300502-0604260001

CH2M HILL
Mound, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, OH
45343-3030

CH2MHILL

ER/WM-089/04
September 27, 2004

Ms. Margaret L. Marks, Director
Miamisburg Closure Project
U. S. Department of Energy
1075 Mound Road
Miamisburg, OH 45342

ATTENTION: Paul Lucas

SUBJECT: Contract No. DE-AC24-03OH20152
Statement of Work Requirement 055 - Regulator Reports
H BLDG OSC REPORT - FINAL

Dear Ms. Marks:

Attached for your records is the following Final document:

- H Building On-Scene Coordinator (OSC) Report, Final

This document includes both the structure and soil portions of the project, and the VSAP Data Report.

If you or members of your staff have any questions regarding the document, or if additional support is needed, please contact me at 937-865-4203.

Sincerely,

David A. Rakel
CERCLA Lead

DAR/ms

Enclosures

cc: David Seely, USEPA, (1) w/attachments
Brian Nickel, OEPA, (1) w/attachments
Ruth Vandegrift, ODH, (1) w/attachments
Mary Wojciechowski, Tetra Tech, (1) w/attach
Frank Schmaltz, DOE/MCP, (1) w/attachments
Lisa Rawls, MCP, w/o attachments
Randy Tormey, DOE/OH, (1) w/attachments
Robert Perrygo, DOE/HQ, (1) w/attachments
Chris Watson, CH2M Hill, (1) w/attachs
CERCLA Documents, CH2M Hill, (1) w/attachs
Val Darnell, CH2M Hill, (1) w/attachments
Bob Ransbottom, CH2M Hill, (1) w/ attach
ER Records, CH2M Hill, (1) w/attachs
Admin Record (2) w/attachments
DCC (1) w/attachments
Frank Bullock/MMCIC (2) w/attachments
Jim Bonfiglio/MESH (1) w/attachments
Public Reading Room (4) w/attachments
John Fulton, CH2M Hill, w/o attachments
Dave Rakel, CH2M Hill, w/o attachments
David Wier, CH2M Hill, w/o attachments
file

300502-0604260001

H BUILDING REMOVAL ACTION

PRSs 210 and 337 are closed via this OSC Report

OSC REPORT

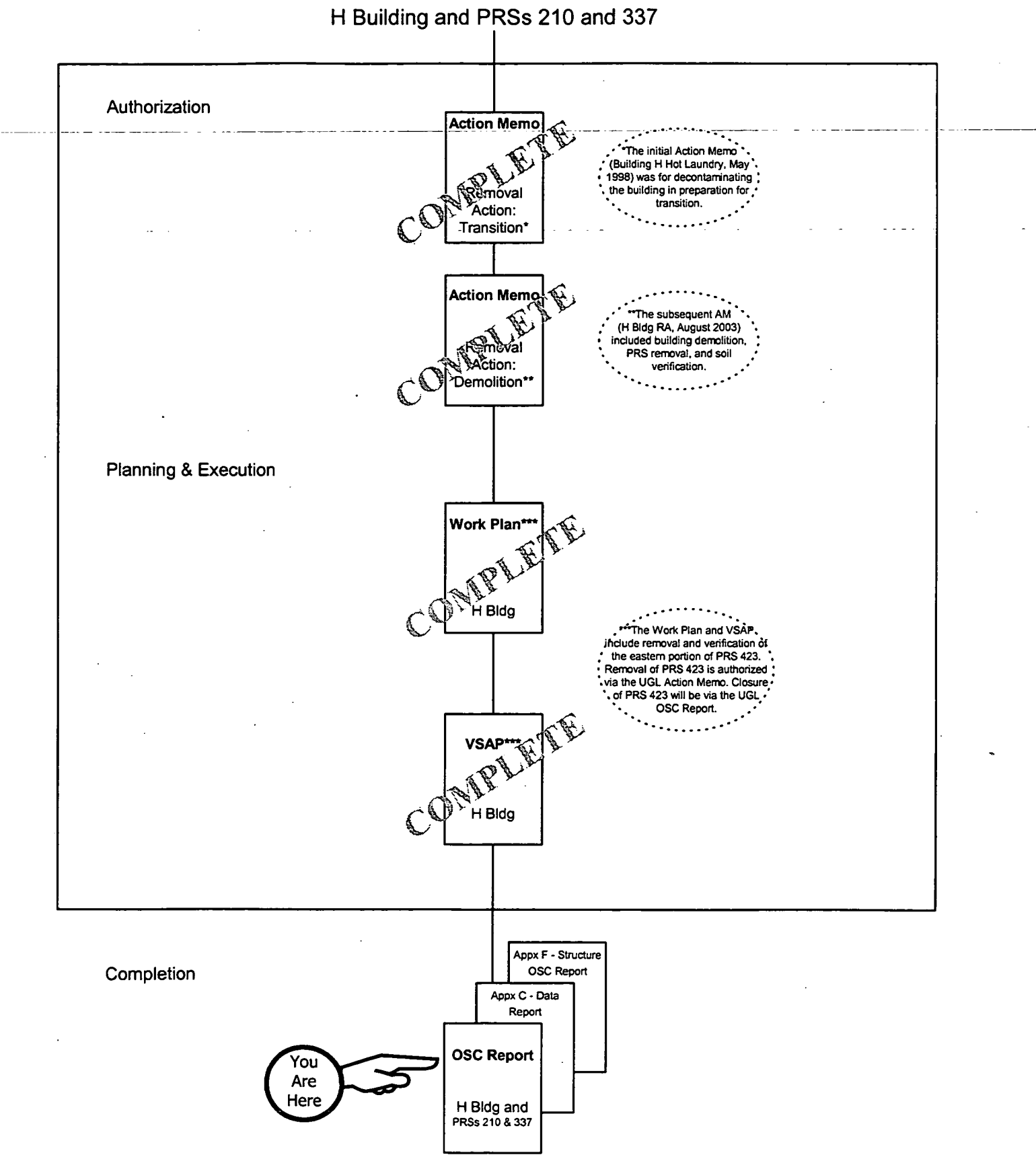
September 2004

Final

Department of Energy
Miamisburg Closure Project

CH2MHILL

H Building



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Acronyms

bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and decomissioning
DOE	Department of Energy
MCP	Miamisburg Closure Project
MMCIC	Miamisburg Mound Community Improvement Corporation
OEPA	Ohio Environmental Protection Agency
OSC	On-Scene Coordinator
PRP	Potentially Responsible Party
PRS	Potential Release Site
RA	Removal Action
USEPA	United States Environmental Protection Agency

RECOMMENDATION

The H Building Removal Action (authorized via the H Building Action Memorandum, August 2003, Final) was performed based on historical processes in the building (laundering of radioactively contaminated clothing), and radiological surveys and soil samples which showed elevated levels of several isotopes, including plutonium-238 and actinium-227. The structural portion of the removal action included the removal of the H Building superstructure and is documented in Appendix F. The soil portion of the project included removal of the H Building slab, footers, and non-contaminated piping; removal of contaminated piping and soil (including historic location SCR321); closure of PRSs 210 (Laundry Water Tank) and 337 (Condensate Sump); and verification sampling and analysis to demonstrate that the remaining soil meets the Cleanup Criteria, and is documented in the main body of this OSC Report.

The structure portion of the project resulted in the disposal of approximately 1,473 cubic yards (cy) of radioactively contaminated debris (for disposal at Envirocare), and 3,780 cy of asbestos and demolition debris meeting surface release criteria (for disposal at Stoney Hollow Landfill). The soil portion of the project resulted in the disposal of approximately 843.7 cy of radioactively contaminated debris and soil (for disposal at Envirocare), and approximately 385 cy of construction debris meeting surface release criteria (for disposal at Stoney Hollow Landfill).

After a thorough review of the H Building OSC Report, the Core Team agrees that the H Building Removal Action (including closure of PRSs 210 and 337) is complete, and that all previously existing environmental issues associated with H Building have been resolved.

Paul Lucas 9/22/04

Paul Lucas, OSC
U.S. Department of Energy
Miamisburg, Ohio

David P Seely 9/21/04

David Seely, Remedial Project Manager
USEPA
Chicago, Illinois

B. Nickel 9/22/04

Brian Nickel, Project Manager
OEPA
Dayton, Ohio

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Document layout note: The main body of this document addresses the Soil portion of the Removal Action activities. Appendix F addresses the Structure portion of the Removal Action activities. The OSC Report documents the completion of all aspects of the Removal Action activities authorized in the Action Memorandum, H Building Removal Action, August 2003, Final.

