contact Dave Rakel at extension 4203.

Sincerely,

Monte A. Williams
Project Manager, Environmental Restoration

MAW/KMA:kma

Enclosures

cc: Tim Fischer, USEPA, (1) w/attachments
Brian Nickel, OEPA, (4) w/attachments
Ruth Vandegrift, ODH, (1) w/attachments
Paul Lucas, DOE/MCP, (1) w/attachments
Randy Tormey, DOE/HQ, (1) w/attachments
Dann Bird, MMCIC, (3) w/attachments
J. D. Bonfiglio, MESH, (1) w/attachments
Dave Rakel, BWXT of Ohio, (1) w/attachments
Karen Arthur, BWXT of Ohio, (1) w/attachments
Monte Williams, BWXT of Ohio, (2) w/attachments
Public Reading Room, (4) w/attachments Received copies previously
DCC

3001-0406080002

MOUND

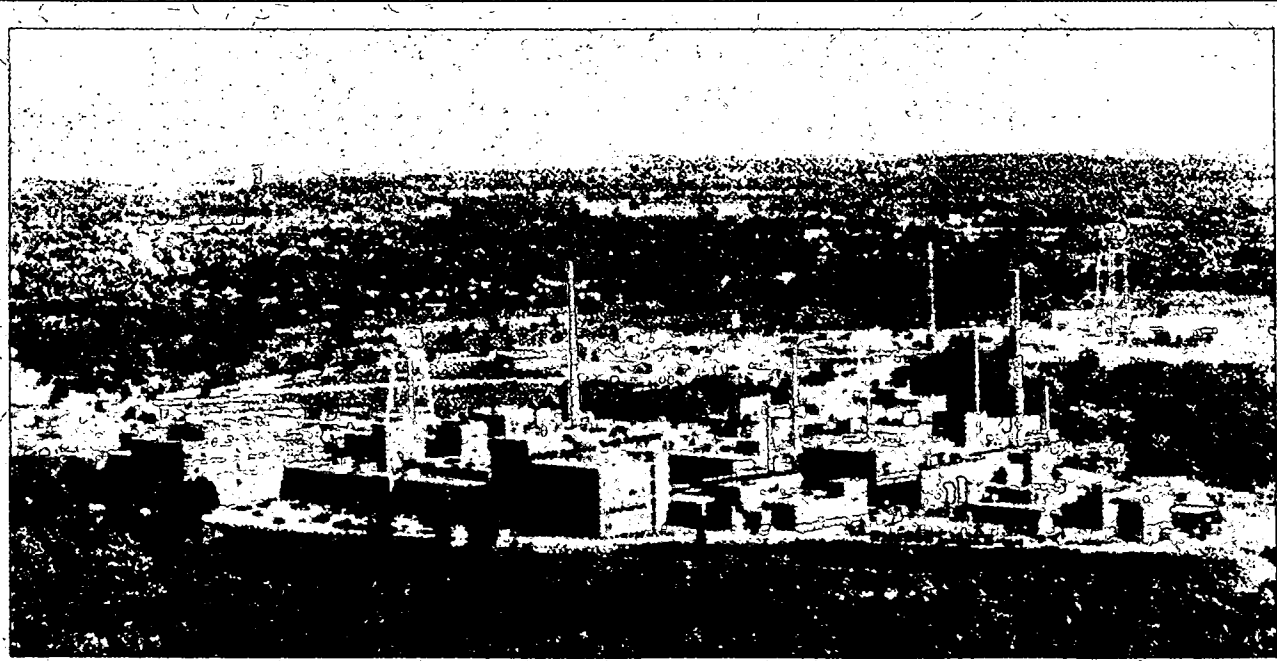
Environmental
Restoration
Program

MIAMISBURG CLOSURE PROJECT

Potential Release Site Package

PRS 274/275

Public Review Draft
December 2002



PRS 274/275 Package Tracking Sheet

REVISION	DESCRIPTION	DATE
Working Draft (to DOE)		
Draft (to Core Team)	CHANGED: - Wording in contamination section. Binned FA, 5/15/96.	**21 March 1996**
Addendum A	PRS depiction on introduction maps corrected per material and data review. Other PRS content unchanged.	
Draft Proposed Final	USEPA had no comments on Addendum 1. OEPA comment incorporated. Recommendation for Removal Action signed by Core Team on 20 March 2002.	**December 2002**
Public Review Draft	Public Review period 18 December 2002 – 17 January 2003.	**December 2002**
Final		

MOUND

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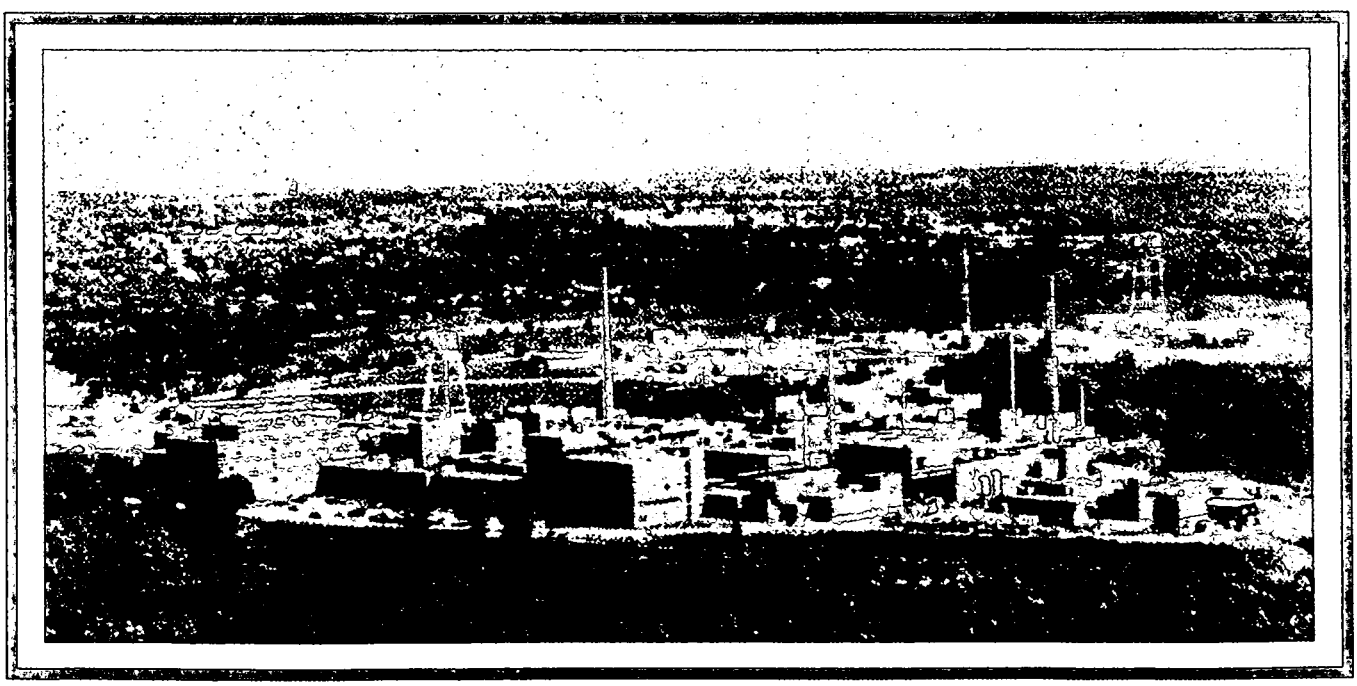
MIAMISBURG CLOSURE PROJECT

Potential Release Site Package

PRS 274/275

Addendum 1

PUBLIC REVIEW DRAFT
DECEMBER 2002



PRS HISTORY:

Potential Release Site (PRS) 274/275, also known as the Former Detonator Shack and Former Explosives Bunker, is located in the east-central part of the Mound Plant property as shown on Figure 1. PRS 274/275 was binned Further Assessment (FA) by the Core Team May 15, 1996.

FURTHER ASSESSMENT ACTIVITY:

The DOE and EPA-approved **Sampling and Analysis Plan** (SAP)[1] was implemented in 2002 and included analyses for contaminants of concern (COCs) as follows: Ac-227, Bi-210m, Cs-137, Pb-210, Pu-238, and Ra-226. Target samples were also collected for lead and Th-230.

FURTHER ASSESSMENT RESULTS:

Onsite gamma spec results confirmed Cs-137 above acceptable levels in two locations as shown on Figure 2. FA sample locations are presented on Figure 2. The FA **Data Report**[2] presents a full account of soil sampling activities and sample results (onsite and offsite laboratory analyses).

Maximum sample detections above screening levels (10-6 Risk-Based Guideline Value (RBGV) plus background) are presented in Table 1. All other isotopes (including the other COCs of Bi-210m, Pb-210, Pu-238, and Ra-226) and lead were below current screening levels.

Table 1: FA Results above Screening Levels (pCi/g)

Radionuclide	No. >SL	No.>CO	Max. Result	Location & depth	SL	CO
Actinium-227+D	5	0	1.7	B096,0-4'	0.56	4.6
Cesium-137+D	8	4	10.87	B063, 4-8'	0.76	3.8
Radium-228+D*	4	0	1.77	B096, 0.4'	1.47*	2.1*

SL: screening level, 10-6 RBGV plus background CO: cleanup objective, 10-5 RBGV plus background
*background for Ra-228 is based on that of the parent nuclide (Th-232)

The Core Team binned PRS 274/275 as a Removal Action on 28 February 2002. The RA was performed under the **Contingent Action Memo**[3], and as such, a **Fact Sheet** detailing the FA results (including the above data) and proposed RA activities was generated and underwent public review. A **Verification Sampling and Analysis Plan**[4] (VSAP) was generated and approved by the Core Team. Following RA and verification sampling, an **OSC Report**[5] was generated, approved by the Core Team, and placed in the public reading room. All results were below cleanup objectives. This PRS Package addendum is submitted for administrative purposes.

REFERENCES:

1) Sampling and Analysis Plan, PRS 274/275, Final, November 2001.
2) PRS 274/275 Data Report, Rev. 1, September 2002.
3) AM/EECA Contingent Removal Action for Contaminated Soil, Final, June 2002.
4) PRS 274/275 Verification Sampling & Analysis Plan, Final, April 2002.
5) PRS 274/275 Removal Action OSC Report, Final, October 2002.

PREPARED BY:

Karen M. Arthur, BWXT of Ohio, Inc., ER QA

ONSITE RESULTS
> CLEANUP OBJ.

B119: 0-4 (4.32 pCi/g Cs)
4-8 (6.52 pCi/g Cs)

B063: 4-8 (10.87 pCi/g Cs)
→ 0-4 < cleanup objective [2.57 Cs]

Cs cleanup obj = 10^{-5} + bkgd.
= 0.42 + 3.4 = 3.8

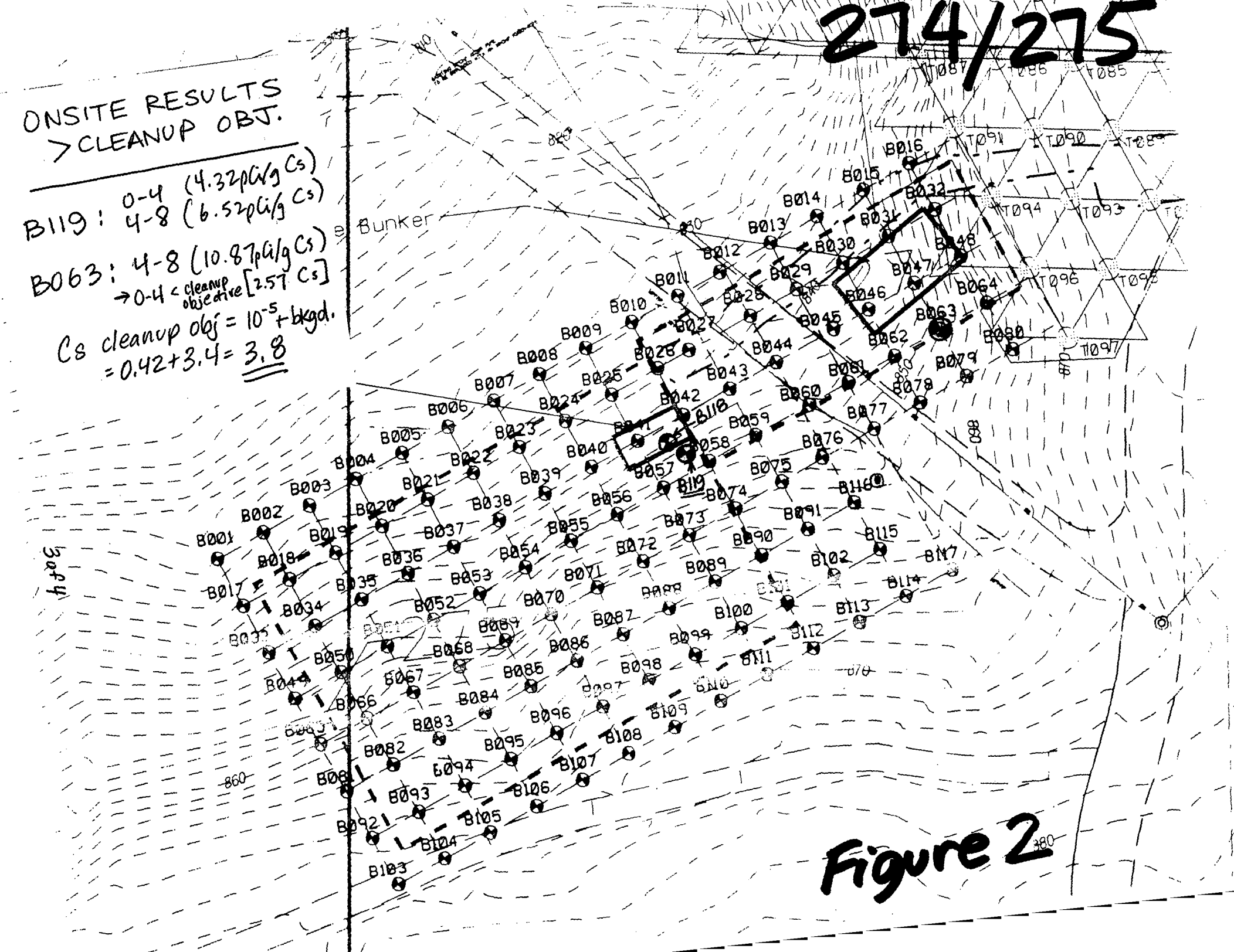


Figure 2

MOUND PLANT
PRS 274/275
Former Detonator Shack (274) & Former Explosives Bunker (275)

RECOMMENDATION:

Potential Release Sites (PRS) 274/275 are former structures located in the east-central part of the Mound Plant property. PRS 274/275 was binned Further Assessment by the Core Team on May 15, 1996. Further Assessment (FA) sampling was conducted in 2002 per the Sampling and Analysis Plan (SAP) approved by the Core Team.

Results of the FA sampling confirmed the presence of radioactive contamination (e.g. Cesium-137) above the cleanup objective (10^{-5} RBGV + background).

Therefore PRS 274/275 requires a REMOVAL ACTION.

CONCURRENCE:

DOE/MEMP: _____ 3/20/02
Robert S. Rothman, Remedial Project Manager (date)

USEPA: _____ 3/20/02
Timothy J. Fischer, Remedial Project Manager (date)

OEPA: _____ 3/20/02
Brian K. Nickel, Project Manager (date)

MOUND

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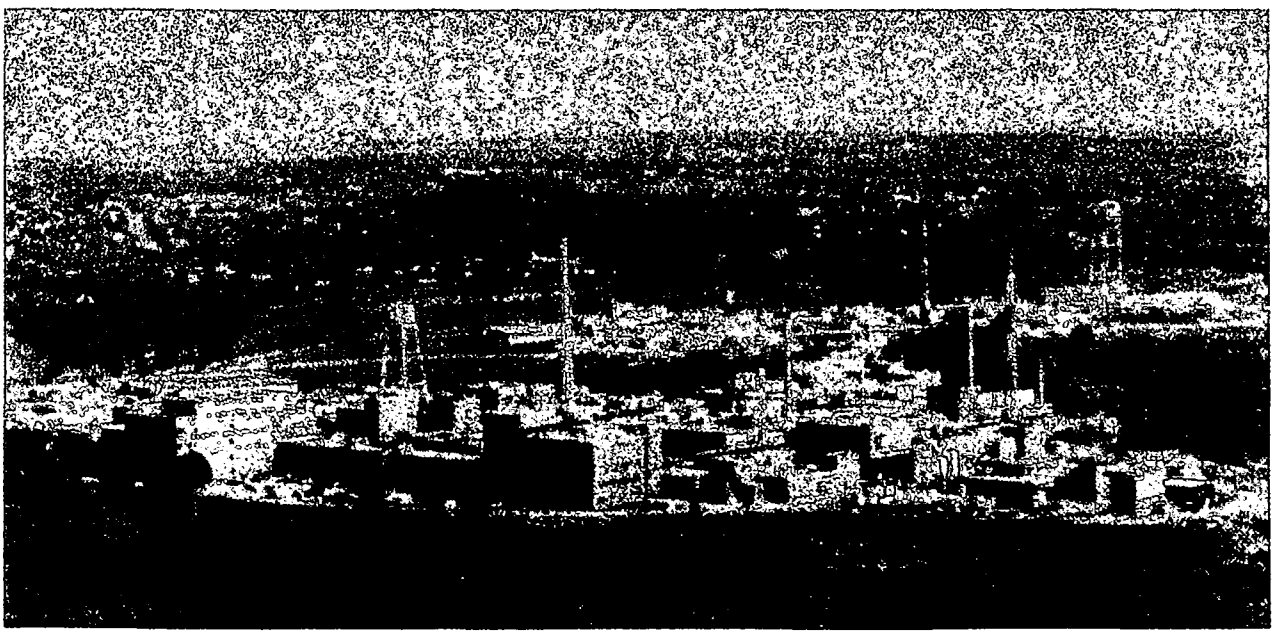
MOUND PLANT

Potential Release Site Package

PRS #274/275

Addendum A



PRS 274/275 (FILE/ADDENDUM)

REV	DESCRIPTION	DATE
DRAFT		
REGULATOR RELEASE A	CHANGED: - Wording in contamination section. Binned FA, 5/15/96.	Mar. 21, 1996
ADDENDUM A	PRS depiction on introduction maps corrected per material and data review. Other PRS content unchanged.	

Addendum A: PRS 274/275

Soil Contamination - Area 21 (SM/PP Hillside)

GENERAL:

Based on a re-evaluation of data and material concerning the definition of PRS 274/275, it has been determined that this PRS is incorrectly depicted on the introduction maps. The attached information depicts the correct geographical representation of the subject PRSs.

CONTAMINATION:

The original narrative as reviewed and evaluated by the Core Team on May 15, 1996 remains unchanged. The binning decision of "Further Assessment" required is also unchanged.

PREPARED BY:

Joseph C. Geneczko, Member of Babcock and Wilcox of Ohio Technical Staff

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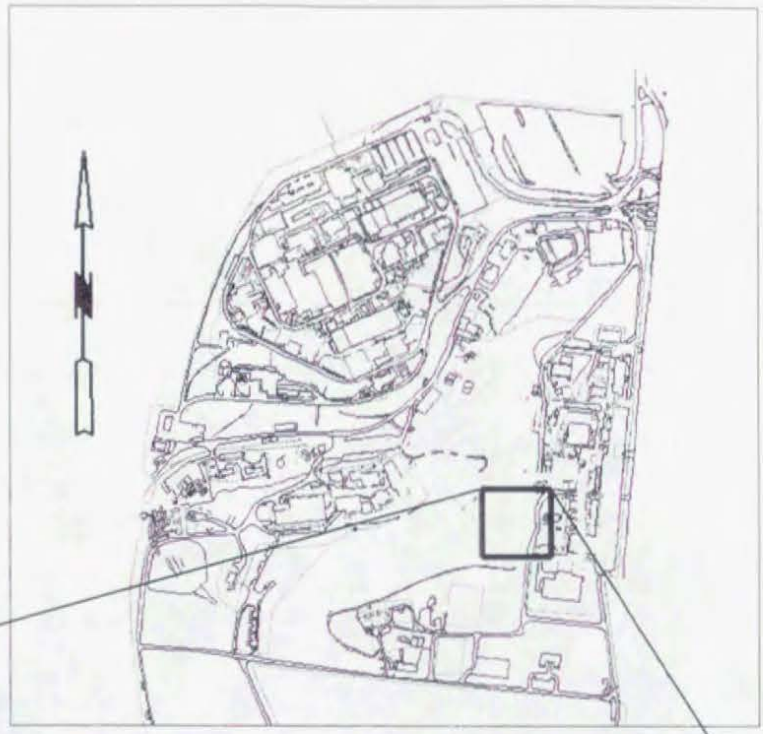
B
A
PRS 274/275