1.0 SUMMARY OF EVENTS

This section describes the site background and removal action events, parties involved in supporting the removal action, chronological narrative of the removal action, and resources committed to complete the project.

1.1 Site Conditions and Background

The levels of radiological contamination present in H Building warranted a Removal Action (RA) under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) and subsequent demolition of H Building. The former location of H Building is shown on Figure 1 (Appendix A). The Action Memorandum, H Building Removal Action, August 2003, Final authorized removal of H Building, Potential Release Sites (PRSs) 210 and 337, and the contaminated soil in the vicinity. The Structure On-Scene Coordinator (OSC) Report documented the removal of the H Building superstructure. This Soil OSC Report documents removal of the H Building slab, footers, and non-contaminated piping (to two feet below ground surface [bgs]); removal of contaminated piping and soil (including historic location SCR321); closure of PRSs 210 and 337; and verification sampling and analysis to demonstrate that the remaining soil meets the Cleanup Criteria.

Potential Release Sites. The PRSs associated with H Building are listed on Table 1 (Appendix B), and their locations are shown on Figure 2. PRS 210 (Room H-133 Laundry Waste Tank) was removed in 1998 under the initial version of the Action Memorandum, before it was decided to demolish the building. PRS 337 (Condensate Sump) was located in a pit in the slab of the building and was removed as part the H Building slab demolition. PRSs 210 and 337 are closed out via this H Building Soil OSC Report. A portion (from H Building to the first manhole) of PRS 423 (Main Hill Under Ground Rad Waste Line Segment 1A) was also removed during H Building removal activities; and will be closed out via the UGL OSC Report.

Removal Action. The removal action in H Building began in 1998 with the authorization of the original action memorandum to decontaminate the Hot Laundry area of the building. It was thought at that time that the building would be transferred to the Miamisburg Mound Community Improvement Corporation (MMCIC) after decontamination was completed. PRS 210 was removed as part of the D&D activities. However, when the extent of contamination was discovered to be greater than originally anticipated, a decision was made to demolish the building. The action memorandum was revised to expand the scope of work to include demolition. The authorization of the

Removal Action for H Building and contaminated soil in the vicinity was made by the Core Team on June 9, 2003 via the revised H Building Action Memorandum. This document was made available for public review and comment on June 28, 2003, and was finalized on August 28, 2003.

Since DOE is the sole responsible party for cleanup of contamination in H Building, no Potentially Responsible Parties (PRPs) were sought to clean up the site. Monsanto Research Corporation, EG&G Mound Applied Technologies, and BWXT of Ohio, Inc. were the operating contractors at the site from 1948 to 30 September 1988, from 1 October 1988 until 30 September 1997, and from 1 October 1997 until 31 December 2002 respectively. CH2M Hill Mound, Inc. became the site contractor for the Miamisburg Closure Project (MCP) effective January 1, 2003.

1.2 Organization of the Removal Action

Table 2 lists the parties supporting the removal action and their responsibilities.

1.3 Objectives

Documentation Objective. The objective of this H Building Soil OSC Report is to describe the soil removal action fieldwork, and document successful completion of the project. Demolition debris quantities and disposition locations are presented in Table 3. The cost breakdown of the soil portion of the RA is presented in Table 4.

The H Building Structure OSC Report is provided in Appendix F and documents the structure removal portion of the project.

Removal Action Objectives: The objectives of the removal action included:

- Project Planning,
- Public Notification,
- Establish Work Zones,
- Decontamination (details from the Action Memo included below),
- Demolition (details from the Action Memo included below),
- Verification,
- Site Restoration, and
- Documentation of Completion.

Per the Action Memorandum, **decontamination** activities were to be as specified in the Work Plan as summarized below.

1. Isolate remaining utilities; drain all systems of liquid. (The only utilities previously isolated were supplying Rooms H-133 and 134.)

2. Remove excess equipment and surplus materials such as laundry equipment, building support equipment (fans, water fountains, etc.), lab equipment, and cleaning supplies. Equipment from Rooms H-131, 132,133 and 134 was previously removed.

3. Remove equipment containing lead shielding.

4. Contain and remove the filter bank based on the radiological characterization and then dismantle for disposal as low-specific activity (LSA) waste.

5. Prepare the filter bank ductwork for removal by using fixative and containment of openings. Negative airflow will be used as an engineering control during disassembly. Dispose of as LSA waste.

6. Remove the hot laundry exhaust stack along with its associated ductwork and dispose of as LSA waste.

7. Remove the contaminated exhaust ductwork in the H-134/135 wall and package and dispose of as LSA waste.

8. Remove remaining contaminated drain piping (approximately 15 feet) in Rooms H-131 and 132, and contaminated drain running north from Room H-134 underneath the east breezeway. Additional contaminated drains may be identified in the ongoing characterization effort (expected to be complete in April 2003). Remove any associated contaminated drains and debris. Other potentially contaminated drains include those under Rooms H-113, 115, 128, and 135.

9. Remove the concrete (PRS 210, Tank 2, Room H-133) sump exterior liner imbedded in the floor subsoil. The sump (the interior tank of the sump that had contact with the effluent) was previously removed.

10. Decontaminate Rooms H-127, 127A, 128, 130, and 132; all have fixed contamination on their floors. Also remove surface contamination from the Penthouse floor and filter bank.

11. Asbestos abatement contractor will remove and dispose of all ACM regulated by EPA under NESHAP.

Per the Action Memorandum, **demolition** activities were to be as specified in the Work Plan as summarized below.

1. Demolish building superstructure.

2. Remove the building floor slab.

3. Remove the foundation, down to at least two feet below grade. Foundation removal must include at least two feet below the bottom of sump linings.

4. Remove inactive drain lines and underground piping, down to two feet below grade.

5. Remove contaminated soil below hot laundry area. Analytical soil results from location SCR231 showed elevated levels of plutonium-238 and thorium-232.

1.4 Chronological Narrative of the Removal Action

The following is a chronological narrative of events surrounding the H Building removal action, following the submittal of the H Building Structure OSC Report. (Refer to Appendix F for a chronological narrative of the initial portions of the project.)

Timeframe	Activity
January 2004	Structure OSC Report generated.
November 2003 August 2004	H Building contaminated soil removal action activities, and verification sampling and analysis.
August 2004	Soil OSC Report generated.

2.0 EFFECTIVENESS OF THE REMOVAL ACTION

The H Building removal action is complete, and the objectives of the Action Memorandum have been met. Results of verification sampling and analysis are provided in Appendix C, and photographs of the site following backfill are provided in Appendix E.

Because of ongoing structure demolitions and removal actions in the vicinity of the former H Building location, final seeding of the area was postponed. Prior to parcel transfer the site will be cleared, graded, and seeded (as needed). Site restoration will be documented in an addendum to this OSC Report.

2.1 Actions Taken by Site Contractor

CH2M Hill Mound, Inc. personnel planned and performed removal action oversight; slab, foundation, and piping removal; onsite transportation and staging of debris and soil to the designated onsite soil staging area; verification sampling; and site restoration. The project met the removal action objectives (Section 1.3), as outlined in the Action Memorandum (Final, dated August 2003). CH2M Hill Mound, Inc. personnel prepared this OSC Report, which shows that the Removal Action objectives were achieved.

2.2 Actions Taken by Local, State, and Federal Agencies

The Department of Energy (DOE)/MCP, the United States Environmental Protection Agency (USEPA), and Ohio EPA (OEPA) had oversight responsibility for the removal action. The DOE/MCP was the lead agency for the RA and provided the funding and oversight for the RA. The USEPA and OEPA had oversight responsibility for the RA and review of the Action Memorandum and OSC Reports to ensure that the objectives are/were met.

2.3 Actions Taken by Subcontractors

Subcontractors involved in the project included:

- General Engineering Laboratory of Ohio - performed offsite soil analyses.
- Envirocare - radiologically contaminated waste for disposal at Envirocare via rail transport.
- Stoney Hollow Landfill - debris that met surface release criteria for disposal at Stoney Hollow Landfill.

3.0 DIFFICULTIES ENCOUNTERED

3.1 Items that Affect the Removal Action

No difficulties were encountered that affected the removal action.

3.2 Issues of Intergovernmental Coordination

All DOE/USEPA/OEPA interactions were good. The agencies were updated informally on a regular basis, and formally at monthly Core Team meetings. The Mound 2000 Process worked well.

4.0 RECOMMENDATIONS

4.1 Means to Prevent a Recurrence

The contaminated slab, piping, and soil was removed and properly disposed of per the Core Team-approved work plan; therefore, the spread of contamination is prevented. Recurrence will be prevented because the sources of the contamination (the building processes) have ceased and the building has been removed. This area will be transferred from federal to private ownership. All State and Federal disposal rules will apply.