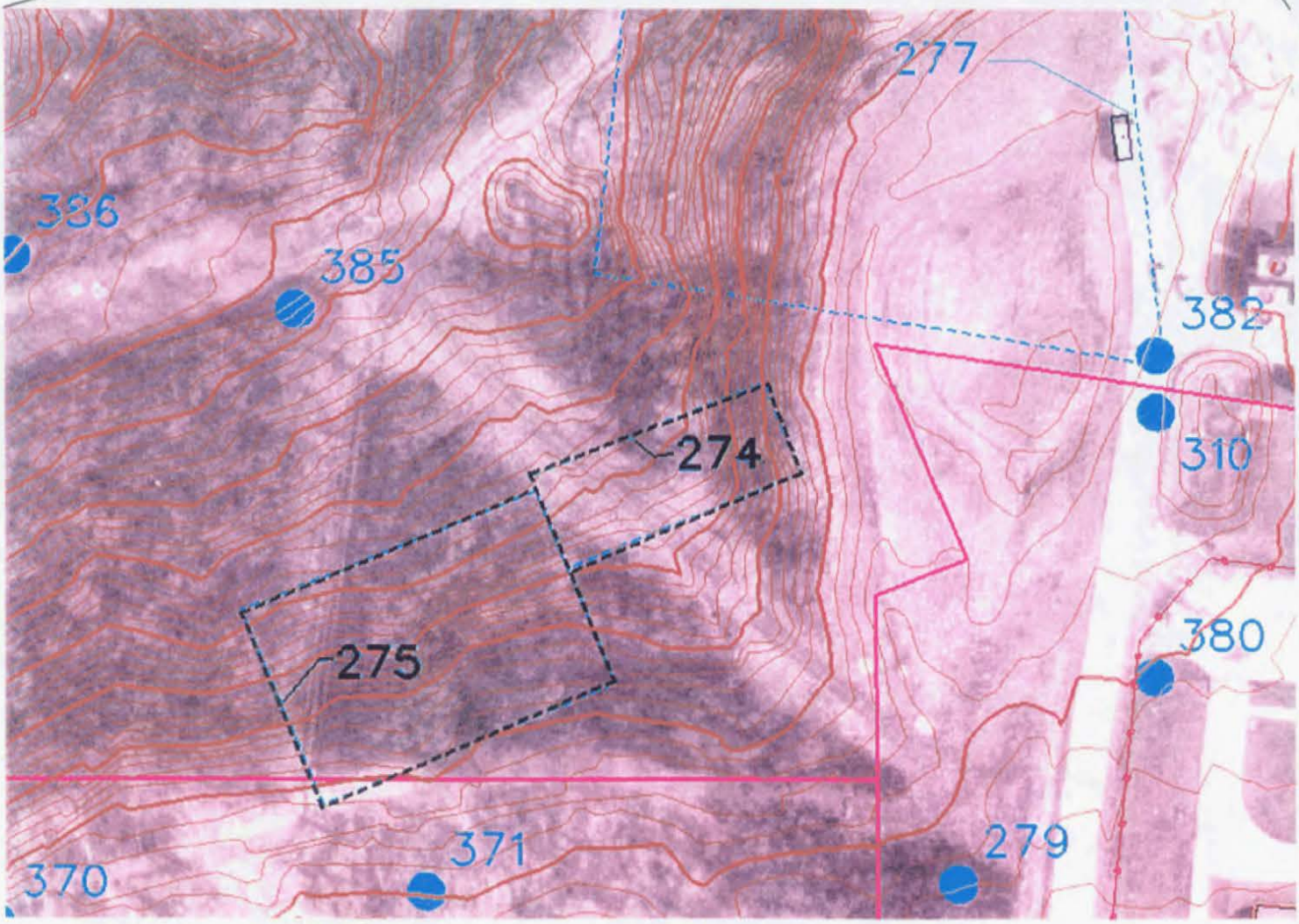
Mound Plant

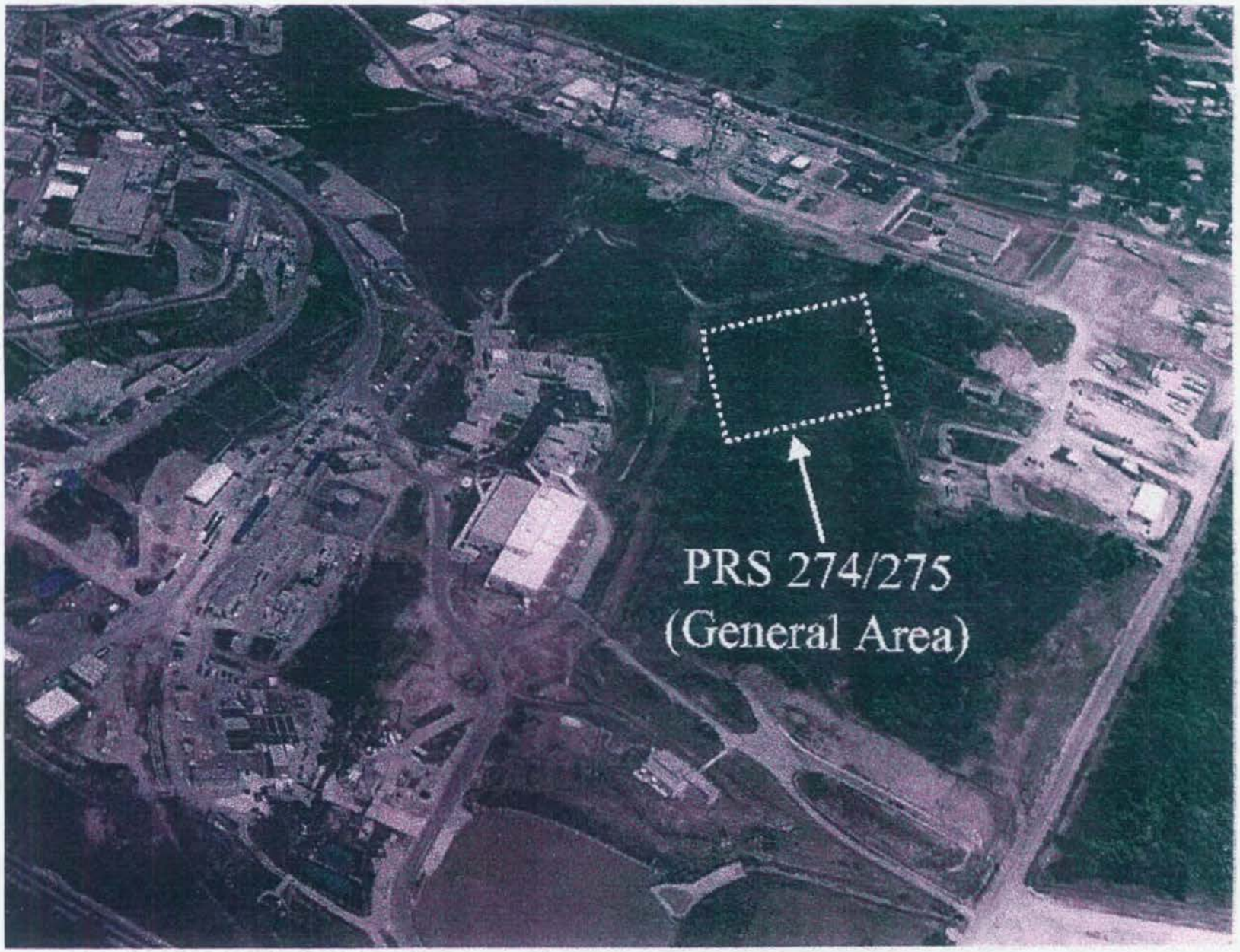
PRS 274/275

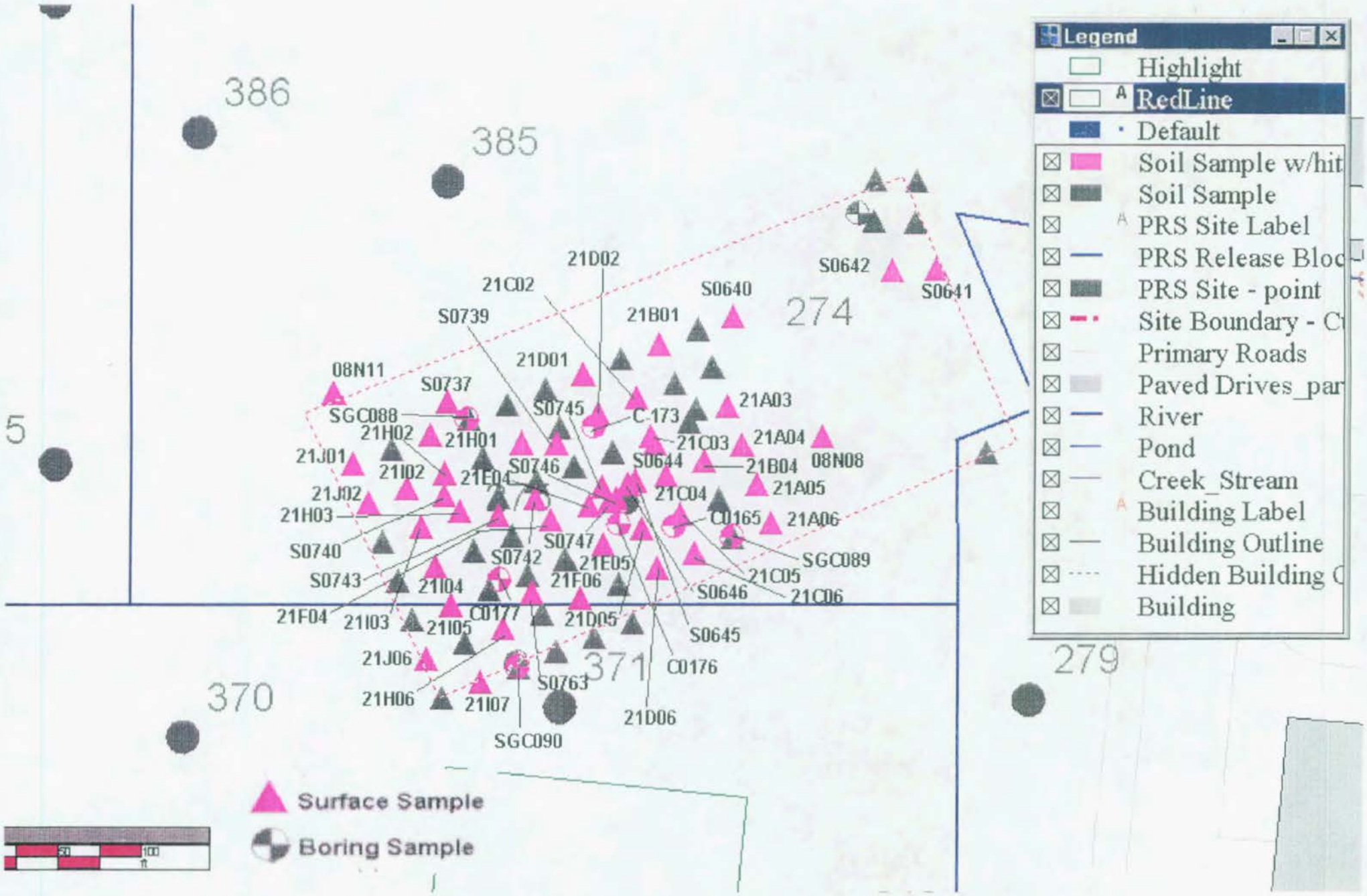
Soil Contamination – Area 21 (SM/PP Hillside)

On the map below:
- Building number and location shown in tan
- PRS number and location shown in black
- Fencing shown in red
- Elevation contours shown in brown






PRS 274/275
(General Area)


Legend
Highlight
RedLine
Default
Soil Sample w/hit
Soil Sample
PRS Site Label
PRS Release Bloc
PRS Site - point
Site Boundary - C
Primary Roads
Paved Drives_par
River
Pond
Creek_Stream
Building Label
Building Outline
Hidden Building C
Building
386
385
274
279
371
370
5
21D02
21C02
S0739
S0640
S0642
S0641
21B01
21D01
08N11
S0737
21A03
SGC088
S0745
C-173
21H02
21H01
21C03
21A04
21J01
21I02
21E04
S0746
S0644
21B04
08N08
21J02
21C04
21A05
21H03
C0165
21A06
S0740
S0747
S0742
21E05
SGC089
S0743
21I04
21F06
21C05
S0646
21C06
21F04
21I03
21I05
C0177
21D05
S0645
21J06
C0176
S0763
21H06
21I07
21D06
SGC090
Surface Sample
Boring Sample
50
100
ft

Location_r	Sample_id	Location_	Collection_d	Media	Value_name	Measured_va	Value_u	Detectio	Chem_cla	Star	End	Dept	Cas_number	Lab_	Project_	Data_	Comments
08N08	08N08	Surface Id	19940927	Soil	Total Aromatic Hydrocarbons	17432.00	IC		GENERA	0	2	FT	AHYD		2680		
08N08	08N08	Surface Id	19940927	Soil	Total C5 TO C11 Petrolium Hydrocarbons	21911.00	IC		GENERA	0	2	FT	TOGRHY		2680		
08N11	08N11	Surface Id	19940927	Soil	Total Aromatic Hydrocarbons	125202.00	IC		GENERA	0	2	FT	AHYD		2680		
08N11	08N11	Surface Id	19940927	Soil	Total C5 TO C11 Petrolium Hydrocarbons	1077032.00	IC		GENERA	0	2	FT	TOGRHY		2680		
08N11	08N11	Surface Id	19940927	Soil	Total Halogenated Hydrocarbons	37147.00	IC		GENERA	0	2	FT	THAHYC		2680		
08N11	08N11	Surface Id	19940927	Soil	Total Semivolatile Hydrocarbons	1311.00	IC		GENERA	0	2	FT	TSVHYC		2680		
21A03	21A03	Surface Id	19940728	Soil	Plutonium-238	29.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21A04	21A04	Surface Id	19940728	Soil	Plutonium-238	40.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21A05	21A05	Surface Id	19940728	Soil	Plutonium-238	25.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value.
21A06	21A06	Surface Id	19940728	Soil	Plutonium-238	33.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21B01	21B01	Surface Id	19940728	Soil	Plutonium-238	25.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value.
21B04	21B04	Surface Id	19940728	Soil	Plutonium-238	30.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21C02	21C02	Surface Id	19940728	Soil	Plutonium-238	25.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value.
21C03	21C03	Surface Id	19940728	Soil	Plutonium-238	28.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21C04	21C04	Surface Id	19940728	Soil	Plutonium-238	43.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21C05	21C05	Surface Id	19940728	Soil	Plutonium-238	28.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21C06	21C06	Surface Id	19940728	Soil	Plutonium-238	50.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21D01	21D01	Surface Id	19940728	Soil	Plutonium-238	27.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21D02	21D02	Surface Id	19940728	Soil	Plutonium-238	30.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21D05	21D05	Surface Id	19940728	Soil	Plutonium-238	32.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21D06	21D06	Surface Id	19940728	Soil	Plutonium-238	31.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21E04	21E04	Surface Id	19940728	Soil	Plutonium-238	28.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21E05	21E05	Surface Id	19940728	Soil	Plutonium-238	34.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21F02	21F02	Surface Id	19940728	Soil	Plutonium-238	26.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21F04	21F04	Surface Id	19940728	Soil	Plutonium-238	26.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21F06	21F06	Surface Id	19940728	Soil	Plutonium-238	43.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21H01	21H01	Surface Id	19940728	Soil	Plutonium-238	37.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21H02	21H02	Surface Id	19940728	Soil	Plutonium-238	40.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21H03	21H03	Surface Id	19940728	Soil	Plutonium-238	27.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21H06	21H06	Surface Id	19940728	Soil	Plutonium-238	33.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21I02	21I02	Surface Id	19940728	Soil	Plutonium-238	25.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value.
21I03	21I03	Surface Id	19940728	Soil	Plutonium-238	37.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21I04	21I04	Surface Id	19940728	Soil	Plutonium-238	34.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21I05	21I05	Surface Id	19940728	Soil	Plutonium-238	31.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21I07	21I07	Surface Id	19940728	Soil	Plutonium-238	35.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21J01	21J01	Surface Id	19940728	Soil	Plutonium-238	36.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21J02	21J02	Surface Id	19940728	Soil	Plutonium-238	34.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
21J06	21J06	Surface Id	19940728	Soil	Plutonium-238	37.00	PCI/G		RAD	0	2	FT	13981-16-3		2680		Exceeds soil 10-6 GV. Exceeds background value. Exceeds other criteria.
C0165	10440	Borehole	19850801	Soil	Cesium-137	3.00	PCI/G	0.50	RAD	2	2	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0165	10440	Borehole	19850801	Soil	Radium-226	0.90	PCI/G		RAD	2	2	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0165	10441	Borehole	19850801	Soil	Radium-226	1.00	PCI/G		RAD	3	3	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0165	10442	Borehole	19850801	Soil	Cesium-137	2.50	PCI/G	0.50	RAD	5	5	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0165	10442	Borehole	19850801	Soil	Radium-226	1.00	PCI/G		RAD	5	5	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0165	10443	Borehole	19850801	Soil	Cesium-137	31.00	PCI/G	0.50	RAD	5	5	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0165	10443	Borehole	19850801	Soil	Radium-226	0.70	PCI/G		RAD	5	5	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0173	10436	Borehole	19850801	Soil	Cesium-137	6.70	PCI/G	0.50	RAD	2	2	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0173	10436	Borehole	19850801	Soil	Radium-226	0.80	PCI/G		RAD	2	2	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0173	10437	Borehole	19850801	Soil	Cesium-137	5.60	PCI/G	0.50	RAD	3	3	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0173	10437	Borehole	19850801	Soil	Radium-226	0.80	PCI/G		RAD	3	3	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0173	10438	Borehole	19850801	Soil	Cesium-137	1.90	PCI/G	0.50	RAD	5	5	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0173	10438	Borehole	19850801	Soil	Radium-226	0.90	PCI/G		RAD	5	5	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0173	10439	Borehole	19850801	Soil	Cesium-137	9.70	PCI/G	0.50	RAD	5	5	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0173	10439	Borehole	19850801	Soil	Radium-226	0.90	PCI/G		RAD	5	5	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0176	10433	Borehole	19850801	Soil	Cesium-137	2.20	PCI/G	0.50	RAD	2	2	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0176	10433	Borehole	19850801	Soil	Radium-226	0.80	PCI/G		RAD	2	2	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0176	10434	Borehole	19850801	Soil	Cesium-137	3.10	PCI/G	0.50	RAD	3	3	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0176	10434	Borehole	19850801	Soil	Radium-226	0.70	PCI/G		RAD	3	3	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0176	10435	Borehole	19850801	Soil	Cesium-137	1.20	PCI/G	0.50	RAD	5	5	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0176	10435	Borehole	19850801	Soil	Radium-226	0.70	PCI/G		RAD	5	5	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0177	10444	Borehole	19850801	Soil	Cesium-137	2.30	PCI/G	0.50	RAD	2	2	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0177	10444	Borehole	19850801	Soil	Radium-226	0.90	PCI/G		RAD	2	2	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0177	10445	Borehole	19850801	Soil	Cesium-137	5.30	PCI/G	0.50	RAD	3	3	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0177	10445	Borehole	19850801	Soil	Radium-226	0.90	PCI/G		RAD	3	3	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
C0177	10446	Borehole	19850801	Soil	Cesium-137	4.50	PCI/G	0.50	RAD	5	5	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
C0177	10446	Borehole	19850801	Soil	Radium-226	0.90	PCI/G		RAD	5	5	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
S0640	2925	Surface Id	19831001	Soil	Plutonium-238	1.56	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.

S0640	2925	Surface Id	19831001	Soil	Tritium	1.53	PCI/ML		RAD	0	0	FT	10028-17-8		RSS		
S0641	2926	Surface Id	19831001	Soil	Plutonium-238	0.12	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		
S0641	2926	Surface Id	19831001	Soil	Tritium	2.17	PCI/ML		RAD	0	0	FT	10028-17-8		RSS		
S0642	6793	Surface Id	19840801	Soil	Plutonium-238	**0.44**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0644	6558	Surface Id	19840801	Soil	Cesium-137	**29.00**	PCI/G	0.50	RAD	0	0	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
S0644	6558	Surface Id	19840801	Soil	Radium-226	**1.20**	PCI/G		RAD	0	0	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
S0645	9789	Surface Id	19850601	Soil	Cesium-137	**28.00**	PCI/G	0.50	RAD	0	0	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
S0646	9788	Surface Id	19850601	Soil	Cesium-137	**0.50**	PCI/G	0.50	RAD	0	0	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
S0737	7331	Surface Id	19840901	Soil	Plutonium-238	**1.04**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0739	7335	Surface Id	19840901	Soil	Plutonium-238	**0.75**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0740	2997	Surface Id	19831001	Soil	Cesium-137	**29.00**	PCI/G	0.50	RAD	0	0	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
S0740	2997	Surface Id	19831001	Soil	Plutonium-238	**0.54**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0740	2997	Surface Id	19831001	Soil	Radium-226	**1.20**	PCI/G		RAD	0	0	FT	13982-63-3		RSS		Exceeds soil 10-6 GV.
S0740	2997	Surface Id	19831001	Soil	Tritium	0.77	PCI/ML		RAD	0	0	FT	10028-17-8		RSS		
S0742	2998	Surface Id	19831001	Soil	Plutonium-238	**0.18**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0742	2998	Surface Id	19831001	Soil	Tritium	0.67	PCI/ML		RAD	0	0	FT	10028-17-8		RSS		
S0742	7337	Surface Id	19840901	Soil	Plutonium-238	**0.37**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0743	7334	Surface Id	19840901	Soil	Plutonium-238	**0.33**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0743	7334	Surface Id	19840901	Soil	Plutonium-238	**0.33**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0745	2999	Surface Id	19831001	Soil	Plutonium-238	**1.12**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0745	2999	Surface Id	19831001	Soil	Tritium	0.64	PCI/ML		RAD	0	0	FT	10028-17-8		RSS		
S0746	9790	Surface Id	19850601	Soil	Cesium-137	**0.50**	PCI/G	0.50	RAD	0	0	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
S0747	9794	Surface Id	19850601	Soil	Cesium-137	**5.00**	PCI/G	0.50	RAD	0	0	FT	10045-97-3		RSS		Exceeds soil 10-6 GV. Exceeds background value.
S0763	2885	Surface Id	19831001	Soil	Plutonium-238	**0.79**	PCI/G	0.01	RAD	0	0	FT	13981-16-3		RSS		Exceeds background value.
S0763	2885	Surface Id	19831001	Soil	Tritium	0.15	PCI/ML		RAD	0	0	FT	10028-17-8		RSS		
SGC088	A21088	Borehole	19960207	Soil	Aluminum	11100.00	MG/KG		INORG	0	3	FT	7429-90-5		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Antimony	0.65	MG/KG		INORG	0	3	FT	7440-36-0	B	SGCSP	B	
SGC088	A21088	Borehole	19960207	Soil	Arsenic	3.70	MG/KG		INORG	0	3	FT	7440-38-2		SGCSP	JS	
SGC088	A21088	Borehole	19960207	Soil	Barium	95.50	MG/KG		INORG	0	3	FT	7440-39-3		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Beryllium	**0.81**	MG/KG		INORG	0	3	FT	7440-41-7		SGCSP		Exceeds soil 10-6 GV.
SGC088	A21088	Borehole	19960207	Soil	Bis(2-ethylhexyl)phthalate	26.00	UG/KG		ORSVO	0	3	FT	117-81-7	J	SGCSP	J	
SGC088	A21088	Borehole	19960207	Soil	Calcium	6570.00	MG/KG		INORG	0	3	FT	7440-70-2		SGCSP	JD	
SGC088	A21088	Borehole	19960207	Soil	Cesium-137	**0.69**	PCI/G	0.00	RAD	0	3	FT	10045-97-3		SGCSP		Exceeds soil 10-6 GV. Exceeds background value.
SGC088	A21088	Borehole	19960207	Soil	Chromium	15.60	MG/KG		INORG	0	3	FT	7440-47-3		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Cobalt	12.90	MG/KG		INORG	0	3	FT	7440-48-4		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Copper	14.10	MG/KG		INORG	0	3	FT	7440-50-8		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Iron	25600.00	MG/KG		INORG	0	3	FT	7439-89-6		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Lead	21.30	MG/KG		INORG	0	3	FT	7439-92-1		SGCSP	JS	
SGC088	A21088	Borehole	19960207	Soil	Lithium	8.70	MG/KG		INORG	0	3	FT	7439-93-2	B	SGCSP	B	
SGC088	A21088	Borehole	19960207	Soil	Magnesium	2510.00	MG/KG		INORG	0	3	FT	7439-95-4		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Manganese	804.00	MG/KG		INORG	0	3	FT	7439-96-5		SGCSP	JD	
SGC088	A21088	Borehole	19960207	Soil	Mercury	**0.06**	MG/KG		INORG	0	3	FT	7439-97-6	B	SGCSP	JD	Exceeds background value.
SGC088	A21088	Borehole	19960207	Soil	Methylene Chloride	16.00	UG/KG		ORVOA	0	3	FT	75-09-2	B	SGCSP	UB	
SGC088	A21088	Borehole	19960207	Soil	Molybdenum	1.70	MG/KG		INORG	0	3	FT	7439-98-7	B	SGCSP	B	
SGC088	A21088	Borehole	19960207	Soil	Nickel	17.90	MG/KG		INORG	0	3	FT	7440-02-0		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Nitrate-Nitrite-N	3.40	MG/KG	0.25	ANION	0	3	FT	NO2/NO3		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Plutonium-238	**0.51**	PCI/G	0.00	RAD	0	3	FT	13981-16-3		SGCSP		Exceeds background value.
SGC088	A21088	Borehole	19960207	Soil	Plutonium-239/240	0.02	PCI/G	0.00	RAD	0	3	FT	PU-239/240		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Potassium	1060.00	MG/KG		INORG	0	3	FT	7440-09-7	B	SGCSP	B	
SGC088	A21088	Borehole	19960207	Soil	Potassium-40	23.30	PCI/G	0.00	RAD	0	3	FT	13966-00-2		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Radium-226	**1.26**	PCI/G	0.00	RAD	0	3	FT	13982-63-3		SGCSP		Exceeds soil 10-6 GV.
SGC088	A21088	Borehole	19960207	Soil	Sodium	95.60	MG/KG		INORG	0	3	FT	7440-23-5	B	SGCSP	JI	
SGC088	A21088	Borehole	19960207	Soil	Thorium-228	**0.95**	PCI/G	0.03	RAD	0	3	FT	14274-82-9		SGCSP		Exceeds soil 10-6 GV.
SGC088	A21088	Borehole	19960207	Soil	Thorium-230	1.30	PCI/G	0.02	RAD	0	3	FT	14269-63-7		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Thorium-232	1.01	PCI/G	0.02	RAD	0	3	FT	7440-29-1		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Toluene	2.00	UG/KG		ORVOA	0	3	FT	108-88-3	J	SGCSP	J	
SGC088	A21088	Borehole	19960207	Soil	Uranium-234	0.86	PCI/G	0.03	RAD	0	3	FT	13966-29-5		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Uranium-238	0.90	PCI/G	0.03	RAD	0	3	FT	24678-82-8		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Vanadium	23.60	MG/KG		INORG	0	3	FT	7440-62-2		SGCSP		
SGC088	A21088	Borehole	19960207	Soil	Zinc	55.40	MG/KG		INORG	0	3	FT	7440-66-6		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	2-Butanone	17.00	UG/KG		ORVOA	0	3	FT	78-93-3	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Aluminum	14800.00	MG/KG		INORG	0	3	FT	7429-90-5		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Arsenic	3.40	MG/KG		INORG	0	3	FT	7440-38-2		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Barium	77.30	MG/KG		INORG	0	3	FT	7440-39-3		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Beryllium	0.42	MG/KG		INORG	0	3	FT	7440-41-7		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Cadmium	**6.10**	MG/KG		INORG	0	3	FT	7440-43-9		SGCSP		Exceeds background value.
SGC089	A21089	Borehole	19960205	Soil	Calcium	92800.00	MG/KG		INORG	0	3	FT	7440-70-2		SGCSP		

SGC089	A21089	Borehole	19960205	Soil	Cesium-137	**0.59**	PCI/G	0.00	RAD	0	3	FT	10045-97-3		SGCSP		Exceeds soil 10-6 GV. Exceeds background value.
SGC089	A21089	Borehole	19960205	Soil	Chromium	17.80	MG/KG		INORG	0	3	FT	7440-47-3		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Cobalt	12.00	MG/KG		INORG	0	3	FT	7440-48-4	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Copper	16.70	MG/KG		INORG	0	3	FT	7440-50-8		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Iron	29300.00	MG/KG		INORG	0	3	FT	7439-89-6		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Lead	16.90	MG/KG		INORG	0	3	FT	7439-92-1		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Lithium	15.40	MG/KG		INORG	0	3	FT	7439-93-2	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Magnesium	3530.00	MG/KG		INORG	0	3	FT	7439-95-4		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Manganese	649.00	MG/KG		INORG	0	3	FT	7439-96-5		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Mercury	**0.07**	MG/KG		INORG	0	3	FT	7439-97-6	B	SGCSP		Exceeds background value.
SGC089	A21089	Borehole	19960205	Soil	Methylene Chloride	9.00	UG/KG		ORVOA	0	3	FT	75-09-2	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Molybdenum	1.90	MG/KG		INORG	0	3	FT	7439-98-7	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Nickel	20.40	MG/KG		INORG	0	3	FT	7440-02-0		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Nitrate-Nitrite-N	1.90	MG/KG	0.24	ANION	0	3	FT	NO2/NO3		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Plutonium-238	**0.44**	PCI/G	0.00	RAD	0	3	FT	13981-16-3		SGCSP		Exceeds background value.
SGC089	A21089	Borehole	19960205	Soil	Plutonium-239/240	0.01	PCI/G	0.00	RAD	0	3	FT	PU-239/240		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Potassium	1170.00	MG/KG		INORG	0	3	FT	7440-09-7	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Potassium-40	17.50	PCI/G	0.00	RAD	0	3	FT	13966-00-2		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Radium-226	**1.03**	PCI/G	0.58	RAD	0	3	FT	13982-63-3		SGCSP		Exceeds soil 10-6 GV.
SGC089	A21089	Borehole	19960205	Soil	Sodium	121.00	MG/KG		INORG	0	3	FT	7440-23-5	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Thorium-228	**0.86**	PCI/G	0.02	RAD	0	3	FT	14274-82-9		SGCSP		Exceeds soil 10-6 GV.
SGC089	A21089	Borehole	19960205	Soil	Thorium-230	1.20	PCI/G	0.01	RAD	0	3	FT	14269-63-7		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Thorium-232	0.83	PCI/G	0.01	RAD	0	3	FT	7440-29-1		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Tin	2.00	MG/KG		INORG	0	3	FT	7440-31-5	B	SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Uranium-234	0.77	PCI/G	0.03	RAD	0	3	FT	13966-29-5		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Uranium-235	0.06	PCI/G	0.02	RAD	0	3	FT	15117-96-1		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Uranium-238	0.80	PCI/G	0.02	RAD	0	3	FT	24678-82-8		SGCSP		
SGC089	A21089	Borehole	19960205	Soil	Vanadium	**29.30**	MG/KG		INORG	0	3	FT	7440-62-2		SGCSP		Exceeds background value.
SGC089	A21089	Borehole	19960205	Soil	Zinc	75.40	MG/KG		INORG	0	3	FT	7440-66-6		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Acetone	7.00	UG/KG		ORVOA	0	3	FT	67-64-1	JB	SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Aluminum	16500.00	MG/KG		INORG	0	3	FT	7429-90-5		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Arsenic	3.50	MG/KG		INORG	0	3	FT	7440-38-2		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Barium	128.00	MG/KG		INORG	0	3	FT	7440-39-3		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Beryllium	**0.88**	MG/KG		INORG	0	3	FT	7440-41-7		SGCSP		Exceeds soil 10-6 GV.
SGC090	A21090	Borehole	19960205	Soil	Bismuth	**1.00**	MG/KG		INORG	0	3	FT	7440-69-9	B	SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Cadmium	**7.10**	MG/KG		INORG	0	3	FT	7440-43-9		SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Calcium	7820.00	MG/KG		INORG	0	3	FT	7440-70-2		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Cesium-137	**0.56**	PCI/G	0.00	RAD	0	3	FT	10045-97-3		SGCSP		Exceeds soil 10-6 GV. Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Chromium	**20.60**	MG/KG		INORG	0	3	FT	7440-47-3		SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Cobalt	13.40	MG/KG		INORG	0	3	FT	7440-48-4		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Copper	21.70	MG/KG		INORG	0	3	FT	7440-50-8		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Iron	33200.00	MG/KG		INORG	0	3	FT	7439-89-6		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Lead	35.40	MG/KG		INORG	0	3	FT	7439-92-1		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Lithium	18.50	MG/KG		INORG	0	3	FT	7439-93-2	B	SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Magnesium	3830.00	MG/KG		INORG	0	3	FT	7439-95-4		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Manganese	982.00	MG/KG		INORG	0	3	FT	7439-96-5		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Mercury	**0.10**	MG/KG		INORG	0	3	FT	7439-97-6	B	SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Methylene Chloride	16.00	UG/KG		ORVOA	0	3	FT	75-09-2	B	SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Molybdenum	1.40	MG/KG		INORG	0	3	FT	7439-98-7	B	SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Nickel	28.50	MG/KG		INORG	0	3	FT	7440-02-0		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Nitrate-Nitrite-N	5.20	MG/KG	0.26	ANION	0	3	FT	NO2/NO3		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Plutonium-238	**0.28**	PCI/G	0.00	RAD	0	3	FT	13981-16-3		SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Plutonium-239/240	0.01	PCI/G	0.00	RAD	0	3	FT	PU-239/240		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Potassium	**2420.00**	MG/KG		INORG	0	3	FT	7440-09-7	B	SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Potassium-40	26.60	PCI/G	0.00	RAD	0	3	FT	13966-00-2		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Radium-226	**1.14**	PCI/G	0.65	RAD	0	3	FT	13982-63-3		SGCSP		Exceeds soil 10-6 GV.
SGC090	A21090	Borehole	19960205	Soil	Sodium	95.40	MG/KG		INORG	0	3	FT	7440-23-5	B	SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Thorium-228	**1.27**	PCI/G	0.03	RAD	0	3	FT	14274-82-9		SGCSP		Exceeds soil 10-6 GV.
SGC090	A21090	Borehole	19960205	Soil	Thorium-230	1.16	PCI/G	0.02	RAD	0	3	FT	14269-63-7		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Thorium-232	1.07	PCI/G	0.02	RAD	0	3	FT	7440-29-1		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Tin	2.40	MG/KG		INORG	0	3	FT	7440-31-5	B	SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Uranium-234	0.79	PCI/G	0.09	RAD	0	3	FT	13966-29-5		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Uranium-238	1.16	PCI/G	0.09	RAD	0	3	FT	24678-82-8		SGCSP		
SGC090	A21090	Borehole	19960205	Soil	Vanadium	**32.00**	MG/KG		INORG	0	3	FT	7440-62-2		SGCSP		Exceeds background value.
SGC090	A21090	Borehole	19960205	Soil	Zinc	101.00	MG/KG		INORG	0	3	FT	7440-66-6		SGCSP		

comp_no	par_code	parameter name	comparison value	units
1	7440-41-7	Beryllium	7.00E-01	MG/KG
1	7440-43-9	Cadmium	5.00E+04	MG/KG
1	7440-47-3	Chromium	7.50E+03	MG/KG
1	121-82-4	RDX	2.70E+01	UG/KG
1	72-55-9	4,4'-DDE	9.00E+00	MG/KG
1	50-29-3	4,4'-DDT	9.00E+00	MG/KG
1	12672-29-6	Aroclor-1248	3.85E-01	MG/KG
1	11096-82-5	Aroclor-1260	3.85E-01	MG/KG
1	319-85-7	Beta-BHC	1.65E+00	MG/KG
1	60-57-1	Dieldrin	1.85E-01	MG/KG
1	56-55-3	Benzo(a)anthracene	4.10E+00	MG/KG
1	50-32-8	Benzo(a)pyrene	4.10E-01	MG/KG
1	205-99-2	Benzo(b)fluoranthene	4.10E+00	MG/KG
1	207-08-9	Benzo(k)fluoranthene	4.10E+01	MG/KG
1	117-81-7	Bis(2-ethylhexyl)phthalate	2.15E+02	MG/KG
1	218-01-9	Chrysene	4.10E+02	MG/KG
1	53-70-3	Dibenz(a,h)anthracene	4.10E-01	MG/KG
1	193-39-5	Indeno(1,2,3-cd)pyrene	4.10E+00	MG/KG
1	78-59-1	Isophorone	3.15E+03	MG/KG
1	86-30-6	N-Nitrosodiphenylamine	6.00E+02	MG/KG
1	87-86-5	Pentachlorophenol	2.50E+01	MG/KG
1	107-06-2	1,2-Dichloroethane	1.10E+01	MG/KG
1	71-43-2	Benzene	3.20E+01	MG/KG
1	75-27-4	Bromodichloromethane	4.80E+01	MG/KG
1	75-25-2	Bromoform	3.75E+02	MG/KG
1	56-23-5	Carbon Tetrachloride	1.20E+01	MG/KG
1	67-66-3	Chloroform	1.55E+01	MG/KG
1	124-48-1	Dibromochloromethane	3.55E+01	MG/KG
1	75-09-2	Dichloromethane	3.95E+02	MG/KG
1	79-01-6	Trichloroethene	1.25E+02	MG/KG
1	AC-227	Actinium-227	1.00E+00	PCI/G
1	14596-10-2	Americium-241	4.95E+00	PCI/G
1	13982-38-2	Bismuth-207	1.75E-01	PCI/G
1	BI-207	Bismuth-207	1.75E-01	PCI/G
1	10045-97-3	Cesium-137	4.60E-01	PCI/G
1	10198-40-0	Cobalt-60	1.00E-01	PCI/G
1	13981-16-3	Plutonium-238	5.50E+00	PCI/G
1	15117-48-3	Plutonium-239	5.50E+00	PCI/G
1	PU239/240	Plutonium-240	5.50E+00	PCI/G
1	13982-63-3	Radium-226	1.40E-01	PCI/G
1	10098-97-2	Strontium-90	3.00E+00	PCI/G
1	14274-82-9	Thorium-228	8.50E-01	PCI/G
1	14269-63-7	Thorium-230	4.40E+01	PCI/G
1	7440-29-1	Thorium-232	5.00E+01	PCI/G
1	10028-17-8	Tritium	2.35E+04	PCI/G
1	U-233	Uranium-233	3.70E+01	PCI/G
1	13966-29-5	Uranium-234	3.75E+01	PCI/G
1	15117-96-1	Uranium-235	3.35E+00	PCI/G
1	24678-82-8	Uranium-238	1.10E+01	PCI/G
2	7429-90-5	Aluminum	19000	MG/KG

comp_no	par_code	parameter name	comparison value	units
2	7440-38-2	Arsenic	8.6	MG/KG
2	7440-39-3	Barium	180	MG/KG
2	7440-69-9	Bismuth	ND	MG/KG
2	7440-41-7	Beryllium	1.3	MG/KG
2	7440-43-9	Cadmium	2.1	MG/KG
2	7440-70-2	Calcium	310000	MG/KG
2	7440-47-3	Chromium	20	MG/KG
2	7440-48-4	Cobalt	19	MG/KG
2	7440-50-8	Copper	26	MG/KG
2	57-12-5	Cyanide	ND	MG/KG
2	7439-89-6	Iron	35000	MG/KG
2	7439-92-1	Lead	48	MG/KG
2	7439-93-2	Lithium	26	MG/KG
2	7439-95-4	Magnesium	40000	MG/KG
2	7439-96-5	Manganese	1400	MG/KG
2	7439-97-6	Mercury	ND	MG/KG
2	7439-98-7	Molybdenum	27	MG/KG
2	7440-02-0	Nickel	32	MG/KG
2	7440-09-7	Potassium	1900	MG/KG
2	7440-22-4	Silver	1.7	MG/KG
2	7782-49-2	Selenium	ND	MG/KG
2	7440-23-5	Sodium	240	MG/KG
2	7440-28-0	Thallium	0.46	MG/KG
2	7440-31-5	Tin	20	MG/KG
2	7440-62-2	Vanadium	25	MG/KG
2	7440-66-6	Zinc	140	MG/KG
2	72-54-8	4,4'-DDD	4.2	MG/KG
2	72-55-9	4,4'-DDE	4.3	MG/KG
2	50-29-3	4,4'-DDT	13	MG/KG
2	309-00-2	Aldrin	ND	MG/KG
2	5103-71-9	Alpha Chlordane	ND	MG/KG
2	319-84-6	Alpha-BHC	ND	MG/KG
2	12672-29-6	Aroclor-1248	ND	MG/KG
2	11097-69-1	Aroclor-1254	58	MG/KG
2	11096-82-5	Aroclor-1260	ND	MG/KG
2	319-85-7	Beta-BHC	ND	MG/KG
2	60-57-1	Dieldrin	ND	MG/KG
2	959-98-8	Endosulfan I	ND	MG/KG
2	1031-07-8	Endosulfan Sulfate	ND	MG/KG
2	72-20-8	Endrin	ND	MG/KG
2	7421-93-4	Endrin Aldehyde	ND	MG/KG
2	53494-70-5	Endrin Ketone	ND	MG/KG
2	5103-74-2	Gamma Chlordane	ND	MG/KG
2	58-89-9	Gamma-BHC (Lindane)	ND	MG/KG
2	76-44-8	Heptachlor	ND	MG/KG
2	1024-57-3	Heptachlor Epoxide	ND	MG/KG
2	72-43-5	Methoxychlor	30	MG/KG
2	77-47-4	Hexachlorocyclopentadiene	ND	MG/KG
2	14596-10-2	Americium-241	ND	MG/KG
2	13982-38-2	Bismuth-207	ND	MG/KG

comp_no	par_code	parameter name	comparison value	units
2	BI-207	Bismuth-207	ND	MG/KG
2	BI-210M	Bismuth-210m	ND	MG/KG
2	10045-97-3	Cesium-137	0.42	PCI/G
2	13981-16-3	Plutonium-238	0.13	PCI/G
2	13966-00-2	Potassium-40	37	PCI/G
2	13982-63-3	Radium-226	2	PCI/G
2	10098-97-2	Strontium-90	0.72	PCI/G
2	14274-82-9	Thorium-228	1.5	PCI/G
2	14269-63-7	Thorium-230	1.9	PCI/G
2	7440-29-1	Thorium-232	1.4	PCI/G
2	10028-17-8	Tritium	1.6	PCI/G
2	13966-29-5	Uranium-234	1.1	PCI/G
2	15117-96-1	Uranium-235	0.11	PCI/G
2	24678-82-8	Uranium-238	1.2	PCI/G
3	7439-92-1	Lead	400	MG/KG
3	13982-63-3	Radium-226	5	PCI/G
3	13981-16-3	Plutonium-238	25	PCI/G
3	7440-29-1	Thorium-232	5	PCI/G
5	7440-36-0	Antimony	0.0006	MG/L
5	7440-38-2	Arsenic	0.05	MG/L
5	7440-39-3	Barium	2	MG/L
5	7440-41-7	Beryllium	0.004	MG/L
5	7440-43-9	Cadmium	0.005	MG/L
5	7440-47-3	Chromium	0.1	MG/L
5	7440-50-8	Copper	1.3	MG/L
5	57-12-5	Cyanide	0.2	MG/L
5	7439-92-1	Lead	0.015	MG/L
5	7439-97-6	Mercury	0.002	MG/L
5	7440-02-0	Nickel	0.1	MG/L
5	7782-49-2	Selenium	0.05	MG/L
5	7440-28-0	Thallium	0.002	MG/L
5	16984-48-8	Flouride	4	MG/L
5	NO3	Nitrate	10	MG/L
5	NO2	Nitrite	1	MG/L
5	57-74-9	Chlordane	0.002	MG/L
5	72-20-8	Endrin	0.002	MG/L
5	76-44-8	Heptachlor	0.0004	MG/L
5	1024-57-3	Heptachlor Epoxide	0.0002	MG/L
5	72-43-5	Methoxychlor	0.04	MG/L
5	8001-35-2	Toxaphene	0.003	MG/L
5	120-82-1	1,2,4-Trichlorobenzene	0.07	MG/L
5	95-95-4	2,4,5-Trichlorophenol	0.05	MG/L
5	50-32-8	Benzo(a)pyrene	0.002	MG/L
5	118-74-1	Hexachlorobenzene	0.001	MG/L
5	77-47-4	Hexachlorocyclopentadiene	0.05	MG/L
5	87-86-5	Pentachlorophenol	0.001	MG/L
5	71-55-6	1,1,1-Trichloroethane	0.2	MG/L
5	79-00-5	1,1,2-Trichloroethane	0.005	MG/L
5	75-35-4	1,1-Dichloroethene	0.007	MG/L
5	156-59-2	1,2-cis-Dichloroethene	0.07	MG/L

comp_no	par_code	parameter name	comparison value	units
5	107-06-2	1,2-Dichloroethane	0.005	MG/L
5	78-87-5	1,2-Dichloropropane	0.005	MG/L
5	106-46-7	1,4-Dichlorobenzene	0.075	MG/L
5	108-90-7	Chlorobenzene	0.1	MG/L
5	96-12-8	Dibromochloropropane	0.0002	MG/L
5	106-93-4	1,2-Dibromoethane	0.00005	MG/L
5	95-50-1	1,2-Dichlorobenzene	0.6	MG/L
5	75-09-2	Dichloromethane (Methylene Chloride)	0.005	MG/L
5	88-85-7	Dinoseb	0.007	MG/L
5	1746-01-6	Dioxin	0.00000003	MG/L
5	94-75-7	2,4-D	0.07	MG/L
5	156-60-5	1,2-trans-Dichloroethene	0.01	MG/L
5	71-43-2	Benzene	0.005	MG/L
5	75-27-4	Bromodichloromethane	0.008	MG/L
5	75-25-2	Bromoform	0.008	MG/L
5	56-23-5	Carbon Tetrachloride	0.005	MG/L
5	67-66-3	Chloroform	0.008	MG/L
5	100-41-4	Ethylbenzene	0.07	MG/L
5	58-89-9	Gamma-BHC (Lindane)	0.0002	MG/L
5	117-81-7	bis(2-ethylhexyl)phthalate	0.006	MG/L
5	100-42-5	Styrene	0.1	MG/L
5	127-18-4	Tetrachloroethene	0.005	MG/L
5	108-88-3	Toluene	1	MG/L
5	79-01-6	Trichloroethene	0.005	MG/L
5	75-01-4	Vinyl Chloride	0.002	MG/L
5	1330-20-7	Xylenes, Total	10	MG/L
5	AC-227	Actinium-227	0.4	PCI/L
5	14596-10-2	Americium-241	1.2	PCI/L
5	13982-38-2	Bismuth-207	1200	PCI/L
5	10045-97-3	Cesium-137	120	PCI/L
5	10198-40-0	Cobalt-60	400	PCI/L
5	13981-16-3	Plutonium-238	1.6	PCI/L
5	13982-63-3	Radium-226	4	PCI/L
5	10098-97-2	Strontium-90	40	PCI/L
5	14274-82-9	Thorium-228	16	PCI/L
5	14269-63-7	Thorium-230	12	PCI/L
5	7440-29-1	Thorium-232	2	PCI/L
5	10028-17-8	Tritium	20000	PCI/L
5	U-233	Uranium-233	20	PCI/L
5	13966-29-5	Uranium-234	20	PCI/L
5	15117-96-1	Uranium-235	24	PCI/L
5	24678-82-8	Uranium-238	24	PCI/L
6	7440-47-3	Chromium	1.10E+03	MG/KG
6	7440-36-0	Antimony	8.50E+01	MG/KG
6	7440-38-2	Arsenic	6.40E+01	MG/KG
6	7440-39-3	Barium	1.50E+04	MG/KG
6	7440-41-7	Beryllium	1.10E+03	MG/KG
6	7440-43-9	Cadmium	2.10E+02	MG/KG
6	57-12-5	Cyanide	4.30E+03	MG/KG
6	7439-96-5	Manganese	2.70E+04	MG/KG

comp_no	par_code	parameter name	comparison value	units
6	7439-97-6	Mercury	6.40E+01	MG/KG
6	7440-02-0	Nickel	4.30E+03	MG/KG
6	7440-22-4	Silver	1.10E+03	MG/KG
6	7440-62-2	Vanadium	1.50E+03	MG/KG
6	7440-66-6	Zinc	6.40E+04	MG/KG
6	2691-41-0	HMX	1.10E+04	UG/KG
6	121-82-4	RDX	6.40E+04	UG/KG
6	50-29-3	4,4'-DDT	1.10E+02	MG/KG
6	11097-69-1	Aroclor-1254	4.30E+00	MG/KG
6	60-57-1	Dieldrin	1.10E+01	MG/KG
6	106-44-5	4-Methylphenol	1.10E+03	MG/KG
6	120-12-7	Anthracene	6.40E+04	MG/KG
6	65-85-0	Benzoic Acid	8.50E+05	MG/KG
6	117-81-7	Bis(2-ethylhexyl)phthalate	4.30E+03	MG/KG
6	85-68-7	Butyl Benzyl Phthalate	4.30E+04	MG/KG
6	84-74-2	Di-n-butyl Phthalate	2.10E+04	MG/KG
6	117-84-0	Di-n-octyl Phthalate	4.30E+03	MG/KG
6	206-44-0	Fluoranthene	8.50E+03	MG/KG
6	78-59-1	Isophorone	4.30E+04	MG/KG
6	87-86-5	Pentachlorophenol	6.40E+03	MG/KG
6	108-95-2	Phenol	1.30E+05	MG/KG
6	129-00-0	Pyrene	6.40E+03	MG/KG
6	75-34-3	1,1-Dichloroethane	7.80E+00	MG/KG
6	156-60-5	1,2-trans-Dichloroethene	4.30E+03	MG/KG
6	108-10-1	2-Methyl-4-pentanone	7.00E+02	MG/KG
6	67-64-1	Acetone	2.10E+04	MG/KG
6	75-27-4	Bromodichloromethane	4.30E+03	MG/KG
6	75-25-2	Bromoform	4.30E+03	MG/KG
6	75-15-0	Carbon Disulfide	2.80E+02	MG/KG
6	56-23-5	Carbon Tetrachloride	1.50E+02	MG/KG
6	75-00-3	Chloroethane	1.60E+02	MG/KG
6	67-66-3	Chloroform	2.10E+03	MG/KG
6	124-48-1	Dibromochloromethane	4.30E+03	MG/KG
6	75-09-2	Dichloromethane	1.00E+03	MG/KG
6	100-41-4	Ethylbenzene	4.80E-01	MG/KG
6	110-54-3	Hexane	9.10E+01	MG/KG
6	127-18-4	Tetrachloroethene	2.10E+03	MG/KG
6	108-88-3	Toluene	2.50E+02	MG/KG
6	75-69-4	Trichlorofluoromethane	7.30E+02	MG/KG
6	1330-20-7	Xylenes, Total	4.30E+05	MG/KG
6	78-93-3	2-Butanone	9.30E+03	MG/KG

1 Value is 10-6 Risk-Based Guide Value
2 Value is OU9 Soil Background Value
3 Value is other criteria, I.e. 5 pCi/g for certain radionuclides
25 pCi/g plutonium
5 Value is MCL
6 Value is the Guide Value based on the hazard index