APPENDIX A

FIGURES

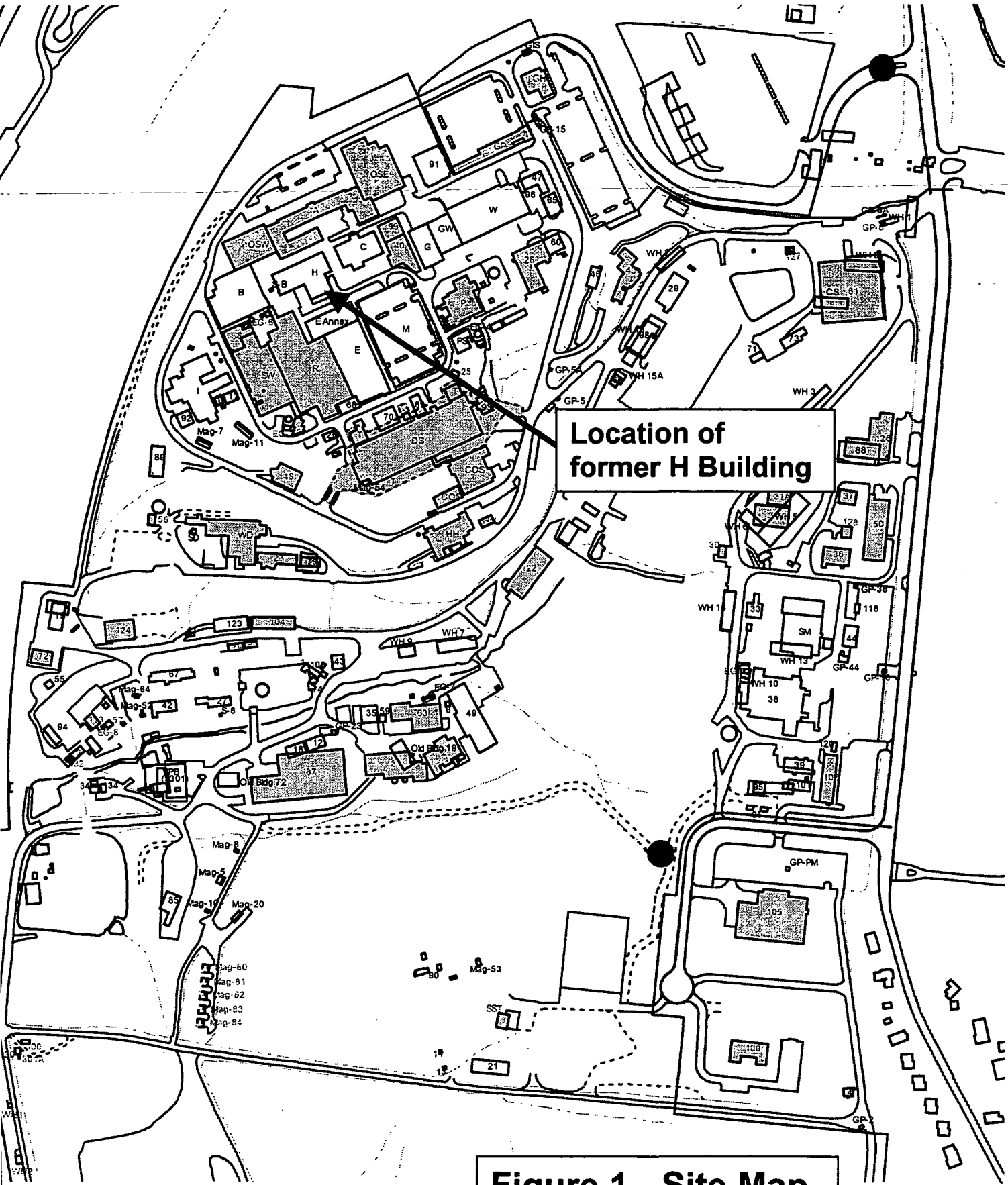

Figure 1 - Site Map

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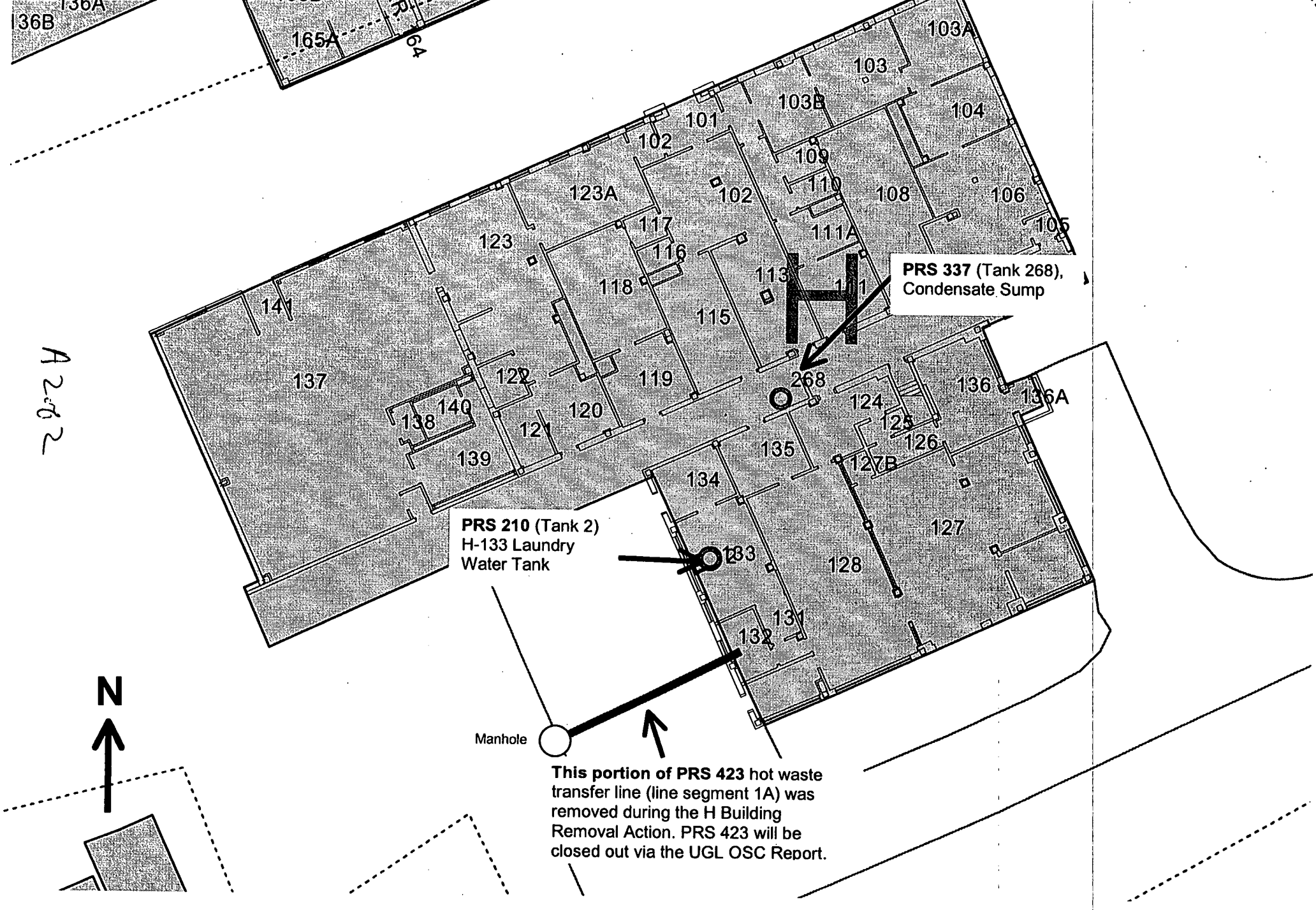

Figure 2: Location of PRSs 210, 337, and 423

APPENDIX B

TABLES

Table 1: PRSs Associated with the H Building Removal Action

PRSs	Description	Disposition
210	Room H-133 Laundry Water Tank (Tank 2)	The tank had been removed in 1998, and the tank liner was removed with the H Building slab demolition. This PRS is closed out via this OSC Report.
337	H Building Condensate Sump (Tank 268)	The condensate sump was removed with the H Building slab demolition. This PRS is closed out via this OSC Report.
423	Hot Waste Line – Segment 1A	A portion of PRS 423 (up to the first manhole) was removed with the H Building demolition activities. The PRS will be closed out via the UGL OSC Report.