MOUND

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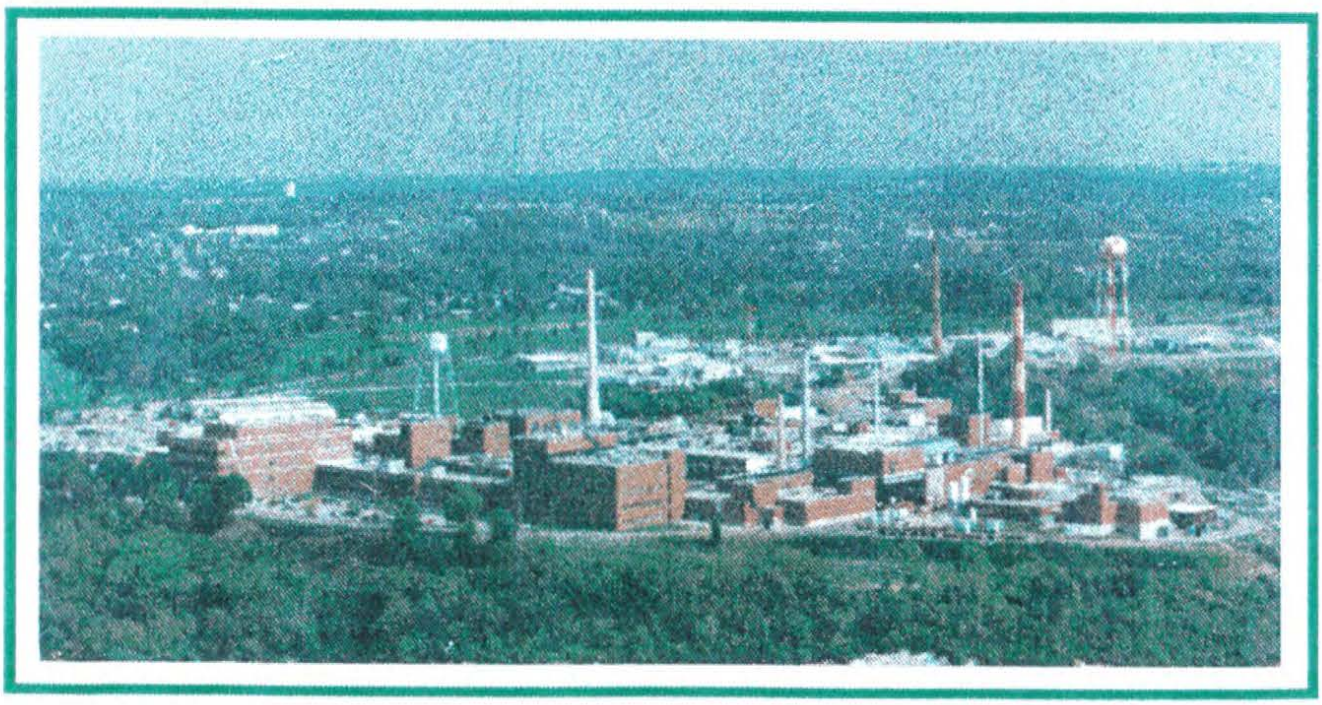
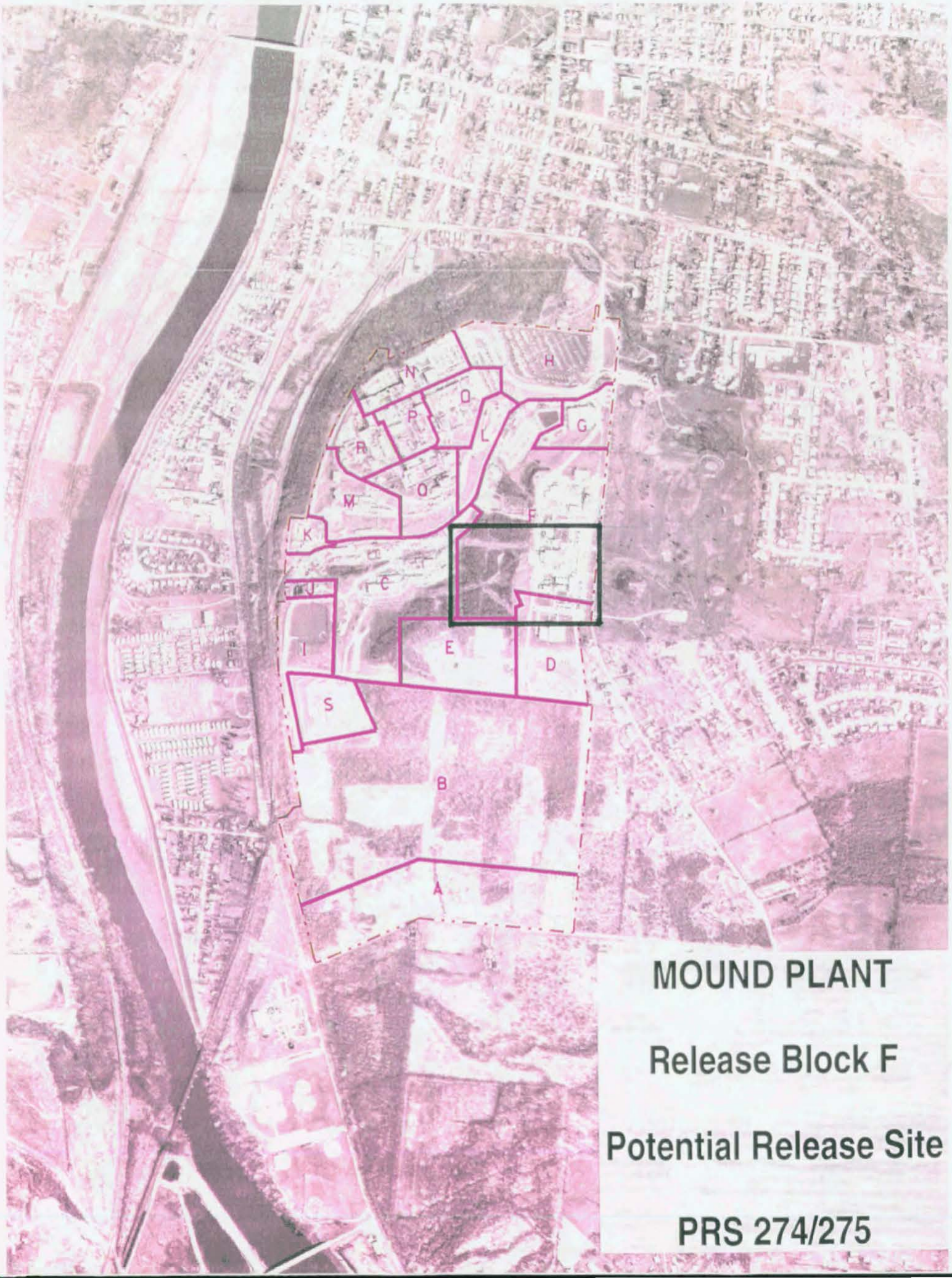
MOUND PLANT
Potential Release Site Package
PRS # 274/275





MOUND PLANT

Release Block F

Potential Release Site

PRS 274/275

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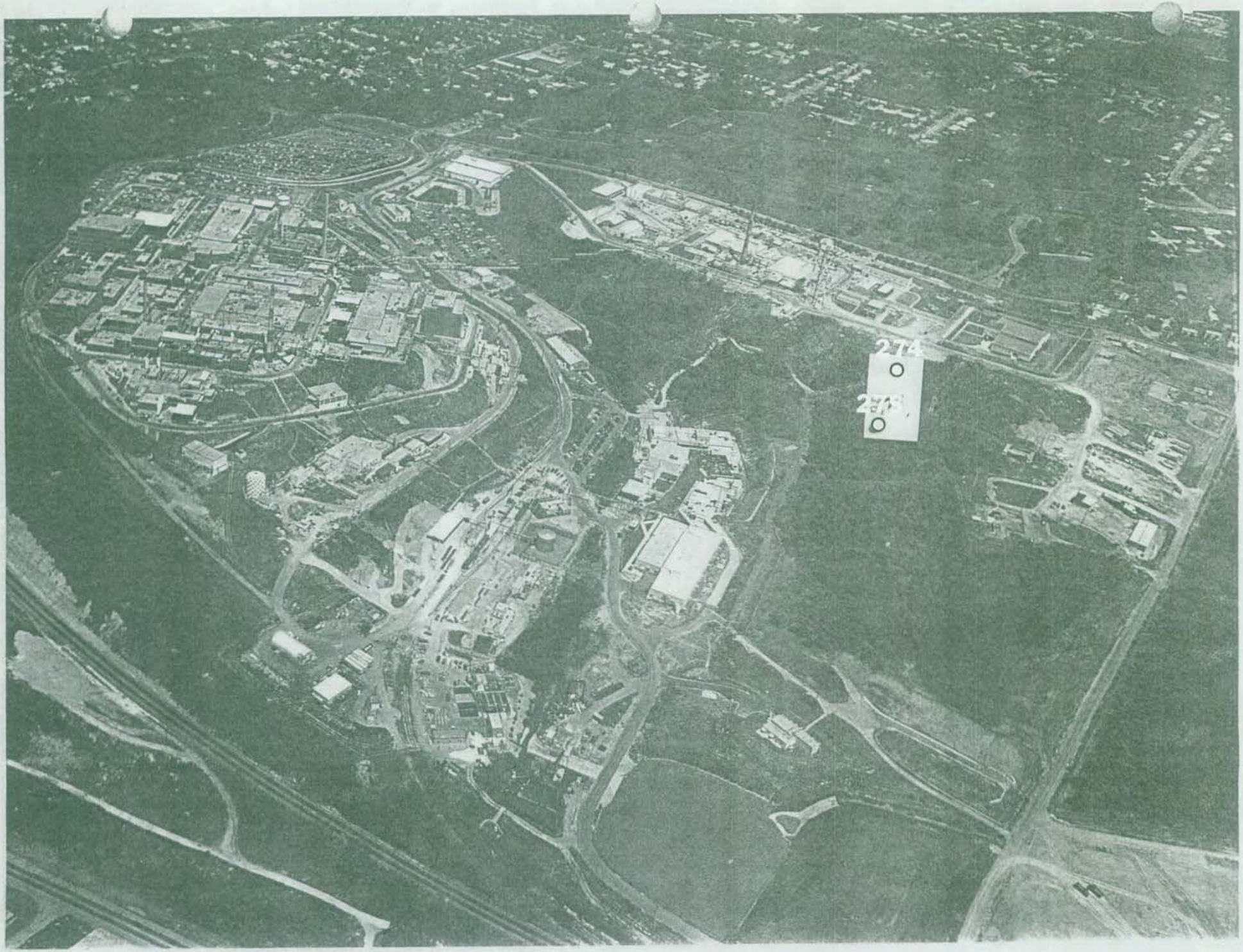
MOUND PLANT

Release Block F

Potential Release Site

PRS 274/275



PRS 274/275

PRS HISTORY:

Potential Release Sites (PRS) 274/275 is a soils area located on the west slope of the SM/PP Hill, west-northwest of Building 105. Two storage buildings, the Old Explosives Bunker (PRS 274) and the Detonator Shack (PRS 275) [1] were formerly located in this area. These buildings were originally used for the storage of explosives during plant construction in 1947 and 1948.[3] In the 1940's and 1950's, both buildings were used extensively for storage of wastes that had high gamma radiation. Residues and high-risk wastes from the radium-actinium project were placed in lead casks and stored in these buildings. At the conclusion of the radium-actinium project, the ion exchange resins containing approximately 10 grams of radium were also stored in the structures.

The two storage structures were built of heavy timbers secured with steel cables and a packed earth floor. No information exists regarding when the waste storage activites ceased or how the shacks were demolished. Partially buried steel cables from the explosives bunker are still visable in this PRS area.

Radiation surveys performed in August 1953 indicated that waste had leaked from the drums.[3] More recent chemical and radiological surveys have been performed in the PRS 274/275 soils area, typically referred to as Area 21 in the reference reports attached to this data package.

CONTAMINATION:

Soil from 15 sampling locations were collected from Area 21 (PRS 274/275 soils) and analyzed for radioactivity during the Site Survey Project.[2] The concentrations of plutonium-238, thorium, tritium, Cobalt-60, Radium-226, and Americium-241 were below the PRS guideline criteria for contamination. Four samples contained 28 to 31 pCi/g of Cesium-137, which exceeds the guideline value of 0.46 pCi/g.

The OU5, Operational Area Phase I [4, 5] recently (1994) conducted an investigation in Area 21. This included a field instrument for the detection of low-energy radiation (FIDLER) survey; surface soil sampling and analysis at the Mound soil screening facility; and a passive soil gas survey to detect volatile and semi-volatile organic compounds. The surveys were conducted over a 25-foot grid system that spanned the estimated boundaries of Area 21.[4]

The OU5 investigation results indicated that plutonium-238 is present in 32 of 70 surface sample locations at concentrations between 25 and 50 pCi/g.[4] Thorium-232 was not detected at levels above 2 pCi/g. The FIDLER survey located several points of elevated radiological activity where neither plutonium-238 nor thorium-232 were detected by analysis.[4] This suggests that other gamma emitting radionuclides may be present, but were not identified.

The PETREX passive soil gas survey[4, 5] indicated relatively moderate readings of total aromatic hydrocarbons and total petroleum hydrocarbons in zones that breach the estimated southern boundary.[5] Total semi-volatile hydrocarbons and total halogenated hydrocarbons were also detected at relatively moderate levels in isolated areas.[5] The PETREX soil gas methods indicate the relative presence of a substance, but does not yield a quantitative concentration of that substance.

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 6-8)
2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 9-12)
3) OU9, Site Scoping Report: Volume 7-Waste Management, February 1993. (pages 13-17)
4) OU5, Operational Area Phase I Investigation Area 21 Field Report, Volume I, June 1995. (pages 18-45)
5) OU5, Operational Area Phase I Investigation Area 21 Field Report, Volume II, June 1995. (pages 46-52)

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PRS 274/275

RECOMMENDATION:

CONCURRENCE:

DOE: _____

USEPA: _____

OEPA: _____

REFERENCE MATERIAL
PRS 274/275

Document Control No. _____

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

December 1994

Final

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes[a]	Results	Ref
272	Area 10, Concrete Debris	G-8 G-9	Grounds	Polonium-210, Cobalt-60, Plutonium-238 (from runoff)	1, 4, 5, 18	Suspected	S	4, 6	14	Table B.1 (Table III.6 in Ref. 6)	6
273	Area 12, Thorium-Contaminated Soil from Area 1	G-9	Grounds	Thorium, Plutonium-238 (from runoff)	1, 4, 5, 18	Suspected thorium	S	4, 6	14, 15	Table B.1 (Table V.5 in Ref. 6)	6
274	Area 21, Old Bunker	H-9	Grounds	Cesium-137, Strontium-90, Actinium-227, Radium-226	4, 5, 18	Suspected thorium	S	4, 6	14, 15, 16	Table B.1 (Table VII.2 in Ref. 6)	6
275	Area 21, Detonator Shack	H-8	Grounds	Cesium-137, Strontium-90, Actinium-227, Radium-226	4, 5, 18	Suspected thorium	S	4, 6	14, 15, 16	Table B.1 (Table VII.2 in Ref. 6)	6
276	Area 22, Orphan Soil from other Areas	I-8	Inactive	Polonium-210, Radium-226, Cobalt-60, Plutonium-238, Cesium-237	4, 5, 18	Suspected	S	6	14, 15, 16	Table B.1 (Table X.1 in Ref. 6)	6
277	Area J, Hillside Disposal Area (AKA Dredged Material Disposal Area 11a)	H-8 H-9	Historical	Construction/building debris, Paints, Thinners, Chemical contaminants, Asbestos, Thorium, Plutonium-238	1, 4, 18	Suspected VOCs	S	4	1 14, 15, 16	SGS[b] Table B.2 Table B.1 (Table X.2 in Ref. 6)	12 6
278	Area J, Hillside catch basin	H-8	In service	Plutonium-238 (from runoff)	1, 4, 18	Suspected	SW	18	No Data		
279	Old Firing Range Drum Storage Area	H-9	Historical	Liquid chemical wastes	5, 18	Confirmed VOCs	S	4	1 2, 3, 4, 5, 6 14, 15	SGS[b] Table B.2 Locations 3152, 3153, and 3187 Tables B.6, B.7, B.8, and B.9 RSS[c] Locations S0162, S0163, and S0647 (Appendix E in Ref. 6)	12 7 6

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

Reference List

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

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

samples were not sampled for tritium. Although tritium was used extensively in the SW Building, the tritium projects postdate the actinium disposal (DOE 1992g).

7.3. AREA 15

The location of Area 15 is shown on Plate 1. Although this room is not underground, it has been known historically as "the old cave" at Mound Plant. The room was used for remote, high-level radioactive work, similar to work usually performed in a hot cell. In 1955, the contaminated equipment was crushed and the room was filled with about 2 ft of concrete, effectively entombing the equipment. Due to practical limitations posed by the presence of the concrete, no intrusive investigations have been performed at this area. However, approximately 1 Ci of radon-222 is released per year through a stack vent from the room, indicating the presence of radium-226 contamination within the concrete.

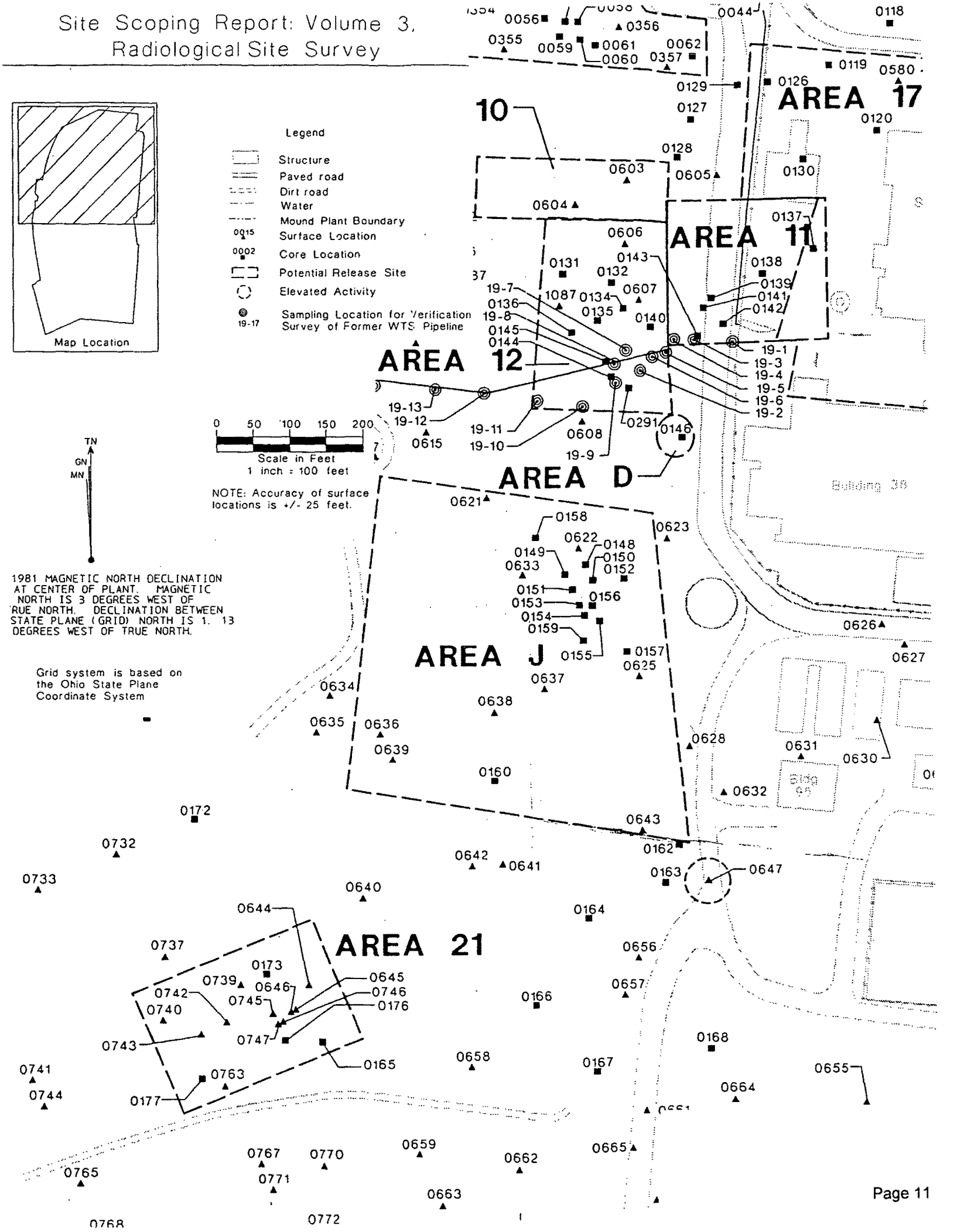
7.4. AREA 21

Area 21 is located on the SM/PP Hill, northeast of Building 53 and Area 22 (Plate 1). Area 21 is also known as the radium shack or old explosives bunker. Originally there were two bunkers, one used for explosives and the other for detonators. Both were used in the early 1950s for storage of radioactive materials that had high gamma radiation levels. These materials included feed and waste solutions from the radium/actinium program and wastes from the reactor waste decontamination program (DOE 1992g). The latter is described in section 9 of this report.

The boundary of Area 21 as shown on Plate 1 is slightly larger than the Area 21 depicted in the project report (Stought et al. 1988). This area was not included in the original compilation of known radiation areas at the beginning of the Site Survey Project, but was reportedly found during the gamma surveys. It is not known whether the boundaries depicted enclose both of the original bunker locations.

The results of the Area 21 sampling are given in Table VII.2. As noted on Table VII.2, several of the analytical results for the gamma-emitting radionuclides could not be found in the gamma spectroscopy results given in Appendix E. These results were handwritten in the original tabulated data, reproduced in Appendix E. The sampling locations are shown on Plate 1.

Cesium-137 was detected in several of the Area 21 samples, with a maximum concentration of 31 pCi/g measured in the sample taken at 60 inches at core location 0165 (C0165 on Table VII.2). Plutonium-238, tritium, and radium-226 were also detected in several samples, although at relatively low levels (1.67, 0.99, and 1.2 pCi/g, respectively).


Map Location
Legend
Structure
Paved road
Dirt road
Water
Mound Plant Boundary
Surface Location
Core Location
Potential Release Site
Elevated Activity
Sampling Location for Verification Survey of Former WTS Pipeline
AREA 17
AREA 11
AREA 12
AREA D
AREA J
AREA 21
10
Building 38
Scale in Feet
1 inch = 100 feet
NOTE: Accuracy of surface locations is +/- 25 feet.
TN
GN
MN
1981 MAGNETIC NORTH DECLINATION AT CENTER OF PLANT. MAGNETIC NORTH IS 3 DEGREES WEST OF TRUE NORTH. DECLINATION BETWEEN STATE PLANE (GRID) NORTH IS 1. 13 DEGREES WEST OF TRUE NORTH.
Grid system is based on the Ohio State Plane Coordinate System

GAMMA SPECTROSCOPY

Table VII.2. Mound Site Survey Project - Area 21

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
S0740	3250	3100	2997	10-83	0	0.54	b	0.77	LDL	29	1.2	LDL
S0739	3250	3025	7335	09-84	0	0.75	b					
S0742	3275	3050	7337	09-84	0	0.37	b					
			2998	10-83	0	0.18	b	0.67				
S0743	3275	3075	7334	09-84	0	0.33	b					
S0745	3285	3010	2999	10-83	0	1.12	b	0.64				
S0746	3295	3005	9790	06-85	0	NR	NR			0.5[c]		
S0747	3295	3010	9794	06-85	0	NR	NR			5.0[c]		
S0644	3275	2970	6558	08-84	0	NR	NR		LDL[c]	29[c]	1.2[c]	LDL[c]
S0645	3290	2990	9789	06-85	0	NR	NR			28[c]		
S0646	3290	2995	9788	06-85	0	NR	NR			0.5[c]		
S0763	3325	3075	2885	10-83	0	0.79	b	0.152				
C0173	3250	3000	10436	08-85	18	NR	NR		LDL	6.7	0.8	LDL
			10437	08-85	36	NR	NR		LDL	5.6	0.8	LDL
			10438	08-85	54	NR	NR		LDL	1.9	0.9	LDL
			10439	08-85	60	NR	NR		LDL	9.7	0.9	LDL
C0176	3310	3010	10433	08-85	18	NR	NR		LDL	2.2	0.8	LDL
			10434	08-85	36	NR	NR		LDL	3.1	0.7	LDL
			10435	08-85	54	NR	NR		LDL	1.2	0.7	LDL
C0177	3310	3090	10444	08-85	18	NR	NR		LDL	2.3	0.9	LDL
			10445	08-85	36	NR	NR		LDL	5.3	0.9	LDL
			10446	08-85	54	NR	NR		LDL	4.5	0.9	LDL
C0165	3325	2980	10440	08-85	18	NR	NR		LDL	3.0	0.9	LDL
			10441	08-85	36	NR	NR		LDL	LDL	1.0	LDL
			10442	08-85	54	NR	NR		LDL	2.5	1.0	LDL
			10443	08-85	60	NR	NR		LDL	31	0.7	LDL

[a]Map locations are given using a "C" to designate core locations and an "S" to designate surface locations.

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

[c]These results could not be confirmed because they were not listed in the gamma spec results included at the end of Appendix F.

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

LDL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226.

MRC ID - Monsanto Research Corporation Identification

NR - No result given

pCi/g - picocuries per gram

pCi/mL - picocuries per milliliter

RADIOCHEMICAL ANALYSIS

Document Control No. DGe

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

July 1992

DRAFT FINAL

(Revision 0)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

~~Area 8 and Area 12, Contaminated Soils from Areas 1 and 8 (Stought et al. 1988). A November 1970~~ survey for thorium-230 and thorium-232 in surface soils and core samples showed no trend in contamination, and readings were within statistical limits of background (MRC 1973a). It was concluded that there was no evidence of loss, leakage, or buildup of thorium in the vicinity of Building 21.

In 1967, a portion of Area 1 was used to stage plutonium-238 waste packages destined for recovery. The area was referred to as the SM field area and is discussed in the section on the SM Drum Storage Area.

A radioactive site survey from 1982 to 1985 (Stought et al. 1988) showed that soils were contaminated with high levels of thorium and plutonium-238 (maximum thorium concentration of 54.3 pCi/g and maximum plutonium-238 concentration of 34,000 pCi/g). That same study alluded to the natural movement of contamination during periods of rain and possible migration of contaminants between 1976 and 1985 into adjacent areas to the south.

There was insufficient sampling for adequate characterization of the vertical extent of contamination (DOE 1991b). A drainage channel to the west was excavated and covered with concrete in 1989. Much of the soil was transferred to the banks of the channel.

5.1.8. Contaminated Soil Box Storage Area (Historical)

The Contaminated Soil Box Storage Area is located south and slightly east of the WD Building (Figure 5.1) (DOE 1992g). In 1969, a radioactive waste line from the SM Building to the WD Building broke and contaminated an area (Area 14) southwest of the WD Building with plutonium. The contaminated soils were excavated from Area 14 in 1974 and placed in wooden boxes for disposal at the NTS (Black 1974). The boxes of soil were decontaminated and screened for surface contamination before they were removed from Area 14. Soil samples from the Soil Box Storage Area collected in 1984 showed ~~some elevated levels of plutonium-238 (DOE 1991c).~~

5.1.9. Area 21, Old Explosives Bunker (Historical)

The Old Explosives Bunker (Area 21) is on the south central slope of the SM/PP Hill at an elevation of approximately 885 ft (Figure 5.2). This bunker was accessed by a dirt road and was used for the storage of explosives during plant construction in 1947 and 1948. There were originally two bunkers: a large one for explosives storage and a small one for detonator storage. These bunkers were also known by the term dynamite caves (Bradley 1953h) and dynamite shacks (MCC 1953-1957). The

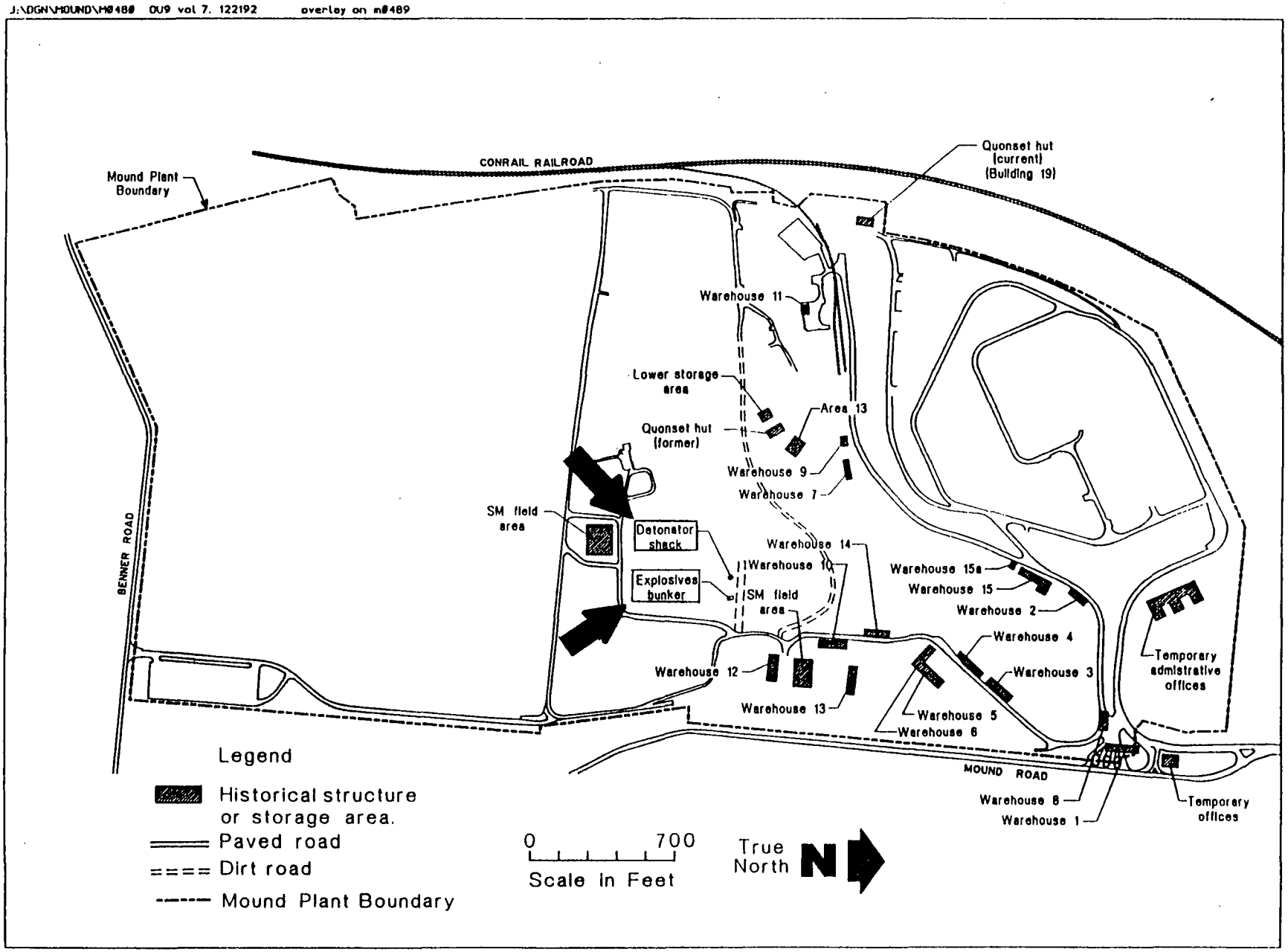


Figure 5.2. Historic buildings, structures, and storage areas.

larger explosives bunker, also known as shack #2, is the one that probably received the greatest use by Mound. The smaller detonator bunker was also known as shack #1. The bunkers were constructed of heavy timbers tied together with steel cables. The floors are believed to have been packed earth. The only current visible sign of the location of the explosives bunker is the residual steel cables that are partly buried. No sign of the detonator shack is apparent.

In the 1940s and 1950s, the Old Explosives Bunker was used extensively for storage of wastes that had high gamma radiation. The isolated location of the bunkers on the far hill of the plant (now the SM/PP Hill) allowed these materials to be stored away from the operational areas. During the era of polonium processing, 20- and 30-gallon drums containing the residual sludge from the bismuth decanning processes in HH building were moved by truck to the bunkers. The sludges contained high levels of short-lived, gamma-producing radionuclides. Storage of these sludges at the bunker site allowed the radiation levels to subside before they were shipped off-plant for disposal (Garner 1991). The drums were trucked from the bunker to the Quonset hut, or later to Warehouse 15, for loading onto trucks and shipment to ORNL for burial.

In the early 1950s, the K-65 residues used in the radium-actinium project were stored in the explosives bunker in lead casks. Plant workers would remove small quantities of the residue for processing. This activity resulted in the bunker being called by the name "the radium shack." At the conclusion of the radium-actinium project, the ion exchange resins containing approximately 10 g of radium were stored at the bunker (Schauer 1953). High-risk wastes from the radium-actinium program were probably also stored here. In July 1952, 37 20-gallon drums of liquid waste were removed from shack #1 and placed in sawdust in 55-gallon drums. These drums showed no external alpha radiation and an average gamma radiation of 150 mR/hr. The drums were moved to Warehouse 7 (MCC 1951-1956). Some wastes were moved to the Quonset hut in July 1953 for shipment offsite (Bradley 1953h).

Drums stored in the shacks were surveyed in June 1953. The highest readings were 7.5 R/hr in shack #2 and 10 R/hr in shack #1 (MCC 1953-1957). The source of these drums could not be determined from the existing records, but was probably the radium-actinium program. In August 1953, radiation surveys of surface and air contamination levels on and around drums of waste in storage indicated drum leakage. The problem was suspected to be mainly residual thorium from the purification and separation processes of the radium/actinium program. The drums were moved to the Quonset hut for shipment offsite (MCC 1953-1957). It is not possible from the available information to know exactly how many and what the sources were of the drums stored in the old bunkers. Subsequent surveys in September 1953 indicated little wipeable contamination in Shack #1 (probably the smaller of the two) and none in Shack #2. No direct readings could be taken in Shack #2 because of the high gamma level inside the shack (MCC 1953-1957). Shack #2 may have still contained waste drums at

that time. No other historical data or references to these shacks or bunkers could be found during the research for this report.

The Site Survey Project (DOE 1991c) reportedly located the area through its gamma surveys of the plant. Cesium-137 was found in the area at levels of 31 pCi/g measured in a core from 60 inches deep (DOE 1991c). It is speculated that wastes from the reactor waste pilot plant were also stored at the explosives bunker site, but limited data indicate that at least the incoming casks were stored at the Quonset hut (Bradley 1952e). There is no recent information on the adjacent detonator shack.

~~5.1.10. Old Warehouses (Historical)~~

Numerous wooden buildings were built by Maxon Construction Company during the initial phase of plant construction in 1947. These temporary buildings included warehouses for shipping and storing construction materials and equipment and supplies, as well as for use as office space (Figure 5.2). Several of the warehouses were retained by Mound after plant construction to provide enclosed storage. Warehouses numbered 1 through 8 and 11 and 12 (Figure 5.2) were apparently demolished in the early 1950s. There are no records that indicate that these 10 structures were ever used by Mound. The temporary office buildings (Figure 5.2) in the north parking lots were also demolished during this time period. Warehouses 9, 10, 13, 14, 15 and 15a were used to stage or store radioactive wastes for shipment offsite. The records of use of these building are sketchy and fragmented.

Two structures for unloading boxcars were located along the south side of the railroad siding south of the present Building 22 (Figure 5.2). The larger of the two was Warehouse 7, located at the far end of the siding; the smaller was Warehouse 9. These were sometimes referred to as the old railroad warehouses. Both buildings were wooden structures with elevated wooden floors and with docks along their north sides. Warehouse 7 is not known to have been used by Mound. Warehouse 9 had a heavy floor structure and was apparently used to ship and receive drummed radioactive materials. Until December 1954, Warehouse 9 served as the central point of waste shipments (MCC 1951-1956). In September 1953, drums of waste from the Purex pilot plant were moved from Warehouse 13, where they had been stored, to Warehouse 9 for shipment to ORNL for burial (MCC 1953-1957). In 1955, Warehouse 9 was used for the unloading of thorium drums for the planned thorium refinery. The drums were moved by truck to other areas of the plant for storage. Neither of the old railroad warehouses was used for unloading of the lead casks used to ship radioactive materials into Mound; the casks were too heavy and required crane unloading along the siding. Warehouse 9 was last used December 7, 1954. Warehouse 15A was used thereafter for waste [illegible] (MCC 1951-1956). ~~Review of photographs indicates that it was gone by August 1962.~~

Environmental Restoration Program

OPERABLE UNIT 5
OPERATIONAL AREA PHASE I INVESTIGATION
AREA 21 FIELD REPORT

MOUND PLANT
MIAMISBURG, OHIO

VOLUME I - TEXT

June 1995

Final (Revision 1)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

1. INTRODUCTION

Area 21 has been identified as an area of concern within the Operational Area of Operable Unit (OU) 5 (see Figure 1.1). The purpose of the Area 21 Field Report is to present the results of the radiological and soil gas surveys conducted in Area 21 as part of a larger OU5 Phase 1 Investigation and to identify potential areas of radiological and chemical contamination within Area 21. The data gathered during the Phase 1 Investigation is not remedial investigation (RI) quality. No conclusions were drawn from the results presented in this field report.

The Phase 1 reconnaissance investigation (radiological and soil gas surveys), as summarized in this report, provides a qualitative screen that can be used to determine a strategy for directing possible Phase 2 and Phase 3 investigations. A Phase 2 investigation will be conducted to gather RI quality data from locations with probable contamination, as found during the Phase 1 reconnaissance investigation. This information will be used to refine the data quality objectives (DQOs) to determine if an additional round of sampling (Phase 3) is necessary. The phased approach to data gathering is part of an overall strategy to conduct a remedial investigation/feasibility study (RI/FS) of OU5.

The following sections briefly describe the scope of the Area 21 Field Report, provide a site description, review the site land use history, and present the organization of the remainder of the report.

1.1. SCOPE

The scope of the Area 21 Field Report is to present the field work performed and the data collected at Area 21 during the Phase 1 investigation conducted in June, July, and August 1994. This work was conducted according to the OU5, South Property, Remedial Investigation/Feasibility Study Work Plan (DOE 1993a). In addition, relevant data available from previous studies are integrated into this report.

1.2. SITE DESCRIPTION

Area 21, approximately 150 feet by 175 feet (26,250 ft^2), is located on the south central slope of the Special Metallurgical/Plutonium Processing (SM/PP) hill south of Area J (see Figure 1.1). There are no buildings in Area 21 and it is covered with thick stands of small trees, underbrush, and grasses which limit accessibility. Partially buried, steel cables of the old explosives bunker located in Area 21 are still visible.

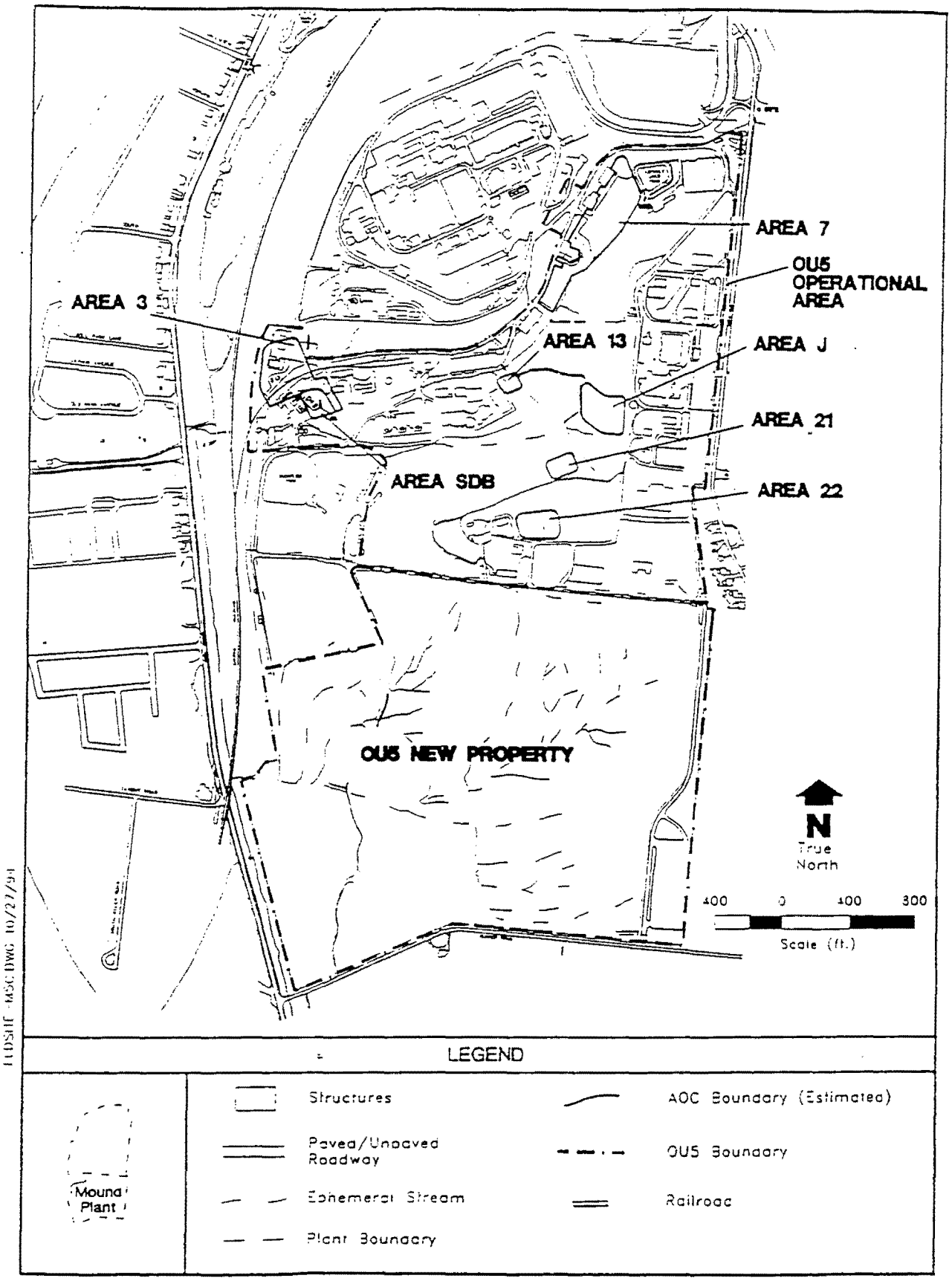


Figure 1.1. Site Map of OU5 Areas of Concern

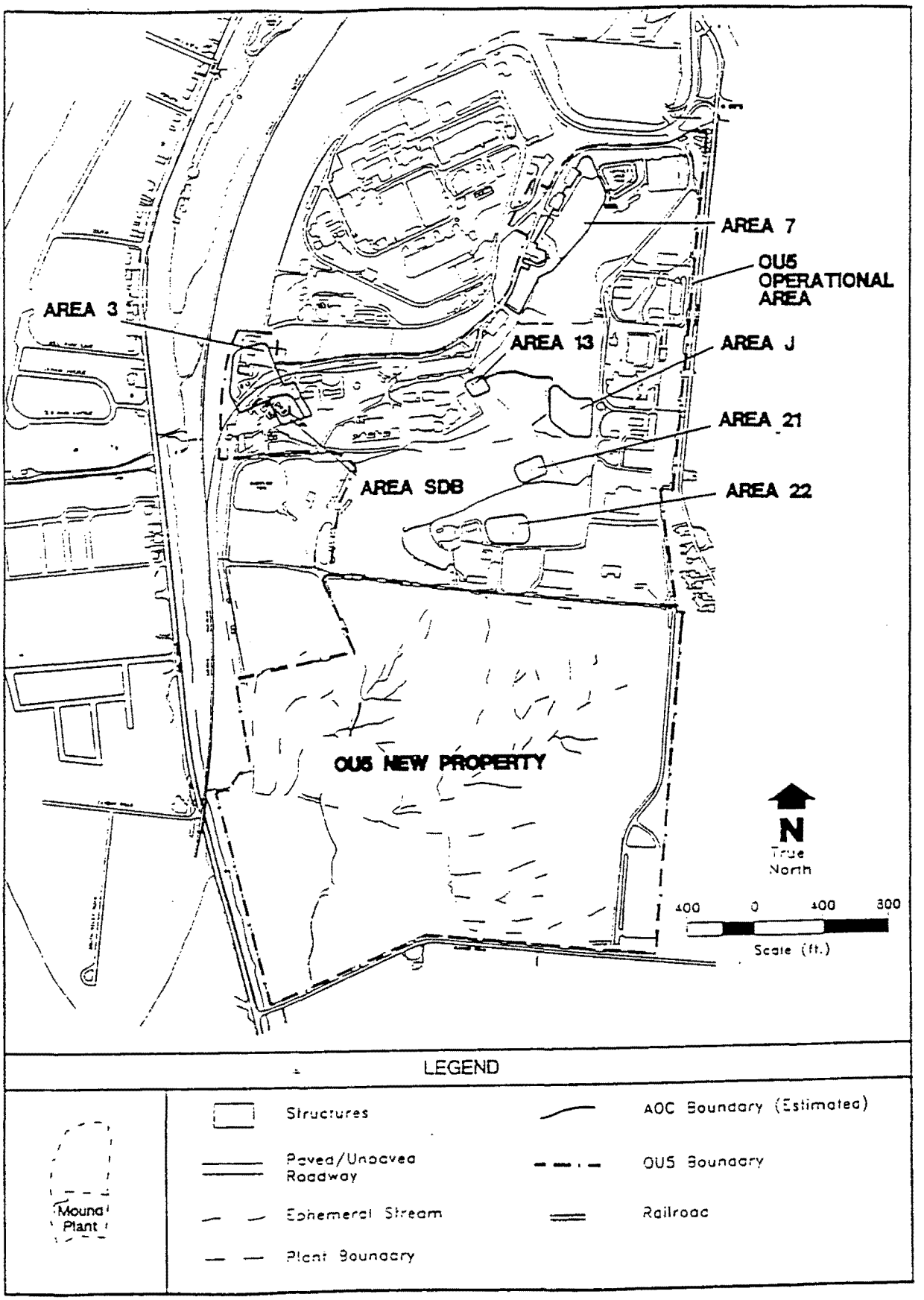


Figure 1.1. Site Map of OU5 Areas of Co

The area slopes uniformly downhill from the southeast to the northwest, though there are several artificial slope breaks. Topographic elevations range from 840 feet to 870 feet above mean sea level. Mound Plant drawings (DOE 1992a) show that bedrock ranges from three to five feet below ground surface.

1.3. SITE HISTORY

The Mound Site Survey Project (Stought et al., 1988) reportedly located Area 21 by gamma survey and found significant levels of radium-226 activity. No indication of radium-226 was found during the evaluation of the data included in the Stought report for the OU9 Site Scoping Report, Volume 3: Radiological Site Survey. Cesium-137 was also found in the area. It is speculated that wastes from the reactor waste pilot plant were stored at the explosives bunker site in Area 21, but limited data indicates that the incoming casks were stored at the Quonset hut (Bradley 1952). The boundaries of Area 21 have not been fully determined.

According to historical data (DOE 1992b), there were two bunkers located in Area 21 during plant construction in 1947 and 1948: a large one for explosives storage and a smaller one for detonator storage. These bunkers were also known as the dynamite caves (Bradley 1953) and the dynamite shacks (MCC 1053-1957). The larger explosives bunker, also known as shack #2, is the one that was probably used the most by Mound Plant. The smaller detonator bunker is also known as shack #1. The bunkers were constructed of heavy timbers tied together with steel cables. The floors are believed to have been packed earth.

During the 1940s and 1950s, the old explosives bunker was used extensively for the storage of wastes that contained high gamma radiation. During the era of polonium processing, 20- and 30-gallon drums containing residual sludge from the bismuth decanting processes in HH Building were moved by truck to the bunkers. The sludge contained high levels of short-lived, gamma emitting radionuclides (Garner 1991).