Table 2: Organization of the Removal Action

Agency or Party Involved	Contact	Description of Participation
US EPA (SR-6J) 77 W. Jackson Chicago, IL 60604 312-886-7058	David Seely	Federal agency responsible for MCP oversight.
Ohio EPA 410 E. Fifth Street Dayton, OH 45402-2911 937-285-6468	Brian Nickel	State agency responsible for MCP oversight.
DOE/ MCP P.O. Box 66 1 Mound Road Miamisburg, OH 45343-0066 937-847-8350, ext. 304	Frank Schmaltz	DOE/ MCP Project Manager responsible for project oversight and success.
CH2M Hill Mound, Inc. SMPP-TFV Project P.O. Box 3030 1 Mound Road Miamisburg, OH 45343-3030 937-608-8007	Chris Watson	Provided the DOE/ MCP Project Manager with technical assistance, administrative support, sampling, decontamination, photo and site documentation, site safety, and report preparation.

Table 3: Materials and Disposition

From the structure portion of the project (Appendix F):

Type of Material	Quantity	Disposal Method	Disposal Location
Radioactive Waste	1,473 cubic yds	Rail	Envirocare
Asbestos Abatement* (debris)	40 cubic yds	Landfill	Stoney Hollow
Construction Debris* (concrete and rebar)	3,740 cubic yds	Landfill	Stoney Hollow

From the slab/soil portion of the project (main document):

Type of Material	Quantity	Disposal Method	Disposal Location
Radioactive Waste	843.7 cubic yds	Rail	Envirocare
Construction Debris* (concrete and rebar)	385 cubic yds**	Landfill	Stoney Hollow

* Debris met surface release criteria.
** Debris temporarily staged onsite; slated for shipment to Stoney Hollow Landfill.

Table 4: H Building Removal Costs

Item	Cost
Work Planning	$55,000
Facility Prep	$179,118
Rad Support and Decon	$155,000
Structure Demolition	$56,823
Soil Removal Activities/Site Restoration/ Waste Shipping & Disposal	$90,177
Total	**$536,118**

APPENDIX C

H BUILDING VSAP DATA REPORT

H Building VSAP

Includes PRS 210, 337, and a portion of 423

DATA REPORT

August 23, 2004

Prepared By:	Roderick C. Case	/	**Date:**	8/23/04
Reviewed By:	Robert Coblentz	/	**Date:**	8/23/04
Approved By:	Dave Rakel	/	**Date:**	8/23/04

Department of Energy
Miamisburg Closure Project

CH2MHILL

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Attachments

RSDS # 04-TF-0162

Data Review and Validation Reports

GroupWise message from John Gill to Robert Ransbottom

GroupWise message from John Lyons to Robert Ransbottom

Acronyms

COC	contaminant of concern
CO	Cleanup objective
DQO	Data Quality Objective
MEIMS	Mound Environmental Information Management System
OEPA	Ohio Environmental Protection Agency
PCI/G	Picocuries Per Gram

PRS	Potential Release Site
QC	quality control
RRE	residual risk evaluation
RSDS	Radiological Survey Data Sheet
USEPA	United States Environmental Protection Agency
VSAP	Verification Sampling and Analysis Plan

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1.0 Historical Overview

Building H was demolished in the Fall of 2003 in accordance with Miamisburg Closure Project goals. The section north of the building corridor (Change House) was surveyed and released for clean demolition in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (Reference 1). The section south of the corridor (Laundry) was demolished as low level waste. The Penthouse filterbank area and contaminated ventilation and drain systems were segregated and disposed of as low level waste. The remaining debris from the penthouse and corridor areas was surveyed and disposed of in accordance with MD80036, *Radiological Operations Procedures*, Operation 10011, *Debris Pile, Rolloff, and RMMA Deposting Surveys.*

2.0 Survey Objectives

The objective of this Verification Sampling and Analysis Plan (VSAP) was to determine whether residual contamination is present above the cleanup objective (CO) in the remaining soils within the building footprint because of the operation or demolition of this facility. This was accomplished by performing a walkover survey of the entire survey unit and performing isotopic analysis on soil samples collected at biased and systematically placed locations. Biased samples were obtained at locations of elevated activity identified by the walkover survey and at other areas of interest as specified in the VSAP.

To demonstrate compliance with cleanup objectives, the contribution of each radiological contaminant of concern in the survey unit was considered individually and as a whole. Systematically placed sample results were averaged and compared to the cleanup objectives for each contaminant of concern (COC) specified in the HVSAP. Biased sample results were compared directly to the cleanup objectives for each radionuclide. A 95% Upper Confidence Limit (UCL) calculation was performed for any COC that exceeds its cleanup objective.

2.1 Survey Design

The VSAP was designed to evaluate the surface soils at the base of the excavation left by the demolition of H Building. The affected area was the Building H footprint including a 5' perimeter and the hot waste pipe trench up to the access manhole approximately 26' to the west of Building H. Also included are those areas identified as potential release site (PRS) 210, PRS 337, SCR 231, and a portion of PRS 423. This area as shown in Figure 1 is approximately 17,334 square feet and is classified as a single Class 1 survey unit in accordance with Reference 1.

The number of sample points required to satisfy the nonparametric statistical test was determined to be 17 in accordance with the MARSSIM. However, since the field instrument for the detection of low energy radiation (FIDLER) scan sensitivity for Pu-238 is less than the hot spot criteria (165pCi/g) an area multiplier was used to calculate a smaller grid spacing to ensure compliance as described in the VSAP. The result was a triangular pattern with 17ft spacing and a distance between rows of 15ft yielding 70 data points.

2.2 Survey Data

A walkover survey was performed over 100% of the survey unit using a FIDLER probe in accordance with the VSAP. Three locations were observed to be above background (RSDS# 04-TF-0162, Attachment 1). Biased soil samples taken at each of these locations (HVB-008,

C40050

04-TF-0162, Attachment 1). Biased soil samples taken at each of these locations (HVB-008, HVB-009, HVB-010) were found to be less than the CO. Three biased soil samples were taken in the hot waste line trench excavation in accordance with the VSAP (HVB-005, HVB-006, HVB-007). Samples HVB-006 and HVB-007 were less than the CO for all nuclides. Sample HVB-005 showed Th-228 in excess of the cleanup objective. The Th-228 result (3.34 pCi/g) is 2.54 pCi/g greater than Th-232 (0.80 pCi/g). Th-232 decays to Th-228 and reaches equilibrium in approximately 30 years. The risk from the Th-228 that is equal to (in secular equilibrium with) Th-232 has already been accounted for in the derivation of the CO for Th-232 (+Daughters). It is the excess (2.54 pCi/g) that should be compared to the Th-228 CO (2.6 pCi/g).[1] A 95% UCL evaluation was performed for Th-228 and the result is 0.67 pCi/g and is shown in Table 1.

Per the Work Plan, one bucket of soil was removed from historic location SCR 231. The location was subsequently verified by taking four biased samples at and around SCR 231 in accordance with the VSAP (HVB001, HVB-002, HVB-003, HVB-004). Sample HVB-003 Pb-210 result is reported at the analysis LDL of 8.84 pCi/g, which is above the CO (7.4 pCi/g), but less than the Hot Spot criteria (19.8 pCi/g). A 95% UCL was not performed on these data since it did not meet the requirements to perform the test.[2] (The data did not meet the requirements for a 95% UCL calculation because the calculation must be performed using a measured value and the lead-210 sample result was not a measured value but was the measurement system's LDL for lead-210, which is a Non-Detect). The average concentration of Pb-210 associated with SCR 231 is 5.74 ±3.5 pCi/g and the average Pb-210 in the survey unit is 3.99 ±0.42 pCi/g. The results for the remaining COCs were less than the cleanup objective for each COC. Biased sample locations are shown on Figure 1. Individual sample results are given in Table 2. No soil removal beyond that specified in the Work Plan was indicated or performed.

Seventy (70) systematically placed soil samples were taken in accordance with the VSAP (HVS-001 through HVS-070). Since none of the systematic sample results was greater than the cleanup objectives, the Sign test was not required to demonstrate compliance. Sample results that are less than the analysis lower limit of detection (LDL) are considered to be at the LDL. Systematic sample locations are shown on Figure 1. Individual sample results are given in Table 2. A graphical representation of the sample results is shown in Figure 2.

The H Building VSAP included a requirement for the data to pass a sum of ratios (SOR) calculation. However, it was subsequently determined that due to statistical limitations (comparatively high background levels vs. Cleanup Objective, and the existence of multiple COCs) even if the soil were remediated to soil background levels, the data could not pass that statistical calculation. As expected, the SOR calculations for the data do not meet the requirements specified in the H Building VSAP. This information was brought to the Core Team's attention, and with Core Team concurrence, it was decided to deviate from the VSAP and remove the requirement for the data to pass the SOR calculation. In lieu of this, it was decided to use the 95% UCL calculation as the statistical test to confirm the Survey Unit met the Cleanup Objectives. The H Building data passed the 95% UCL calculation.