In the early 1950s, the K-65 residues used in the radium-actinium project were stored in the explosives bunker in lead casks. Plant workers would remove small quantities of the residue for processing. At the conclusion of the radium-actinium project, the ion exchange resins containing approximately 10 grams of radium were stored at the bunker (Schauer 1953). High risk wastes from the radium-actinium project were probably also stored here (MCC 1951-1956).

In August 1953, radiation surveys of surface and air contamination levels on and around drums of waste storage indicated drum leakage. Residual thorium from the purification and separation processes of the radium-actinium program was the suspected cause. The drums were moved for shipment off-site (MCC 1953-1957).

No other historical data or references to these bunkers could be found during the research for this report. The only visible signs of the explosives bunker are partially buried, steel cables. No sign of the detonator shack is apparent.

1.4. REPORT ORGANIZATION

The remainder of this report presents the results of the Area 21 Phase 1 field investigation. Section 2 summarizes field activities performed and data collected during the radiological and the soil gas surveys. It also compares relevant data from previous investigations with Phase 1 investigation data. Section 3 summarizes the results of the radiological and chemical reconnaissance surveys. Section 4 lists the references used to prepare this report. Survey maps, field logbooks, radiological data, and soil gas data are included in Appendices A, B, C, and D respectively, contained in Volume II.

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2. FIELD ACTIVITIES AND DATA SUMMARY

The Area 21 Phase 1 field activities were conducted to qualitatively screen this area of concern. In Area 21, Phase 1 reconnaissance activities consisted of:

- a field instrument for the detection of low-energy radiation (FIDLER) survey and surface soil sample analyses at the Mound Plant Soil Screening Facility to detect possible surface radiological contamination; and

- a soil gas survey to detect subsurface volatile and semi-volatile organic chemical contamination.

As specified in the OU5 Field Sampling Plan (FSP) (DOE 1993b), the radiological screening was conducted to detect the presence of plutonium-238 (Pu-238) and thorium-232 (Th-232) in Area 21. These two radionuclides are the most prevalent radiological contaminants at Mound Plant. The soil gas survey was conducted to detect total aromatic hydrocarbons, total semi-volatile compounds, total petroleum hydrocarbons, and total volatile halogenated compounds.

The data collection points for the FIDLER survey, the soil screening activities, and the soil gas survey were established over the estimated Area 21 boundary on a 25-foot grid system (see Figure 2.1 or Plate 1, Appendix B). The survey map of Area 21 (Appendix A) shows those points within the area located by a registered land surveyor. Before sampling, all transverses of the grid system were cleared of trees and underbrush and the remaining sample locations were marked with wooden stakes.

The following sections describe the field activities and the analyses performed, present the results of the Phase 1 investigation, and compare these results with historical data. No conclusions are presented.

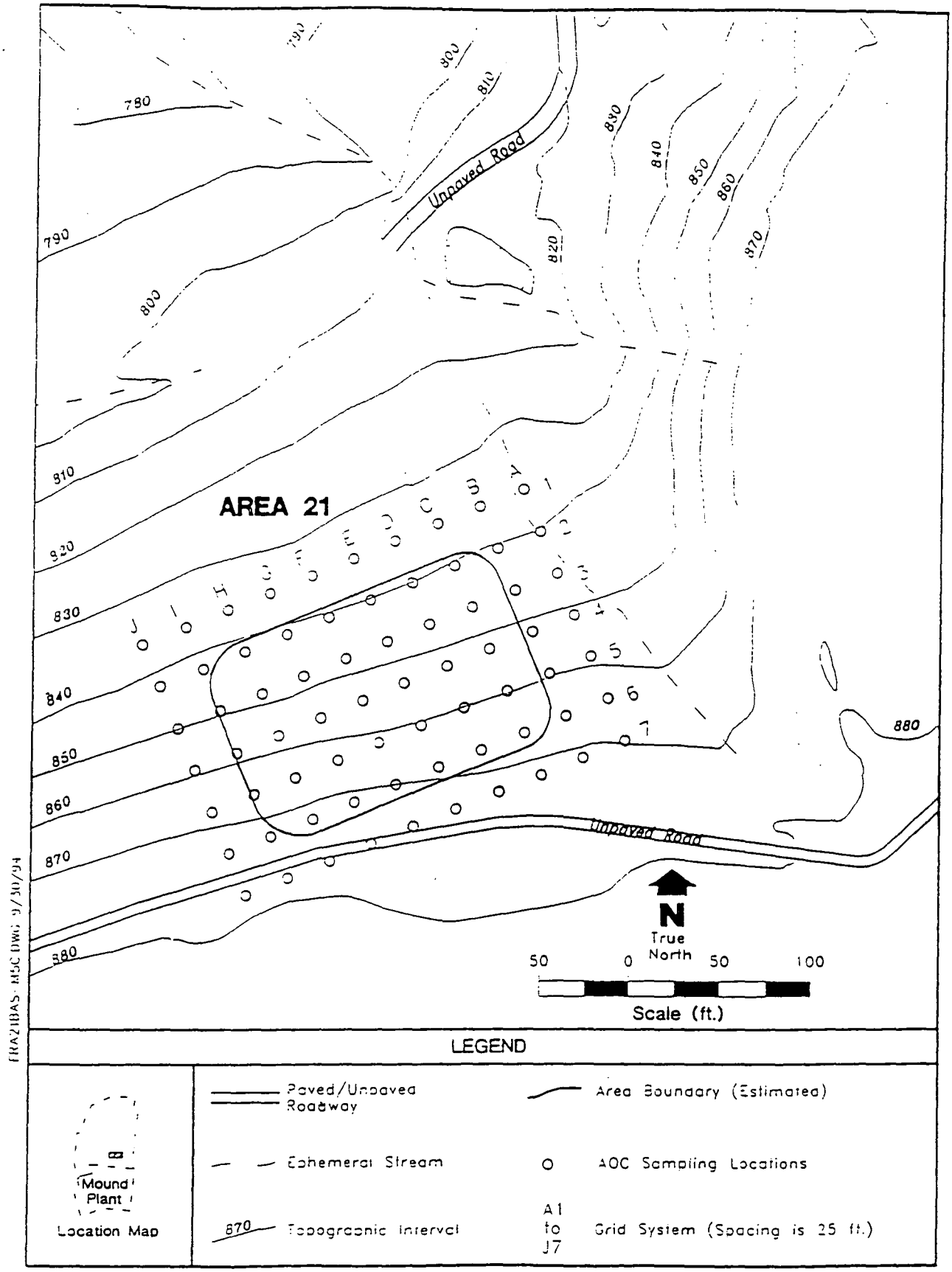

Figure 2.1. The Estimated Boundary and Established Grid System of Area 21

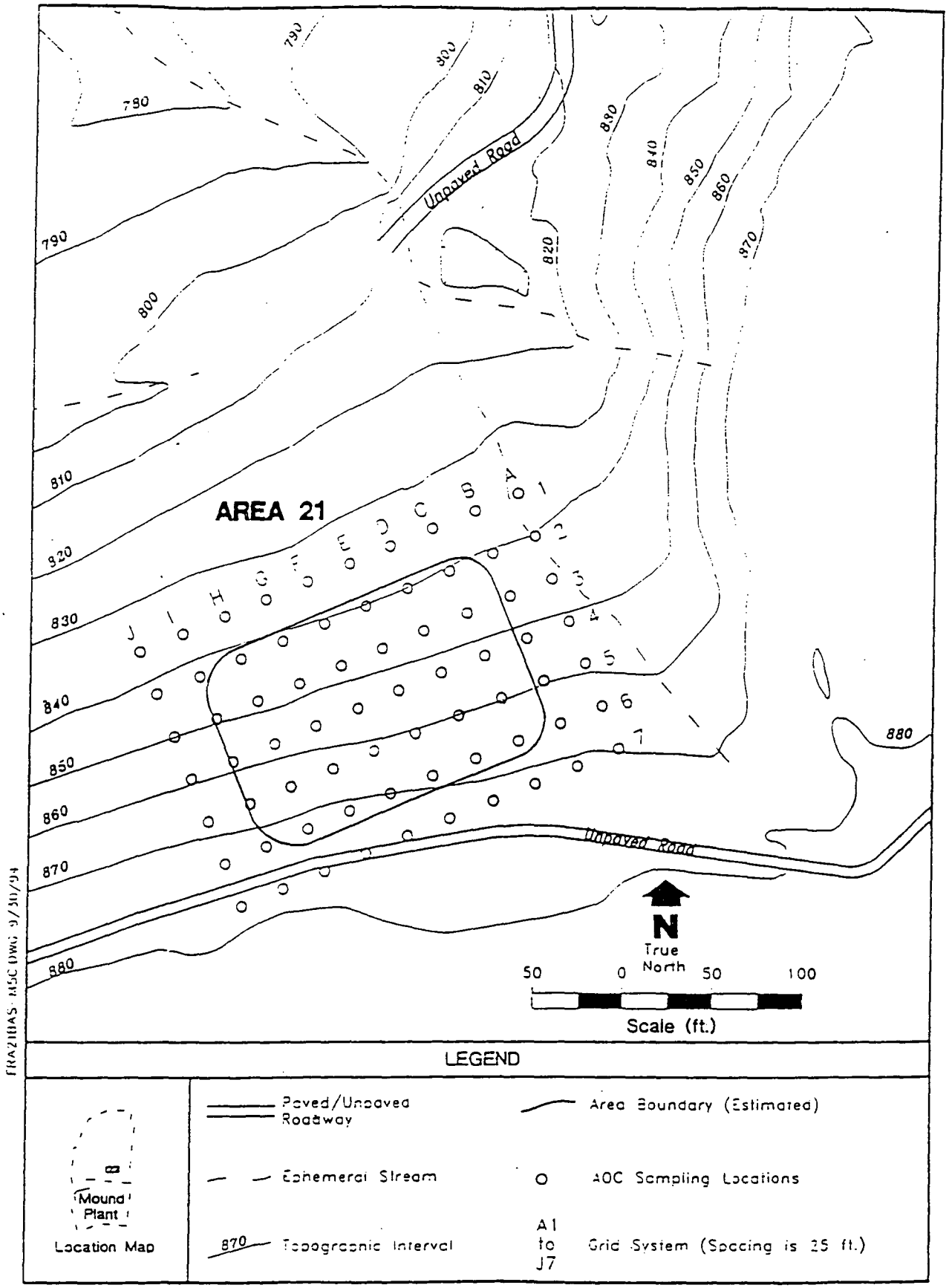

Figure 2.1. The Estimated Boundary and Established Grid System of Area 21

2.1. RADIOLOGICAL (FIDLER) SURVEY

2.1.1. Field Work Performed and Procedures

A FIDLER survey was performed at Area 21 on August 2, 1994, per the Mound Standard Operating Procedure (SOP) 6.7, Near Surface and Soil Screening for Low-Energy Gamma Radiation Using the FIDLER.

Before beginning the survey, Bicron FIDLER #3 (instrument #3228, probe #3432) was calibrated and the grid location J7 was established as the background station. Background and standard source checks for Pu-238 and Th-232 were performed daily and readings were recorded on the card attached to the FIDLER and in the FIDLER Logbook (Appendix B). The standard deviations and the contamination criteria were calculated for the Out Channel, Channel 1, and Channel 2.

Due to its ability to detect a wide range of isotopes, the Out Channel was selected for screening surface radiological contamination within Area 21. The Out Channel detects low energy gamma rays and x-rays while Channel 1 primarily detects Pu-238 and Channel 2 primarily detects Th-232.

None of the 25 square foot grid blocks in Area 21 could be surveyed in a serpentine fashion due to the thick vegetation and heavy undergrowth. Therefore, Channel 1, Channel 2, and Out Channel readings were recorded at each stake after a one minute stabilization period. The FIDLER operator then walked between stakes perpendicular to Row 1, (i.e., F1 to F7, G1 to G7, etc. as shown in Figure 2.1) at a rate of 20 feet per minute in the Out Channel mode. No readings were recorded for the sweep, unless the contamination criterion (CC) for the Out Channel was exceeded. When this occurred, the FIDLER crew located the point of highest concentration in that area by identifying where the highest Out Channel reading was detected. Channel 1 and Channel 2 readings were taken at the point of highest concentration after a one minute stabilization period and recorded in the FIDLER Logbook. The FIDLER was then slowly moved radially around the point of highest concentration until the Out Channel reading dropped below the CC, thereby defining the area of elevated activity. The size of the that area was recorded by distance and direction from the point of highest concentration in the FIDLER Logbook (see Appendix B).

2.1.2. Quality Assurance Summary Report

The field and data analysis variances are summarized in the following subsections.

2.1.2.1. Field Variance Report

The FIDLER survey was completed with no variances from the OU5 Quality Assurance Project Plan (QAPjP) (DOE 1993b). Two minor variances from SOP 6.7 involved check sources and scanning techniques.

The first variance was the use of Pu-238 and Th-232 sources for the daily source check as opposed to the americium-241 source specified in SOP 6.7. Plutonium and thorium sources were provided by the Mound Plant for the required daily check. The second variance from SOP 6.7, the inability to screen in a serpentine fashion, occurred due to the thick vegetation and heavy undergrowth covering Area 21. Instead, the screening was conducted at and between grid points, as described in Section 2.1.1.

2.1.2.2. Data Analysis Variance Report

FIDLER survey data were not formally validated. However, all logbook entries were checked for accuracy, completeness, and format. One error was found in the calculations used to determine the FIDLER contamination criteria. These values were recalculated and compared to the collected data. After reviewing the data, several additional points in Area 21 were identified as having elevated radiological activity based on the recalculated Out Channel CC. Because the corrections were made following the completion of the survey, no Channel 1 or Channel 2 readings were taken at these locations identified as having elevated Out Channel readings.

2.1.3. Health and Safety Summary Report

The FIDLER survey was conducted according to the OU5 South Property RI/FS Health and Safety Plan (DOE 1993c), and the Environmental Restoration Program Site-Specific Health and Safety Plan for OU5 Operational Area - Area 21. Health and safety issues were discussed and resolved during daily tailgate safety briefings conducted by the Site Health and Safety Officer and documented in the Site Manager Logbook (Appendix B).

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No accidents or safety violations occurred during the FIDLER survey at Area 21. On August 23, a health and safety surveillance was conducted; no deviations were reported.

2.1.4. Presentation of Radiological Data

Appendix C contains all radiological data collected during the Phase 1 investigation. It includes data from the FIDLER survey and the analytical results of soil samples from the Mound Plant Soil Screening Facility.

The FIDLER survey located several points and one area of elevated radiological surface activity as shown in Figure 2.2 and summarized in Table II.1. A total of 52 of the 70 survey points displayed elevated radiological activity. At location B2.5, an eight ft. by 15 ft. area of elevated radiological activity was found. Pu-238 was detected on Channel 1 at 215 counts per minute (cpm) and Th-232 was detected on Channel 2 at 22 counts per minute x 1000 (kcpm) in this area.

Surface soil samples, collected as part of the soil gas survey (see Section 2.2.1.1), were analyzed for Pu-238 and Th-232 at the Mound Plant Soil Screening Facility. The data are summarized in Table II.2. Concentrations of Th-232 at or exceeding the Mound Plant detection limit of 2.0 pCi/g were not detected at any of the sample locations. Concentrations of Pu-238 at or exceeding the Mound Plant detection limit of 25 pCi/g were detected at 32 of the 70 sample locations. Figure 2.3 shows the locations where concentrations of Pu-238 equal or exceed 25 pCi/g and the concentration contours where Pu-238 exists at concentrations from 25-50 pCi/g. This information is summarized in Table II.2. The concentration of Pu-238 does not exceed 50 pCi/g in the estimated boundary of Area 21. Additionally, surface soil sample results indicate that Pu-238 might be present outside the estimated Area 21 boundary on the east side of the area at concentrations above 25 pCi/g.

2.1.5. Comparison with Historical Radiological Data

Surface and subsurface soil samples were collected within the estimated boundary of Area 21 from 1983 to 1985 during the Site Survey Project (Stought et al., 1988). Four core locations (drilled to a maximum depth of 60 inches) and 11 surface soil sample locations were analyzed for Pu-238 and isotopic thorium. Selected samples were also analyzed for tritium, cobalt-60, cesium-137, radium-226, and americium-241.

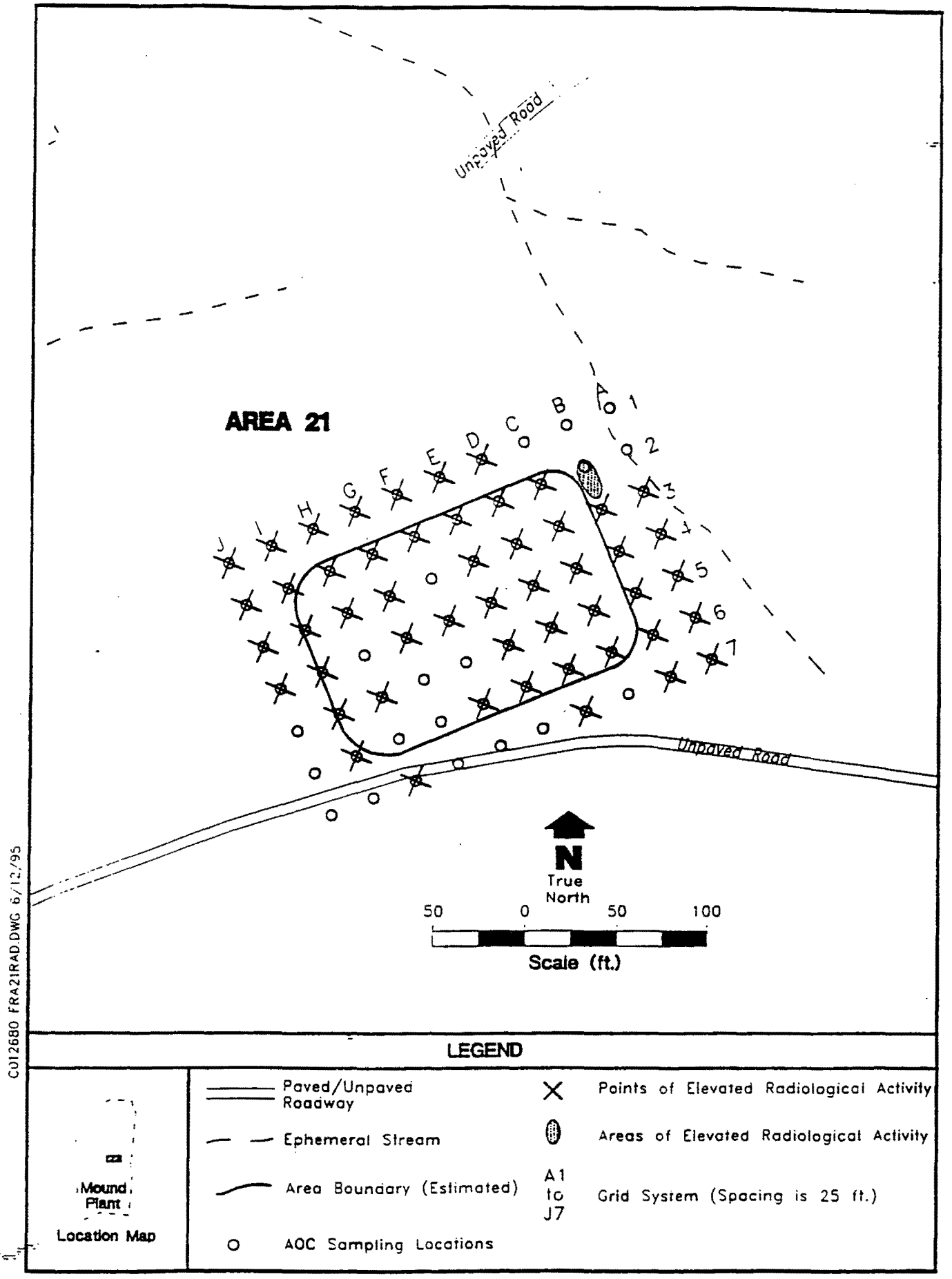

Figure 2.2. Areas of Elevated Surface Radiological Activity (FIDLER Survey)

Table II.1. Summary of Elevated Radiological Activity (FIDLER Survey)
Page 1 of 2

Location	Out Channel Reading (kcpm)	Out Channel CC (kcpm)
D1	12.0	11.6
E1	13.0	11.6
F1	12.5	11.6
G1	12.5	11.6
H1	12.0	11.6
I1	13.5	11.6
J1	13.5	11.6
B2	18.0	11.6
B2.5	26.0	11.6
C2	12.5	11.6
D2	12.0	11.6
E2	12.5	11.6
F2	12.5	11.6
G2	12.5	11.6
H2	12.0	11.6
I2	13.0	11.6
J2	13.5	11.6
A3	12.0	11.6
B3	12.0	11.6
C3	13.0	11.6
D3	12.5	11.6
E3	13.5	11.6
G3	12.0	11.6
H3	13.0	11.6
I3	13.5	11.6
J3	13.0	11.6
A4	13.0	11.6
B4	12.0	11.6
C4	13.0	11.6
D4	13.0	11.6

Table II.1. Summary of Elevated Radiological Activity (FIDLER Survey)
Page 2 of 2

Location	Out Channel Reading (kcpm)	Out Channel CC (kcpm)
E4	13.5	11.6
F4	12.0	11.6
G4	12.5	11.6
I4	12.0	11.6
J4	12.5	11.6
A5	12.5	11.6
B5	12.5	11.6
C5	12.0	11.6
D5	12.5	11.6
E5	12.0	11.6
H5	12.0	11.6
I5	12.5	11.6
A6	12.0	11.6
B6	12.5	11.6
C6	12.5	11.6
D6	12.5	11.6
E6	13.0	11.6
F6	12.0	11.6
I6	12.0	11.6
A7	12.0	11.6
B7	12.5	11.6
D7	12.0	11.6
H7	12.0	11.6

CC contamination criteria
kcpm counts per minute X 1000

Table II.1. Summary of Elevated Radiological Activity (FIDLER Survey)
Page 2 of 2

Location	Out Channel Reading (kcpm)	Out Channel CC (kcpm)
E4	13.5	11.6
F4	12.0	11.6
G4	12.5	11.6
I4	12.0	11.6
J4	12.5	11.6
A5	12.5	11.6
B5	12.5	11.6
C5	12.0	11.6
D5	12.5	11.6
E5	12.0	11.6
H5	12.0	11.6
I5	12.5	11.6
A6	12.0	11.6
B6	12.5	11.6
C6	12.5	11.6
D6	12.5	11.6
E6	13.0	11.6
F6	12.0	11.6
I6	12.0	11.6
A7	12.0	11.6
B7	12.5	11.6
D7	12.0	11.6
H7	12.0	11.6

CC contamination criteria
kcpm counts per minute X 1000

Table II.2. Summary of Elevated Surface Soil Radiological Activity (Soil Screening)
Page 1 of 2

Grid Location[a]	Mound Soil Screening Facility Data	
	Plutonium-238 (pCi/g)	Thorium-232 (pCi/g)
A3	29	ND
A4	40	ND
A5	25	ND
A6	33	ND
B1	25	ND
B4	30	ND
C2	25	ND
C3	28	ND
C4	43	ND
C5	28	ND
C6	50	ND
D1	27	ND
D2	30	ND
D5	32	ND
D6	31	ND
E4	28	ND
E5	34	ND
F2	26	ND
F4	26	ND
F6	43	ND
H1	37	ND
H2	40	ND
H3	27	ND
H6	33	ND

Table II.2. Summary of Elevated Surface Soil Radiological Activity (Soil Screening)
Page 2 of 2

Grid Location[a]	Mound Soil Screening Facility Data	
	Plutonium-238 (pCi/g)	Thorium-232 (pCi/g)
I2	25	ND
I3	37	ND
I4	34	ND
I5	31	ND
I7	35	ND
J1	36	ND
J2	34	ND
J6	37	ND

a - See Figure 2.2 for grid location.
ND - Radiological contamination not detected above detection limit.

Table II.2. Summary of Elevated Surface Soil Radiological Activity (Soil Screening)
Page 2 of 2

Grid Location[a]	Mound Soil Screening Facility Data	
	Plutonium-238 (pCi/g)	Thorium-232 (pCi/g)
I2	25	ND
I3	37	ND
I4	34	ND
I5	31	ND
I7	35	ND
J1	36	ND
J2	34	ND
J6	37	ND

a - See Figure 2.2 for grid location.
ND - Radiological contamination not detected above detection limit.

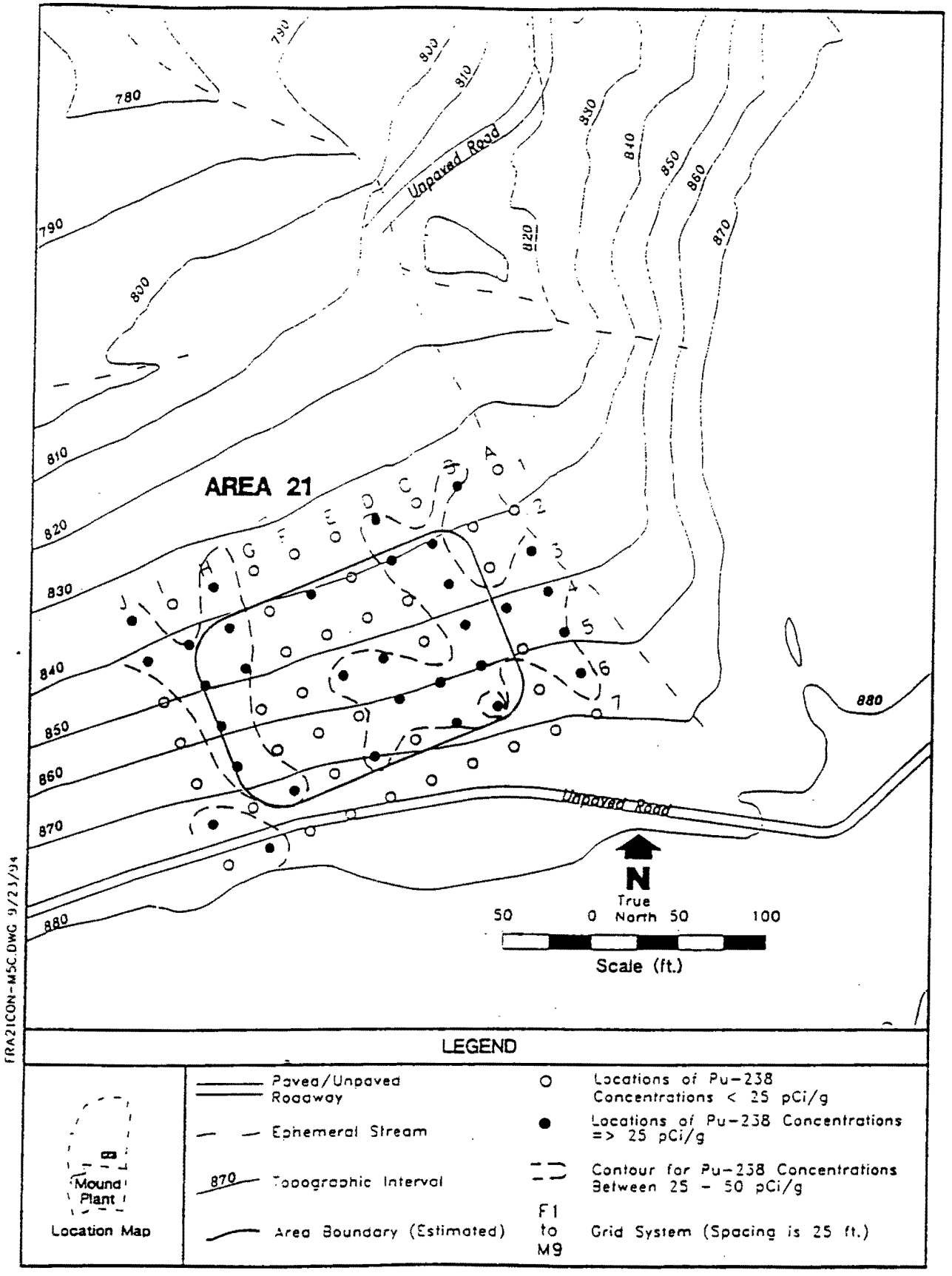

Figure 2.3. Locations of Elevated Surface Soil Radiological Activity (Pu-238)

The results of the surface soil sampling conducted under the Site Survey Project are presented in Table II.3 of this report (DOE 1992b). The corresponding core and surface soil sampling locations are shown in Figure 2.4.

During the Site Survey Project, cesium-137 was detected in several Area 21 soil samples, with a maximum concentration of 31 pCi/g measured in the sample taken at 60 inches at core location C0165. Pu-238, tritium, and radium-226 were also detected in several soil samples at low levels (1.12, 0.77, and 1.2 pCi/g respectively). Thorium and americium-241 were not detected in any of the soil samples collected. No indication of radium-226 was found during the evaluation of the data included in the Stought report for the OU9 Site Scoping Report, Volume 3: Radiological Site Survey (DOE 1992b).

The results from the soil sample screening of Area 21 during the 1994 Phase I investigation clearly indicate the presence of Pu-238 in the surface soil. Pu-238 was detected at levels higher than 25 pCi/g at 32 of the 70 sample locations (see Figure 2.3). The results are not consistent with the results for Pu-238 reported in the Mound Site Survey Project which were very low (see Table II.3). Th-232 was not detected at levels above 2.0 pCi/g in either survey.

The radiological survey of the Phase 1 investigation does not clearly indicate the areal extent of Area 21. The estimated area of Area 21 should be expanded for future phase activities.

2.2. SOIL GAS SURVEY

2.2.1. Field Work Performed and Procedures

A soil gas survey was performed at Area 21 from June 23 to August 2, 1994 per the OU5 QAPjP, SOP for Petrex Environmental Surveys [Attachment 1] (DOE 1993b). The survey was completed over the grid system established for Area 21 (see Figure 2.1 or Plate 1, Appendix B).

2.2.1.1. Soil Gas Sampler Installation

Two sets of time calibration samplers (timers) and 25 data samplers were installed on June 23, 1994. The remaining 45 samplers were installed on June 27, 1994. Locations of samplers and timers are shown in Appendix D, Plate 1. Samplers and timers were installed at depths between eight and 12 inches using an

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Table II.3. Summary of Historical Radiological Data Collected in Area 21
(Mound Site Survey Project; 1983-1985)
Page 1 of 2

Sample Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
S0740	3250	3100	2997	10-83	0	0.54	b	0.77	LDL	29	1.2	LDL
S0745	3285	3010	2999	10-83	0	1.12	b	0.64				
S0747	3295	3010	9794	06-85	0	NR	NR			5.0[c]		
S0644	3275	2970	6558	08-84	0	NR	NR		LDL[c]	29[c]	1.2[c]	LDL[c]
S0645	3290	2990	9789	06-85	0	NR	NR			28[c]		
C0173	3250	3000	10436	08-85	18	NR	NR		LDL	6.7	0.8	LDL
			10437	08-85	36	NR	NR		LDL	5.6	0.8	LDL
			10438	08-85	54	NR	NR		LDL	1.9	0.9	LDL
			10439	08-85	60	NR	NR		LDL	9.7	0.9	LDL
C0176	3310	3010	10433	08-85	18	NR	NR		LDL	2.2	0.8	LDL
			10434	08-85	36	NR	NR		LDL	3.1	0.7	LDL
			10435	08-85	54	NR	NR		LDL	1.2	0.7	LDL
C0177	3310	3090	10444	08-85	18	NR	NR		LDL	2.3	0.9	LDL
			10445	08-85	36	NR	NR		LDL	5.3	0.9	LDL
			10446	08-85	54	NR	NR		LDL	4.5	0.9	LDL

Table II.3. Summary of Historical Radiological Data Collected in Area 21
(Mound Site Survey Project, 1983-1985)
Page 2 of 2

Sample Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
C0165	3325	2980	10440	08-85	18	NR	NR		LDL	3.0	0.9	LDL
			10441	08-85	36	NR	NR		LDL	LDL	1.0	LDL
			10442	08-85	54	NR	NR		LDL	2.5	1.0	LDL
			10443	08-85	60	NR	NR		LDL	31	0.7	LDL

a-A "C" designates core locations and an "S" designates surface locations. Locations are shown in Figure 2.3.
b-A "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.
c-These results could not be confirmed because they were not listed in the gamma spec results included at the end of Appendix F.
FIDLER - field instrument for the detection of low-energy radiation
LDL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226.
MRC ID - Monsanto Research Corporation identification
NR - No result given
pCi/g - picocuries per gram
pCi/mL - picocuries per milliliter

Table II.3. Summary of Historical Radiological Data Collected in Area 21
(Mound Site Survey Project, 1983-1985)
Page 2 of 2

Sample Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
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			10442	08-85	54	NR	NR		LDL	2.5	1.0	LDL
			10443	08-85	60	NR	NR		LDL	31	0.7	LDL

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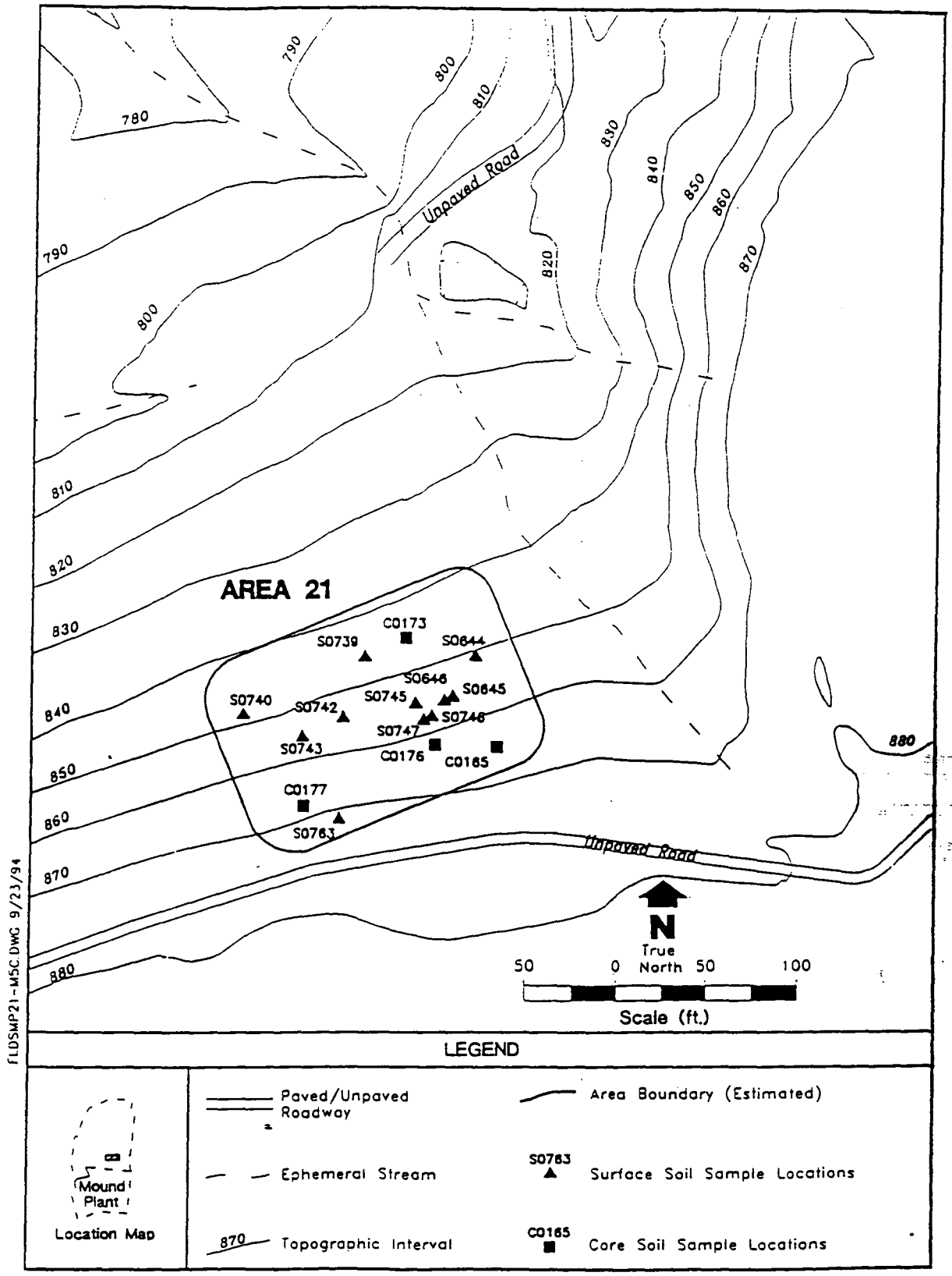

Figure 2.4. Sampling Locations for Historical Radiological Data Collected in Area 21 (Mound Site Survey Project, 1983-1985)

electric hammer drill and an 18 x 1.5 inch steel/tungsten carbide tipped drill bit. After each insertion, the drill bit was washed in a phosphate free detergent solution with a synthetic scrub brush, rinsed with deionized water, and allowed to air dry.

A FIDLER was used to monitor the placement of all samplers and timers. Surface soil samples were collected from each location for analysis of radiological contamination at the Mound Plant Soil Screening Facility. Results of the soil screening analyses are summarized in Section 2.1.4. and presented in their entirety in Appendix C.

2.2.1.2. Soil Gas Sampler Retrieval

On June 30, 1994, one timer from each of the two sets of timers was extracted, checked for radiological contamination, and sent to Northeast Research Institute LLC (NERI) for analysis. The timer analyses indicated low levels of petroleum hydrocarbons. On July 7, 1994, a second timer from each of the two sets of timers was extracted, checked for radiological contamination, and sent to NERI for analysis. Based on the analyses of the second set of timers, NERI recommended an exposure time of three and 1/2 to four weeks for the samplers. On July 28, 1994 all but one of the samplers were extracted. Due to soil conditions one sampler (E7) broke and the sample wires were not recovered. The samplers were wiped and prepared for shipment. On August 2, 1994, the samplers were sent to NERI for analysis.

2.2.2. Quality Assurance Summary Report

Field and laboratory analysis variances are summarized in the following subsections.

2.2.2.1. Field Variance Report

The soil gas survey was completed with minor variances from the OU5 QAPjP, SOP for Petrex Environmental Surveys [Attachment 1] (DOE 1993b) and the FSP (DOE 1993b). These variances included decontamination procedures, timers, and travel blanks.

One minor variance from the SOP, per instruction from NERI, was the elimination of the methanol rinse step from the decontamination process used for cleaning drill bits. Two minor variances from the FSP affected timers and travel blanks. The first variance was a decrease in the number of timers installed in

electric hammer drill and an 18 x 1.5 inch steel/tungsten carbide tipped drill bit. After each insertion, the drill bit was washed in a phosphate free detergent solution with a synthetic scrub brush, rinsed with deionized water, and allowed to air dry.

A FIDLER was used to monitor the placement of all samplers and timers. Surface soil samples were collected from each location for analysis of radiological contamination at the Mound Plant Soil Screening Facility. Results of the soil screening analyses are summarized in Section 2.1.4. and presented in their entirety in Appendix C.

2.2.1.2. Soil Gas Sampler Retrieval

On June 30, 1994, one timer from each of the two sets of timers was extracted, checked for radiological contamination, and sent to Northeast Research Institute LLC (NERI) for analysis. The timer analyses indicated low levels of petroleum hydrocarbons. On July 7, 1994, a second timer from each of the two sets of timers was extracted, checked for radiological contamination, and sent to NERI for analysis. Based on the analyses of the second set of timers, NERI recommended an exposure time of three and 1/2 to four weeks for the samplers. On July 28, 1994 all but one of the samplers were extracted. Due to soil conditions one sampler (E7) broke and the sample wires were not recovered. The samplers were wiped and prepared for shipment. On August 2, 1994, the samplers were sent to NERI for analysis.

2.2.2. Quality Assurance Summary Report

Field and laboratory analysis variances are summarized in the following subsections.

2.2.2.1. Field Variance Report

The soil gas survey was completed with minor variances from the OU5 QAPjP, SOP for Petrex Environmental Surveys [Attachment 1] (DOE 1993b) and the FSP (DOE 1993b). These variances included decontamination procedures, timers, and travel blanks.

One minor variance from the SOP, per instruction from NERI, was the elimination of the methanol rinse step from the decontamination process used for cleaning drill bits. Two minor variances from the FSP affected timers and travel blanks. The first variance was a decrease in the number of timers installed in

Area 21. The FSP requires five timers for an area this size, whereas NERI stated that two timers were sufficient.

The second variance from the FSP was the use of the travel blanks. The FSP requires that travel blanks be returned with the timers and samplers, whereas NERI instructed that travel blanks be returned with the samplers only.

2.2.2.2. Laboratory Data Variance Report

Petrex analytical data were not formally validated. However, logbook entries were checked for accuracy, completeness, and format. A final report for Area 21 was received from NERI on September 16, 1994. Sample locations shown on Plate 1 (Appendix D) of the NERI report were checked against the field map to confirm that all sampling locations were correctly plotted; no errors were found. Ion count values for aromatic hydrocarbons, volatile halogenated compounds, semi-volatile hydrocarbons, and petroleum hydrocarbons, listed in Table 1 of Appendix D were checked for plot accuracy on Plates 2 through 5, (also in Appendix D); no errors were found.

2.2.3. Health and Safety Summary Report

The soil gas survey was conducted according to the OU5 South Property RI/FS Health and Safety Plan (DOE 1993b), and the Environmental Restoration Program Site-Specific Health and Safety Plan for OU5 Operational Area - Area 21. All soil gas locations were screened using a FIDLER to avoid digging in radioactively contaminated soil. All sampling locations were checked for underground utilities to avoid damaging or severing utility lines while digging. Health and safety issues were discussed and resolved during daily tailgate safety briefings conducted by the Site Health and Safety Officer and documented in the Site Manager Logbook (Appendix B).

No accidents or safety violations occurred during the soil gas survey. On August 23, 1994, a health and safety surveillance was conducted; no deviations were found.

2.2.4. Presentation of Chemical Data

The Report of Findings of the Petrex soil gas survey is presented in Appendix D. The report discusses the Petrex method, the scope of work, quality assurance/quality control methods, and results. Appendix D, Plates 1 through 5, show sample locations and significant ion counts of targeted compounds. Ion count values are the unit of measure assigned by the mass spectrometer to the relative intensities associated with each compound. These intensity levels do not represent actual concentrations. Soil gas data are considered qualitative in that multiple sources in soil and/or groundwater cannot be differentiated.

Based on a review of historical information for Area 21 and the immediate vicinity, NERI was instructed to provide analytical data for four general classes of compounds to assess the potential for the presence of these compounds below the surface:

- total aromatic hydrocarbons;
- total semi-volatile hydrocarbons;
- total petroleum hydrocarbons; and
- total halogenated compounds.

2.2.4.1. Distribution of Total Aromatic Hydrocarbons

Total aromatic hydrocarbons are reported as the combined levels of C_6 to C_{15} aromatic (benzene based) hydrocarbon compounds detected in the soil gas samples. These aromatics are common constituents of petroleum fuels, heating oils, some light lubricating oils, and many other petroleum based products.

The soil gas samplers for Area 21 were analyzed after a four-week field exposure. When compared to the qualitative detection capability of the analysis method, the levels of aromatic hydrocarbons in the soil gas samples for Area 21 were low. Elevated levels of aromatics are present principally in the southern half of Area 21 (see Appendix D, Plate 2). The majority of the samples contained only light weight aromatics benzene (C_6) and toluene (C_7). Very few samples contained C_9 and heavier aromatics. This mixture of aromatics is typical of the composition of vapor that may be released from dilute levels of the residue of highly weathered and degraded fuel-like petroleum products. Along with elevated levels of aromatics, samples #104 and #122 (grid coordinates H7 and I6, respectively) included elevated levels of light weight alkanes and cycloalkanes/alkenes.

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2.2.4.2. Distribution of Total Semi-volatile Hydrocarbons

Total semi-volatile hydrocarbons are reported as the combined response to naphthalene, C_{11} through C_{15} alkyl naphthalenes, and C_{12}, C_{14}, and C_{16} polycyclic hydrocarbons (including acenaphthene, anthracene, and pyrene). These compounds are constituents of creosote, coal, tar, and other heavy, high boiling point fraction petroleum products.

The only semi-volatile hydrocarbons identified in the samples collected at Area 21 were naphthalene and C_{11} through C_{13} alkyl naphthalenes (see Appendix D, Plate 3). Elevated levels of these compounds were detected primarily at sampling points #104 and #152 (grid coordinates H7 and G3, respectively) in the western half of Area 21. Lower levels of naphthalenes were detected in soil gas at sampling points nearby.

2.2.4.3. Distribution of Total C_5 to C_{11} Petroleum Hydrocarbons

Total C_5 and C_{11} petroleum hydrocarbons reported include alkanes, cycloalkanes, alkenes, cycloaklenes, dienes, aromatics, and naphthalene and alkyl naphthalenes. These compounds together make up the bulk of most petroleum fuels, oils, and lubricants.

Elevated levels of C_5 to C_{11} petroleum hydrocarbons occurred in soil gas principally in the southern and southwestern portion of Area 21. The distribution of total C_5 to C_{11} petroleum hydrocarbons, see Plate 4 (Appendix D), was similar to that of aromatics alone (discussed in subsection 2.2.4.1. above). This indicates that most of the soil gas samples were nearly uniform in composition; only minor differences were recorded. Specifically, soil gas samples #122, #130, and #153 (grid coordinates B6, D2, and G2, respectively) contained more prominent levels of alkanes, cyloalkanes, and alkenes.

Given the high sensitivity of the sampling method, and the extended exposure time, it is apparent that total C_5 to C_{11} petroleum hydrocarbons in the soil gas are present at very low levels.

2.2.4.4. Distribution of Total Halogenated Hydrocarbons

Total halogenated hydrocarbons are reported as the combined levels of trichlorofluoromethane (Freon-11), trichloroethene (TCE), tetrachloroethene (PCE), and dichlorobenzene(s) (DCB) in soil gas. TCE, PCE, and the 1,3- and 1,4-isomers of DCB are liquids commonly used as solvents and cleaning agents for petroleum based products.

The majority of elevated responses to total halogenated hydrocarbons shown on Plate 5 (Appendix D) principally reflect the presence of PCE in the soil gas. However, three of the four sampling points (highlighted on Plate 5) did not solely exhibit the occurrence of PCE. Samples #122 and #130 (grid coordinates I6 and A1, respectively) contained Freon-11, TCE, and PCE. Sample #154 (grid coordinate G1) contained DCB and PCE. Each of the four points that exhibited the highest levels of halogenated hydrocarbons occurred in isolated locations on the periphery of Area 21.

2.2.5. Comparison with Historical Chemical Data

No historical data is available on possible Resource Conservation and Recovery Act (RCRA) hazardous constituents (chemical contamination) in Area 21 (DOE 1993d). Therefore, no comparison with the Phase 1 investigation results can be made.

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3. SUMMARY

The results of the reconnaissance (radiological and chemical) surveys conducted in Area 21 are summarized in this section.

The results of the radiological surveys (FIDLER and soil screening) are summarized below:

- The FIDLER survey located 52 points and one area of elevated radiological activity in Area 21.

- Soil screening analysis of surface samples indicates that Pu-238 might be present outside the estimated Area 21 boundary on the east side. These results are not consistent with the results reported for Pu-238 in the Mound Site Survey Project. Th-232 was not detected in either survey.

The FIDLER survey located several points of elevated radiological activity where neither Pu-238 nor Th-232 were found during the soil screening analysis. This suggests the presence of other gamma emitting radionuclides at these locations. Radium, actinium, and cesium-137 are also suspected contaminants which were not part of the Phase 1 sampling scheme. Gammaspectroscopy can be utilized to determine if these and other suspected radiological contaminants are present in Area 21 during the sampling conducted under the Phase 2 investigation.

The soil gas survey conducted in Area 21 indicates the presence of chemical contaminants as summarized below:

- Elevated levels of total aromatic hydrocarbons (primarily C_6 and C_7) were detected in the southern half of Area 21.