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[1] GroupWise from John Gill to Robert Ransbottom, 8/5/04

[2] GroupWise from John Lyons to Robert Ransbottom, 8/5/04

2.3 Quality Control

Analytical data assessment can be performed on two quality control levels. Data Review involves an assessment of the quality controls used by the laboratory during the performance of the analysis. These include such things as laboratory blanks, system monitoring compound (surrogate) recoveries, matrix spikes, etc. Which controls are assessed and what criteria are applied depend on the analysis performed. The results of field quality control measures such as field duplicates and trip blanks may also be evaluated. Data Review is normally performed on 100% of the analytical data.

Data Validation is a much more detailed review of the entire laboratory data package. It includes all the elements of the Data Review plus verification of such things as proper instrument calibration, proper use of standards and correct performance of data calculations. Data Validation is used to identify systemic problems with the way the laboratory performs and reports analyses. Data validation was performed on Laboratory Sample Delivery Group (LSDG) 116057 and includes 14 samples (17.5%).

All sample data were found to be acceptable. Data Review and Validation Assessments for each COC are included as an attachment to this report.

2.4 Conclusion

The objective of this VSAP was to determine whether residual contamination is present above the cleanup objective in the remaining soils within the building footprint as a result of the operation or demolition of this facility. The data presented in this report has been recorded in the Mound Environmental Information Management System (MEIMS). The data as presented supports the conclusion that the COs have been met for each COC in the survey unit.

3.0 References

1. NUREG 1575, Rev 1, Aug 2000, *Multi-Agency Radiation Survey and Site Investigation Manual*, (MARSSIM)

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TABLES

Project Code	Sample Id	Station	CAS Name	CAS Number	Results	ln(Results)	Units
HBLDGVSAP	HVS-001	HVS-001	14274-82-9	Thorium-228	0.737000	-0.3052	PCI/G
HBLDGVSAP	HVS-002	HVS-002	14274-82-9	Thorium-228	0.656000	-0.4216	PCI/G
HBLDGVSAP	HVS-003	HVS-003	14274-82-9	Thorium-228	0.587000	-0.5327	PCI/G
HBLDGVSAP	HVS-004	HVS-004	14274-82-9	Thorium-228	0.444000	-0.8119	PCI/G
HBLDGVSAP	HVS-005	HVS-005	14274-82-9	Thorium-228	0.435000	-0.8324	PCI/G
HBLDGVSAP	HVS-006	HVS-006	14274-82-9	Thorium-228	0.684000	-0.3798	PCI/G
HBLDGVSAP	HVS-007	HVS-007	14274-82-9	Thorium-228	0.562000	-0.5763	PCI/G
HBLDGVSAP	HVS-008	HVS-008	14274-82-9	Thorium-228	0.551000	-0.5960	PCI/G
HBLDGVSAP	HVS-009	HVS-009	14274-82-9	Thorium-228	0.793000	-0.2319	PCI/G
HBLDGVSAP	HVS-010	HVS-010	14274-82-9	Thorium-228	0.657000	-0.4201	PCI/G
HBLDGVSAP	HVS-011	HVS-011	14274-82-9	Thorium-228	0.441000	-0.8187	PCI/G
HBLDGVSAP	HVS-012	HVS-012	14274-82-9	Thorium-228	0.643000	-0.4416	PCI/G
HBLDGVSAP	HVS-013	HVS-013	14274-82-9	Thorium-228	0.539000	-0.6180	PCI/G
HBLDGVSAP	HVS-014	HVS-014	14274-82-9	Thorium-228	0.627000	-0.4668	PCI/G
HBLDGVSAP	HVS-015	HVS-015	14274-82-9	Thorium-228	0.583000	-0.5396	PCI/G
HBLDGVSAP	HVS-016	HVS-016	14274-82-9	Thorium-228	0.714000	-0.3369	PCI/G
HBLDGVSAP	HVS-018	HVS-018	14274-82-9	Thorium-228	0.743000	-0.2971	PCI/G
HBLDGVSAP	HVS-019	HVS-019	14274-82-9	Thorium-228	0.782000	-0.2459	PCI/G
HBLDGVSAP	HVS-020	HVS-020	14274-82-9	Thorium-228	0.941000	-0.0608	PCI/G
HBLDGVSAP	HVS-021	HVS-021	14274-82-9	Thorium-228	0.833000	-0.1827	PCI/G
HBLDGVSAP	HVS-022	HVS-022	14274-82-9	Thorium-228	0.518000	-0.6578	PCI/G
HBLDGVSAP	HVS-023	HVS-023	14274-82-9	Thorium-228	0.579000	-0.5465	PCI/G
HBLDGVSAP	HVS-024	HVS-024	14274-82-9	Thorium-228	0.514000	-0.6655	PCI/G
HBLDGVSAP	HVS-025	HVS-025	14274-82-9	Thorium-228	0.499000	-0.6951	PCI/G
HBLDGVSAP	HVS-026	HVS-026	14274-82-9	Thorium-228	0.786000	-0.2408	PCI/G
HBLDGVSAP	HVS-028	HVS-028	14274-82-9	Thorium-228	0.606000	-0.5009	PCI/G
HBLDGVSAP	HVS-029	HVS-029	14274-82-9	Thorium-228	0.591000	-0.5259	PCI/G
HBLDGVSAP	HVS-030	HVS-030	14274-82-9	Thorium-228	0.456000	-0.7853	PCI/G
HBLDGVSAP	HVS-031	HVS-031	14274-82-9	Thorium-228	0.454000	-0.7897	PCI/G
HBLDGVSAP	HVS-032	HVS-032	14274-82-9	Thorium-228	0.692000	-0.3682	PCI/G
HBLDGVSAP	HVS-033	HVS-033	14274-82-9	Thorium-228	0.514000	-0.6655	PCI/G
HBLDGVSAP	HVS-034	HVS-034	14274-82-9	Thorium-228	0.614000	-0.4878	PCI/G
HBLDGVSAP	HVS-035	HVS-035	14274-82-9	Thorium-228	0.392000	-0.9365	PCI/G
HBLDGVSAP	HVS-036	HVS-036	14274-82-9	Thorium-228	0.392000	-0.9365	PCI/G

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Project Code	Sample Id	Station	CAS Name	CAS Number	Results	ln(Results)	Units
HBLDGVSAP	HVS-037	HVS-037	14274-82-9	Thorium-228	0.631000	-0.4604	PCI/G
HBLDGVSAP	HVS-038	HVS-038	14274-82-9	Thorium-228	0.728000	-0.3175	PCI/G
HBLDGVSAP	HVS-039	HVS-039	14274-82-9	Thorium-228	0.447000	-0.8052	PCI/G
HBLDGVSAP	HVS-040	HVS-040	14274-82-9	Thorium-228	1.070000	0.0677	PCI/G
HBLDGVSAP	HVS-041	HVS-041	14274-82-9	Thorium-228	0.653000	-0.4262	PCI/G
HBLDGVSAP	HVS-042	HVS-042	14274-82-9	Thorium-228	0.524000	-0.6463	PCI/G
HBLDGVSAP	HVS-043	HVS-043	14274-82-9	Thorium-228	0.573000	-0.5569	PCI/G
HBLDGVSAP	HVS-044	HVS-044	14274-82-9	Thorium-228	0.455000	-0.7875	PCI/G
HBLDGVSAP	HVS-045	HVS-045	14274-82-9	Thorium-228	0.573000	-0.5569	PCI/G
HBLDGVSAP	HVS-046	HVS-046	14274-82-9	Thorium-228	0.423000	-0.8604	PCI/G
HBLDGVSAP	HVS-047	HVS-047	14274-82-9	Thorium-228	0.834000	-0.1815	PCI/G
HBLDGVSAP	HVS-048	HVS-048	14274-82-9	Thorium-228	0.569000	-0.5639	PCI/G
HBLDGVSAP	HVS-049	HVS-049	14274-82-9	Thorium-228	0.567000	-0.5674	PCI/G
HBLDGVSAP	HVS-050	HVS-050	14274-82-9	Thorium-228	0.312000	-1.1648	PCI/G
HBLDGVSAP	HVS-051	HVS-051	14274-82-9	Thorium-228	0.590000	-0.5276	PCI/G
HBLDGVSAP	HVS-052	HVS-052	14274-82-9	Thorium-228	0.771000	-0.2601	PCI/G
HBLDGVSAP	HVS-053	HVS-053	14274-82-9	Thorium-228	0.866000	-0.1439	PCI/G
HBLDGVSAP	HVS-055	HVS-055	14274-82-9	Thorium-228	0.426000	-0.8533	PCI/G
HBLDGVSAP	HVS-057	HVS-057	14274-82-9	Thorium-228	0.721000	-0.3271	PCI/G
HBLDGVSAP	HVS-059	HVS-059	14274-82-9	Thorium-228	0.517000	-0.6597	PCI/G
HBLDGVSAP	HVS-061	HVS-061	14274-82-9	Thorium-228	0.632000	-0.4589	PCI/G
HBLDGVSAP	HVS-062	HVS-062	14274-82-9	Thorium-228	0.304000	-1.1907	PCI/G
HBLDGVSAP	HVS-063	HVS-063	14274-82-9	Thorium-228	0.615000	-0.4861	PCI/G
HBLDGVSAP	HVS-064	HVS-064	14274-82-9	Thorium-228	0.540000	-0.6162	PCI/G
HBLDGVSAP	HVS-066	HVS-066	14274-82-9	Thorium-228	0.730000	-0.3147	PCI/G
HBLDGVSAP	HVS-069	HVS-069	14274-82-9	Thorium-228	0.552000	-0.5942	PCI/G
HBLDGVSAP	HVS-070	HVS-070	14274-82-9	Thorium-228	0.667000	-0.4050	PCI/G
HBLDGVSAP	HVB-001	HVB_001	14274-82-9	Thorium-228	0.495000	-0.7032	PCI/G
HBLDGVSAP	HVB-002	HVB_002	14274-82-9	Thorium-228	0.698000	-0.3595	PCI/G
HBLDGVSAP	HVB-003	HVB_003	14274-82-9	Thorium-228	0.728000	-0.3175	PCI/G
HBLDGVSAP	HVB-004	HVB_004	14274-82-9	Thorium-228	0.530000	-0.6349	PCI/G
HBLDGVSAP	HVB-006	HVB_006	14274-82-9	Thorium-228	1.320000	0.2776	PCI/G
HBLDGVSAP	HVB-007	HVB_007	14274-82-9	Thorium-228	0.803000	-0.2194	PCI/G
HBLDGVSAP	HVB-008	HVB_008	14274-82-9	Thorium-228	0.342000	-1.0729	PCI/G

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Project Code	Sample Id	Station	CAS Name	CAS Number	Results	ln(Results)	Units
HBLDGVSAP	HVB-009	HVB_009	14274-82-9	Thorium-228	0.495000	-0.7032	PCI/G
HBLDGVSAP	HVB-010	HVB_010	14274-82-9	Thorium-228	0.616000	-0.4845	PCI/G
HBLDGVSAP	HVB-005	HVB_005	14274-82-9	Thorium-228	3.340000	1.2060	PCI/G
HBLDGVSAP	HVS-017	HVS-017	14274-82-9	Thorium-228	0.556000	-0.5870	PCI/G
HBLDGVSAP	HVS-027	HVS-027	14274-82-9	Thorium-228	0.342000	-1.0729	PCI/G
HBLDGVSAP	HVS-054	HVS-054	14274-82-9	Thorium-228	0.428000	-0.8486	PCI/G
HBLDGVSAP	HVS-056	HVS-056	14274-82-9	Thorium-228	0.354000	-1.0385	PCI/G
HBLDGVSAP	HVS-058	HVS-058	14274-82-9	Thorium-228	0.196000	-1.6296	PCI/G
HBLDGVSAP	HVS-060	HVS-060	14274-82-9	Thorium-228	0.559000	-0.5816	PCI/G
HBLDGVSAP	HVS-065	HVS-065	14274-82-9	Thorium-228	1.050000	0.0488	PCI/G
HBLDGVSAP	HVS-067	HVS-067	14274-82-9	Thorium-228	0.309000	-1.1744	PCI/G
HBLDGVSAP	HVS-068	HVS-068	14274-82-9	Thorium-228	0.342000	-1.0729	PCI/G

ave	-0.54
sd	0.37
n	80
df	79
H	1.774

95% UCL	0.67	PCI/G

df	sd	H
70	0.30	1.745
	0.37	1.780
	0.40	1.794

80	0.30	1.740
	0.37	1.773
	0.40	1.787

df	sd	H
79		
	0.37	1.774

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Summary for H Building VSAP

	95 % UCL		Ave(ln)	Std Dev (ln)	n	df	Interpolated H	Max			
Thorium-228	0.67	PCI/G	-0.54	0.37	80	79	1.77	3.34	PCI/G		

Thorium-228	7.082048	PCI/G
Thorium-228+D	1.609581	PCI/G
Thorium-228 long lived decay	1.609581	PCI/G

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Table 2
Sample Results

pCi/g	Gamma Spec						Alpha Spec						LSC	Unity w/<
Sample ID	Am-241	Bi-210m	Cs-137	Co-60	Pb-210	Ra-226	Pu-238	Pu-239/240	Th-228	Th-230	Th-232	Ac-227	H-3	values
Cleanup Objective	63	8.3	3.8	0.7	7.4	2.9	55	62	2.6	2.8	2.1	4.6	2,350,000	included*
HVS-001	0.179	0.089	0.041	0.042	4.67	0.86	0.053	0.018	0.737	1.34	0.877	0.085	2.39	2.21
HVS-002	0.145	0.074	0.037	0.036	3.93	1.72	0.053	0.012	0.656	0.809	0.559	0.081	2.38	2.02
HVS-003	0.149	0.077	0.039	0.034	4.07	1.06	0.088	0.038	0.587	1.37	0.473	0.069	3.33	1.94
HVS-004	0.146	0.076	0.037	0.035	3.68	0.973	0.093	0.051	0.444	1.44	0.521	0.057	5.70	1.85
HVS-005	0.147	0.078	0.035	0.035	3.91	1.27	0.137	0.073	0.435	1.02	0.522	0.056	5.45	1.83
HVS-006	0.194	0.1	0.053	0.039	5.3	2.04	0.100	0.079	0.684	1.39	0.650	0.068	4.83	2.59
HVS-007	0.159	0.079	0.041	0.039	4.19	1.1	0.112	0.044	0.562	1.56	0.542	0.082	5.20	2.08
HVS-008	0.153	0.078	0.04	0.034	3.87	1.42	0.085	0.049	0.551	1.16	0.511	0.073	4.52	1.97
HVS-009	0.257	0.131	0.162	0.063	6.84	1.82	0.170	0.043	0.793	1.85	0.641	0.065	4.91	2.99
HVS-010	0.156	0.078	0.034	0.034	4.24	1.90	0.117	0.037	0.657	0.992	0.537	0.082	4.76	2.18
HVS-011	0.139	0.076	0.082	0.035	3.98	1.03	0.128	0.054	0.441	1.15	0.440	0.189	2.43	1.81
HVS-012	0.176	0.083	0.04	0.041	4.49	1.2	0.079	0.061	0.643	1.45	0.855	0.165	2.42	2.31
HVS-013	0.145	0.074	0.035	0.033	4.00	1.07	0.083	0.043	0.539	1.45	0.527	0.057	6.19	1.97
HVS-014	0.159	0.085	0.041	0.04	4.18	1.09	0.249	0.069	0.627	1.65	0.544	0.050	4.66	2.13
HVS-015	0.059	0.65	0.037	0.034	0.563	1.25	0.157	0.087	0.583	0.855	0.437	0.221	3.96	1.43
HVS-016	0.152	0.08	0.037	0.037	3.95	1.1	0.038	0.029	0.714	1.70	0.517	0.019	2.34	2.12
HVS-017	0.154	0.08	0.041	0.036	4.05	2.14	0.068	0.012	0.556	1.56	0.363	0.023	2.79	2.31
HVS-018	0.152	0.084	0.038	0.038	4.15	2.42	0.054	0.037	0.743	0.918	0.459	0.205	3.86	2.35
HVS-019	0.166	0.086	0.045	0.034	4.41	1.68	0.054	0.042	0.782	2.09	0.521	0.284	1.9	2.61
HVS-020	0.179	0.09	0.043	0.042	4.64	1.46	0.072	0.047	0.941	1.11	0.743	0.113	2.38	2.35
HVS-021	0.197	0.093	0.152	0.05	5.45	2.08	0.077	0.037	0.833	1.60	0.722	0.078	3.70	2.83
HVS-022	0.161	0.079	0.041	0.038	4.25	1.15	0.067	0.052	0.518	1.27	0.517	0.174	4.00	1.99
HVS-023	0.161	0.083	0.034	0.037	4.2	1.13	0.097	0.014	0.579	1.36	0.538	0.148	3.07	2.03
HVS-024	0.149	0.079	0.038	0.028	4.00	1.04	0.093	0.097	0.514	1.26	0.513	0.159	2.80	1.89
HVS-025	0.139	0.07	0.032	0.033	3.69	1.03	0.042	0.049	0.499	1.91	0.436	0.231	1.57	2.05
HVS-026	0.153	0.079	0.037	0.036	4.2	2.34	0.055	0.032	0.786	1.31	0.604	0.219	2.68	2.55
HVS-027	0.156	0.076	0.036	0.037	4.19	1.43	0.095	0.098	0.342	1.49	0.453	0.202	2.98	2.06
HVS-028	0.158	0.08	0.038	0.033	4.25	1.33	0.046	0.017	0.606	2.56	0.819	0.265	2.47	2.70
HVS-029	0.06	0.069	0.034	0.035	0.555	1.79	0.054	0.024	0.591	1.14	0.517	0.051	2.37	1.65
HVS-030	0.15	0.049	0.023	0.023	6.39	1.61	0.066	0.022	0.456	1.27	0.582	0.179	1.85	2.41
HVS-031	0.165	0.082	0.052	0.042	4.36	1.18	0.032	0.013	0.454	1.22	0.556	0.035	4.95	1.97
HVS-032	0.134	0.072	0.032	0.031	3.92	0.7	0.369	0.097	0.692	1.40	0.440	0.167	2.45	1.85
HVS-033	0.165	0.081	0.04	0.041	4.32	1.17	0.068	0.019	0.514	0.665	0.418	0.185	2.50	1.74
HVS-034	0.193	0.094	0.048	0.044	4.91	1.31	0.176	0.071	0.614	1.39	0.811	0.186	2.84	2.37
HVS-035	0.054	0.061	0.031	0.033	0.619	0.928	0.098	0.061	0.392	0.876	0.369	0.116	2.50	1.13