- Elevated levels of semi-volatile hydrocarbons (primarily naphthalene and C_{11} - C_{12} alkyl napthalenes) were detected at grid coordinates H7 and G3 in the western half of Area 21.

- Elevated levels of petroleum hydrocarbons (primarily C_5 to C_{11}) were detected in the south and southwestern portions of Area 21.

- Elevated levels of halogenated hydrocarbons (PCE, TCE, Freon-11, and DCB) were detected in isolated locations along the periphery of Area 21.

While specific conclusions cannot be made from these findings, the results may be used to direct a Phase 2 investigation of Area 21.

- Elevated levels of halogenated hydrocarbons (PCE, TCE, Freon-11, and DCB) were detected in isolated locations along the periphery of Area 21.

While specific conclusions cannot be made from these findings, the results may be used to direct a Phase 2 investigation of Area 21.

4. REFERENCES

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Environmental Restoration Program

OPERABLE UNIT 5
OPERATIONAL AREA PHASE 1 INVESTIGATION
AREA 21 FIELD REPORT

MOUND PLANT
MIAMISBURG, OHIO

VOLUME II - APPENDICES A-D

November 1994

Draft

U.S. Department of Energy
Albuquerque Operations Office

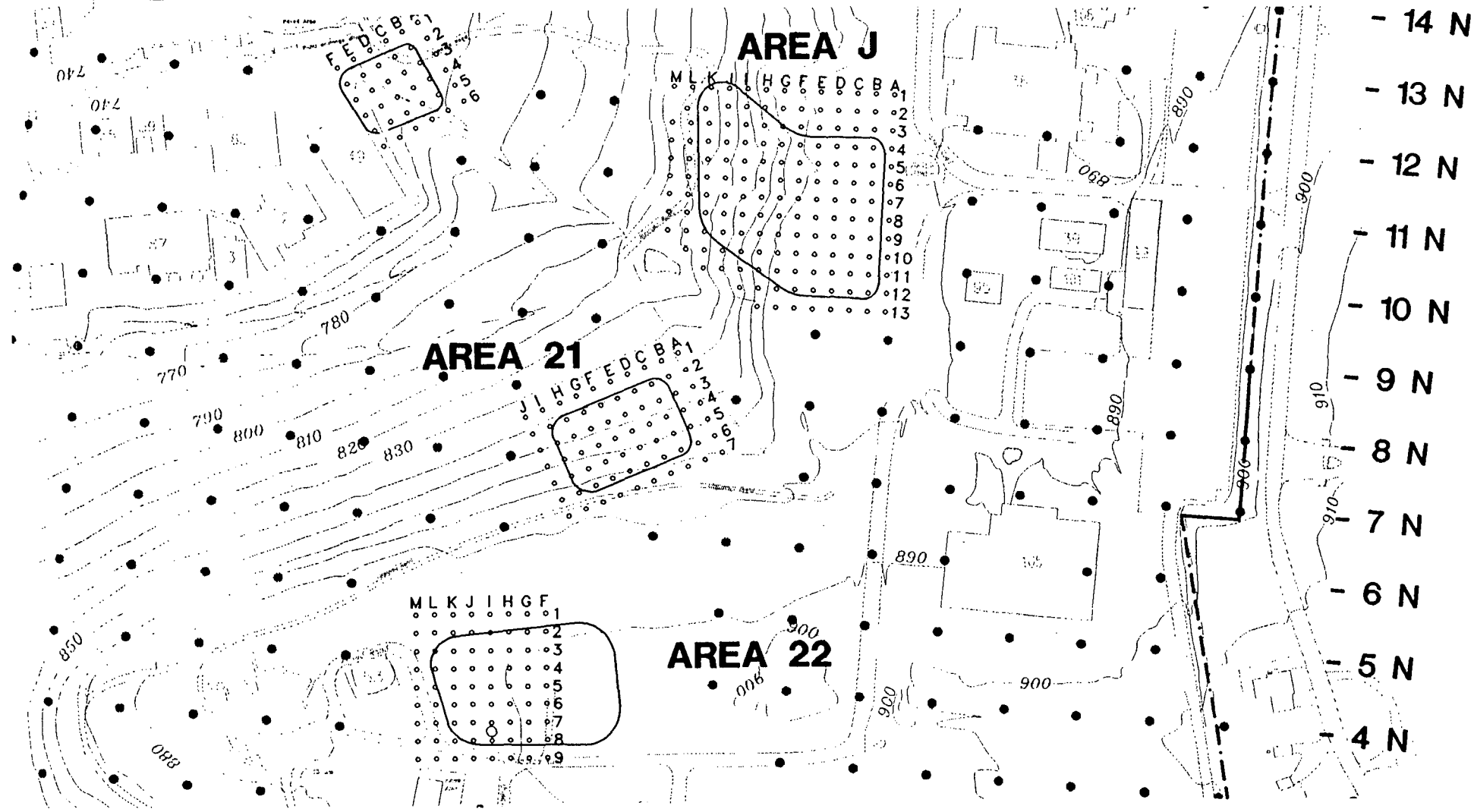
EG&G Mound Applied Technologies

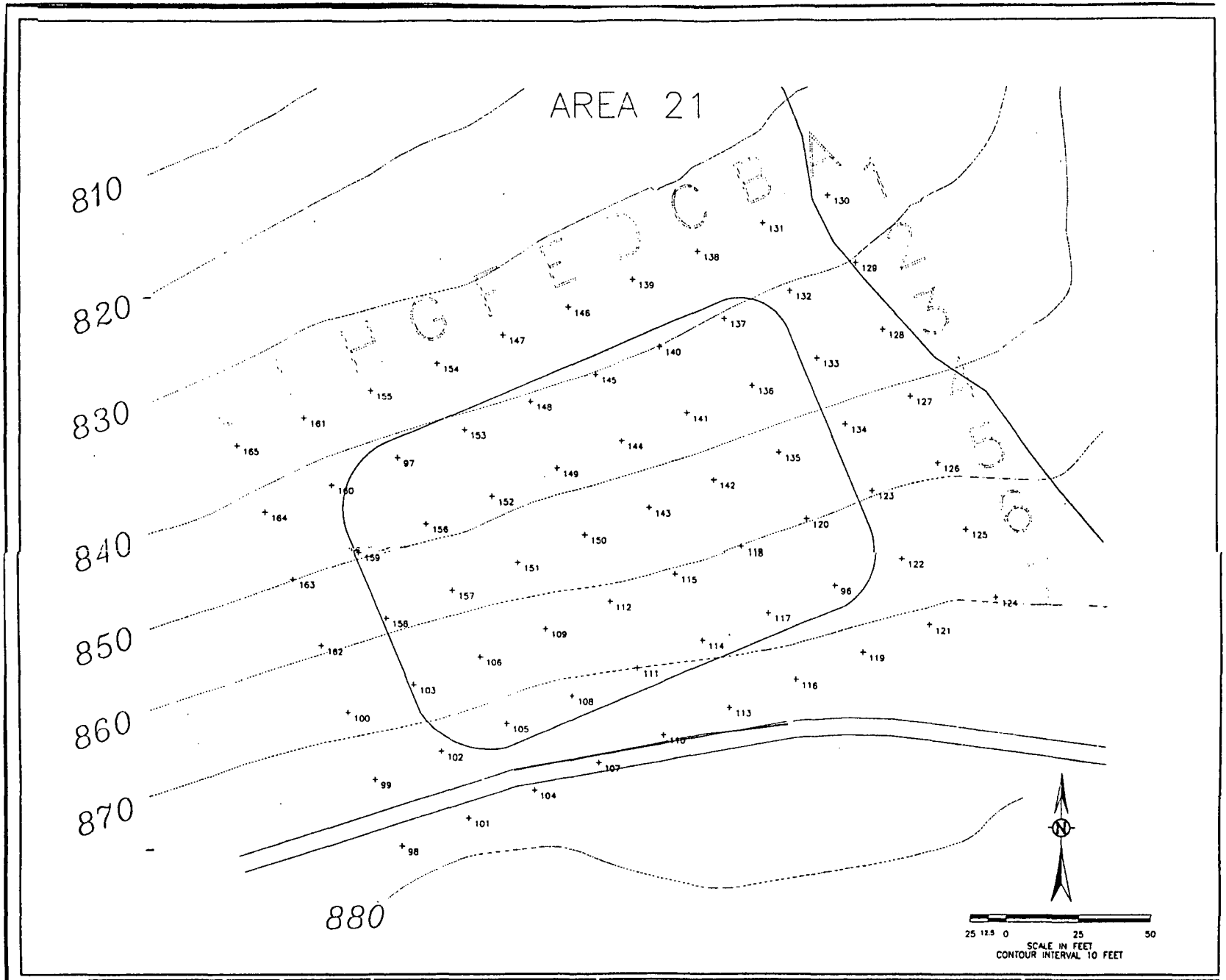
PLATE 1	MOUND PLANT OPERABLE UNIT 5 PHASE 1 RI/FS OPERATIONAL AREA LOCATIONS OF AREAS OF CONCERN

LEGEND

- Structures
- Plant Boundary
- Paved/Unpaved Roadway
- Ephemeral Stream
- Contour Line
- OU5 Boundary
- ● 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

Note: Information on Basemap is Derived from the Weston OU9 Site Scoping Report, 1993, & Referenced to the 1927 Ohio State Plane Coordinate System





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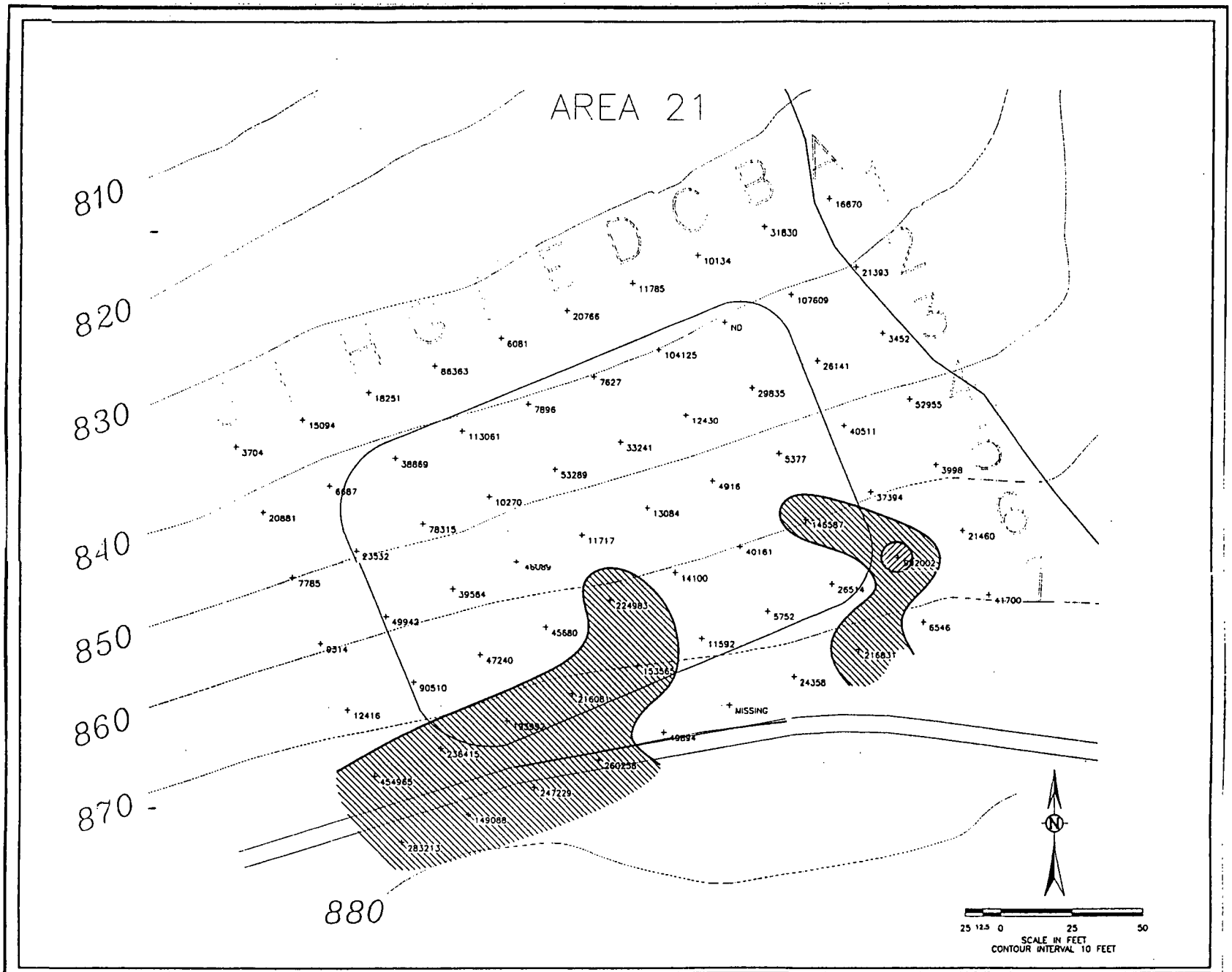

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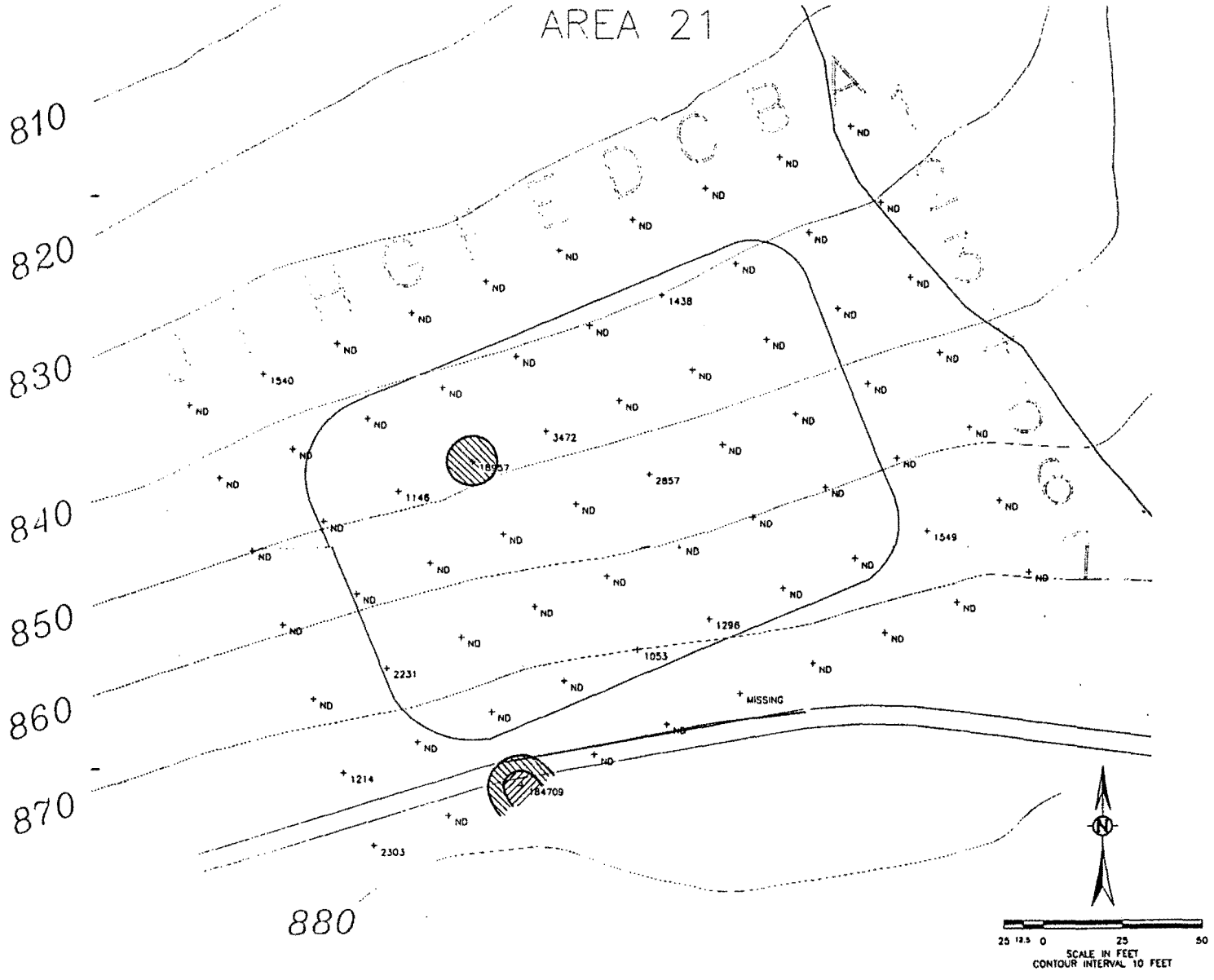

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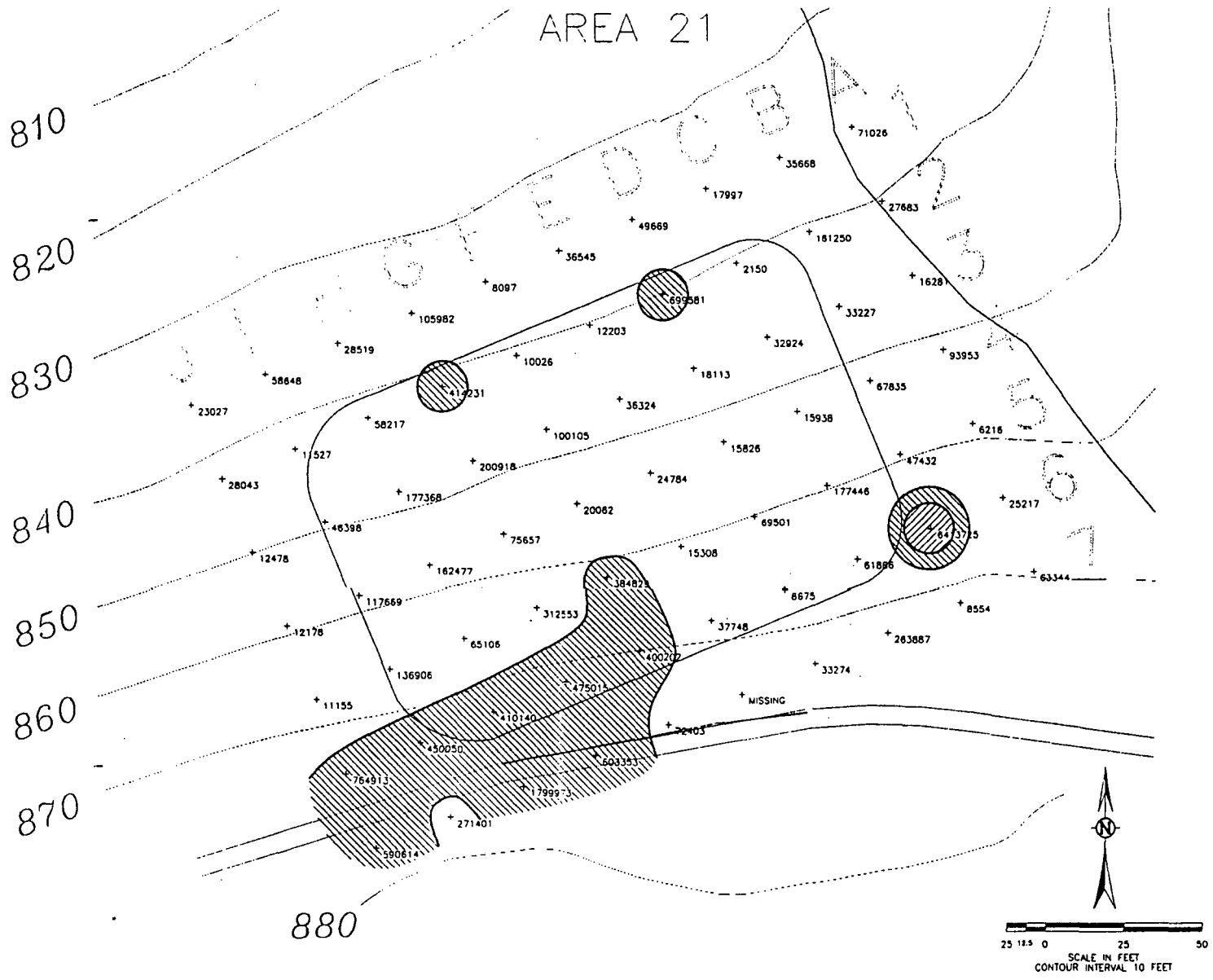

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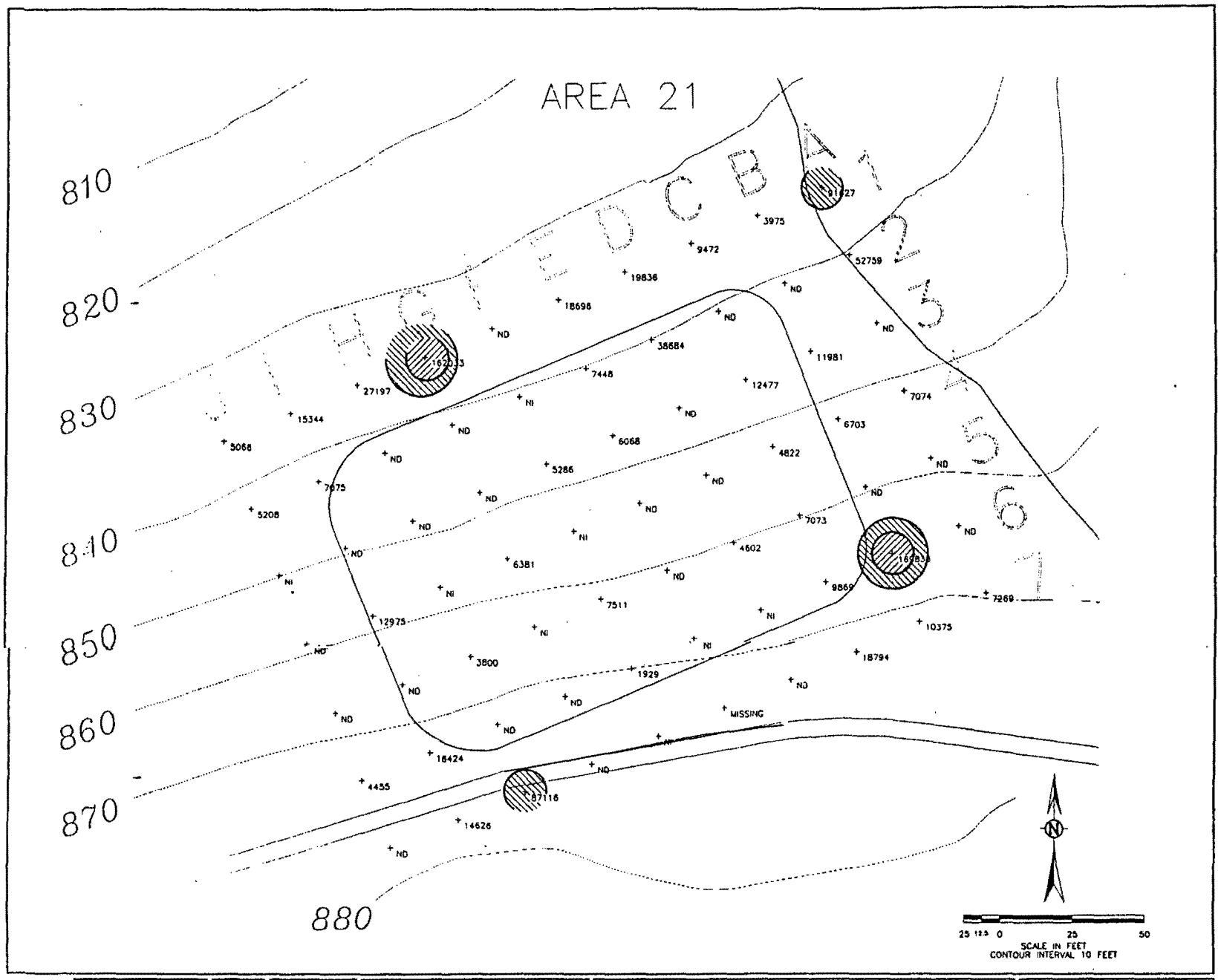

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