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pCi/g	Gamma Spec						Alpha Spec						LSC	Unity w/<
Sample ID	Am-241	Bi-210m	Cs-137	Co-60	Pb-210	Ra-226	Pu-238	Pu-239/240	Th-228	Th-230	Th-232	Ac-227	H-3	values
Cleanup Objective	63	8.3	3.8	0.7	7.4	2.9	55	62	2.6	2.8	2.1	4.6	2,350,000	included*
HVS-036	0.197	0.096	0.049	0.048	5.43	1.01	0.093	0.066	0.392	1.29	0.346	0.186	4.85	2.00
HVS-037	0.188	0.098	0.046	0.042	4.94	2.23	0.081	0.064	0.631	2.22	0.822	0.277	4.83	3.01
HVS-038	0.121	0.039	0.018	0.019	4.88	1.29	0.014	0.036	0.728	1.48	0.448	0.226	2.44	2.21
HVS-039	0.06	0.068	0.035	0.036	0.921	1.84	0.089	0.049	0.447	1.05	0.424	0.612	1.27	1.71
HVS-040	0.129	0.044	0.02	0.021	5.76	1.85	0.076	0.034	1.07	2.22	1.02	0.181	2.34	3.19
HVS-041	0.064	0.074	0.041	0.035	0.608	2.11	0.130	0.036	0.653	1.33	0.653	0.174	2.64	1.96
HVS-042	0.156	0.078	0.038	0.035	4.25	2.62	0.11	0.074	0.524	1.36	0.643	0.182	3.91	2.59
HVS-043	0.172	0.087	0.041	0.041	4.53	1.24	0.139	0.057	0.854	1.63	0.585	0.265	6.40	2.37
HVS-044	0.151	0.046	0.023	0.023	6.26	2.02	0.098	0.058	0.445	1.16	0.600	0.165	5.22	2.50
HVS-045	0.155	0.079	0.033	0.035	3.94	1.20	0.129	0.134	0.573	1.68	0.636	0.258	5.09	2.20
HVS-046	0.16	0.082	0.04	0.035	4.31	1.87	0.109	0.076	0.423	1.18	0.722	0.267	4.01	2.29
HVS-047	0.172	0.084	0.04	0.042	4.55	2.08	0.14	0.145	0.834	1.50	0.512	0.288	2.85	2.58
HVS-048	0.15	0.074	0.038	0.035	3.98	0.964	0.059	0.026	0.569	1.49	0.693	0.162	2.76	2.06
HVS-049	0.2	0.102	0.063	0.045	5.39	2.26	9.16	1.82	0.567	1.89	0.794	0.191	2.83	3.11
HVS-050	0.185	0.095	0.046	0.047	4.85	1.30	0.067	0.134	0.312	1.30	0.433	0.188	2.87	2.03
HVS-051	0.149	0.075	0.035	0.036	3.84	1.07	0.128	0.075	0.590	1.32	0.489	0.174	2.86	1.93
HVS-052	0.159	0.084	0.038	0.038	4.23	1.62	0.109	0.052	0.771	1.09	0.566	0.213	2.86	2.21
HVS-053	0.153	0.078	0.042	0.04	4.1	0.78	0.136	0.06	0.866	0.897	0.818	0.224	2.87	2.00
HVS-054	0.147	0.072	0.065	0.036	3.78	1.86	0.164	0.101	0.428	1.32	0.205	0.226	2.75	2.02
HVS-055	0.065	0.078	0.037	0.038	0.618	0.688	0.085	0.052	0.426	0.981	0.468	0.314	2.93	1.20
HVS-056	0.163	0.052	0.024	0.026	6.68	1.19	0.078	0.038	0.354	1.05	0.450	0.264	2.89	2.15
HVS-057	0.191	0.101	0.049	0.043	4.89	1.61	0.18	0.1	0.721	0.877	0.580	0.117	2.74	2.20
HVS-058	0.151	0.047	0.02	0.022	6.03	1.45	0.079	0.032	0.196	0.886	0.289	0.212	2.79	1.94
HVS-059	0.069	0.079	0.042	0.035	0.65	2.33	0.120	0.054	0.517	0.803	0.556	0.224	2.88	1.77
HVS-060	0.146	0.05	0.022	0.024	5.77	1.67	0.178	0.063	0.559	0.584	0.478	0.447	2.96	2.16
HVS-061	0.076	0.087	0.049	0.044	0.812	1.38	0.304	0.075	0.632	1.38	0.411	0.209	2.97	1.66
HVS-062	0.176	0.055	0.027	0.028	7.2	1.60	0.109	0.06	0.304	1.23	0.473	0.465	2.91	2.47
HVS-063	0.074	0.086	0.044	0.045	0.979	1.94	0.101	0.06	0.615	1.54	0.577	0.215	2.96	2.00
HVS-064	0.057	0.063	0.036	0.036	0.563	1.97	0.082	0.047	0.540	1.06	0.538	0.195	2.93	1.71
HVS-065	0.166	0.053	0.025	0.024	6.88	1.48	0.177	0.044	1.05	1.04	0.864	0.564	2.9	2.80
HVS-066	0.072	0.083	0.044	0.044	0.956	1.91	0.284	0.037	0.730	1.29	0.636	0.133	2.85	1.95

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pCi/g	Gamma Spec						Alpha Spec						LSC	Unity w/< values included
Sample ID	Am-241	Bi-210m	Cs-137	Co-60	Pb-210	Ra-226	Pu-238	Pu-239/240	Th-228	Th-230	Th-232	Ac-227	H-3	
Cleanup Objective	63	8.3	3.8	0.7	7.4	2.9	55	62	2.6	2.8	2.1	4.6	2,350,000	
HVS-067	0.15	0.049	0.023	0.025	6.06	1.94	0.311	0.043	0.309	0.954	0.477	0.223	2.99	2.28
HVS-068	0.064	0.073	0.038	0.039	0.847	1.21	0.073	0.065	0.342	1.13	0.333	0.213	2.95	1.35
HVS-069	0.162	0.054	0.024	0.023	6.76	1.80	0.069	0.033	0.552	0.924	0.475	0.272	2.76	2.41
HVS-070	0.066	0.076	0.041	0.038	0.622	1.59	0.279	0.033	0.667	1.04	0.290	0.343	2.88	1.55
MAX	0.26	0.65	0.16	0.06	7.20	2.62	9.16	1.82	1.07	2.56	1.02	0.61	6.40	3.19
MIN	0.05	0.04	0.02	0.02	0.56	0.69	0.01	0.01	0.20	0.58	0.21	0.02	1.27	1.13
AVG	0.14	0.08	0.04	0.04	3.99	1.51	0.24	0.08	0.59	1.31	0.55	0.19	3.30	2.14
Stdev	0.04	0.07	0.02	0.01	1.79	0.46	1.08	0.21	0.17	0.37	0.15	0.11	1.12	0.41
N	70	70	70	70	70	70	70	70	70	70	70	70	70	70
Confidence +/-	0.01	0.02	0.01	0.002	0.42	0.11	0.25	0.05	0.04	0.09	0.04	0.03	0.26	0.10

Note: A graphical representation of the statistical data is shown in Figure 2.

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Table 2
Sample Results

pCi/g	Gamma Spec						Alpha Spec						LSC	Unity w/< values included*
Sample ID	Am-241	Bi-210m	Cs-137	Co-60	Pb-210	Ra-226	Pu-238	Pu-239/240	Th-228	Th-230	Th-232	Ac-227	H-3	
Cleanup Objective	63	8.3	3.8	0.7	7.4	2.9	55	62	2.6	2.8	2.1	4.6	2,350,000	
Biased Sample Results														
HVB-001	0.147	0.047	0.021	0.024	6.41	1.19	0.341	0.09	0.495	1.25	0.427	0.224	3	2.22
HVB-002	0.071	0.079	0.043	0.041	0.656	1.31	0.083	0.039	0.698	1.12	0.497	0.145	3	1.56
HVB-003	0.222	0.07	0.029	0.034	8.84	2.07	0.277	0.098	0.728	1.16	0.553	0.137	3	2.97
HVB-004	0.167	0.053	0.022	0.025	7.06	1.11	0.129	0.106	0.530	1.19	0.529	0.235	3	2.32
HVB-005	0.181	0.091	0.042	0.04	4.7	1.22	39.9	1.10	3.34	1.25	0.801	0.182	3	4.03
HVB-006	0.232	0.12	0.061	0.047	6.05	2.41	6.35	0.09	1.32	1.32	0.662	0.206	3	3.21
HVB-007	0.183	0.093	0.048	0.048	4.83	1.29	0.677	0.079	0.803	1.04	0.991	0.186	3	2.40
HVB-008	0.056	0.064	0.031	0.036	0.848	1.38	0.119	0.047	0.342	0.889	0.260	0.149	3	1.27
HVB-009	0.177	0.058	0.023	0.029	7.22	1.39	0.136	0.089	0.495	0.870	0.358	0.287	3	2.25
HVB-010	0.171	0.08	0.043	0.045	4.43	1.11	0.131	0.064	0.616	1.22	0.616	0.197	3	2.08
MAX	0.232	0.12	0.061	0.048	8.84	2.41	39.9	1.1	3.34	1.32	0.991	0.287	3	4.03
MIN	0.056	0.047	0.021	0.024	0.656	1.11	0.083	0.039	0.342	0.87	0.26	0.137	3	1.27
AVG	0.1607	0.0755	0.0363	0.0369	5.1044	1.448	4.8143	0.1802	0.9367	1.1309	0.5694	0.1948	3	2.43
Stdev	0.05711	0.02198	0.01319	0.0088	2.65523	0.43606	12.4779	0.3239183	0.885268	0.15325	0.21343	0.04626	0	0.80
N	10	10	10	10	10	10	10	10	10	10	10	10	10	10.00
Confidence +/-	0.04	0.01	0.01	0.01	1.65	0.27	7.73	0.20	0.55	0.09	0.13	0.03	0.05	0.50
Field Duplicate Results														
HVB-008 FD	< 0.144	< 0.048	< 0.021	< 0.023	< 5.84	1.36	0.086	0.038	0.276	1.08	0.092	< 0.130	< 2.97	0.39
HVS-025 FD	< 0.139	< 0.070	0.088	< 0.032	< 3.86	< 0.992	< 0.056	0.037	0.715	1.45	0.488	< 0.163	< 2.28	0.47
HVS-031 FD	< 0.165	< 0.084	0.130	< 0.037	< 4.57	1.82	< 0.117	0.048	0.321	1.38	0.464	< 0.174	5.13	0.52
HVS-033 FD	< 0.162	< 0.079	< 0.036	< 0.038	< 4.25	< 1.12	0.085	< 0.051	0.513	0.823	0.402	0.058	< 2.44	0.38
HVS-046 FD	< 0.065	< 0.074	< 0.040	< 0.039	< 0.616	1.81	0.352	< 0.062	0.790	1.33	0.539	< 0.181	4.31	0.50
HVS-054 FD	< 0.146	< 0.048	< 0.022	< 0.021	< 6.42	1.35	< 0.095	< 0.069	0.328	0.953	0.289	0.136	< 2.85	0.42

*Unity is the Sum of Ratios (SOR). The term "w/ < values" indicates measured results less than the LDL are listed in the table at the LDL and included in the SOR.

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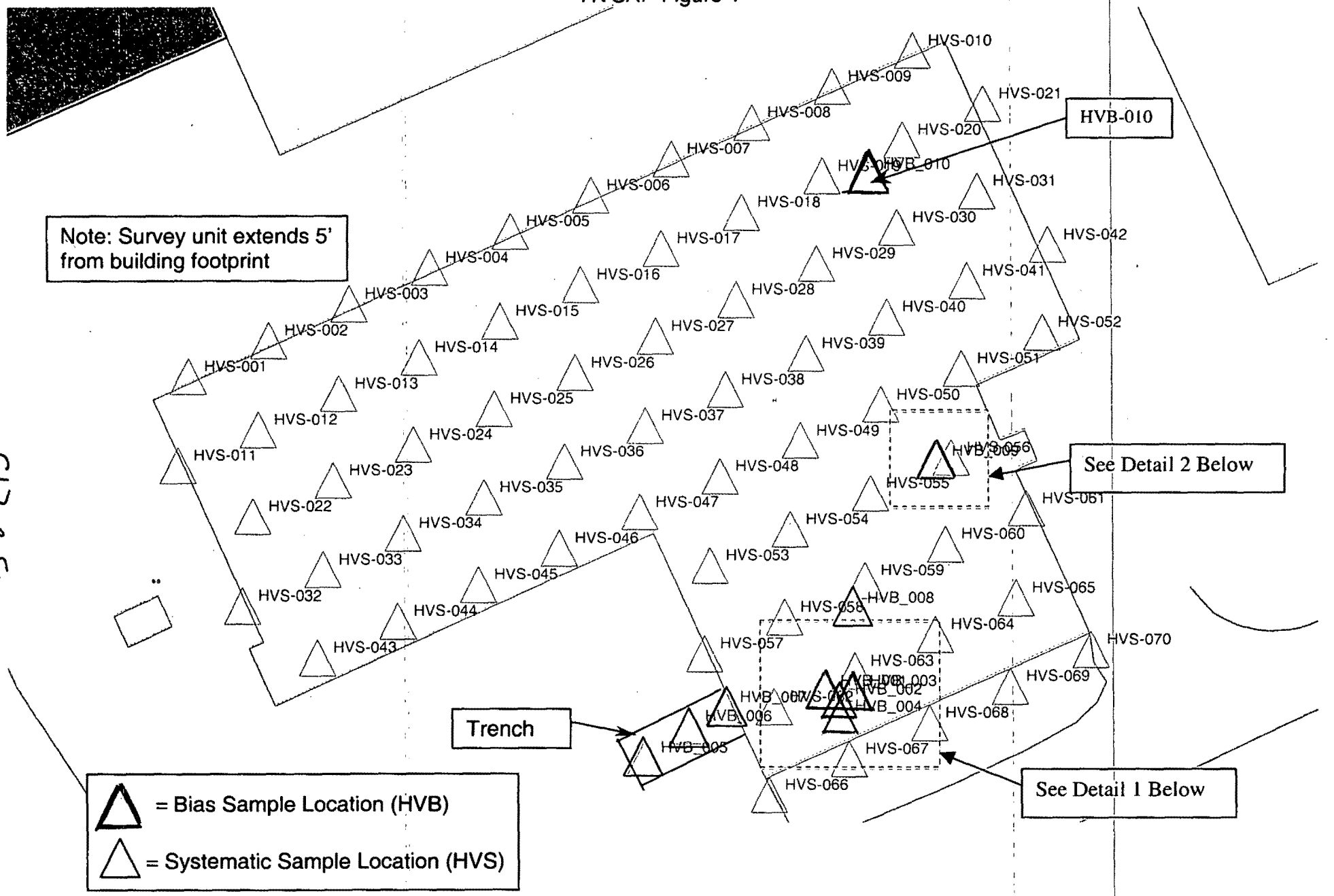
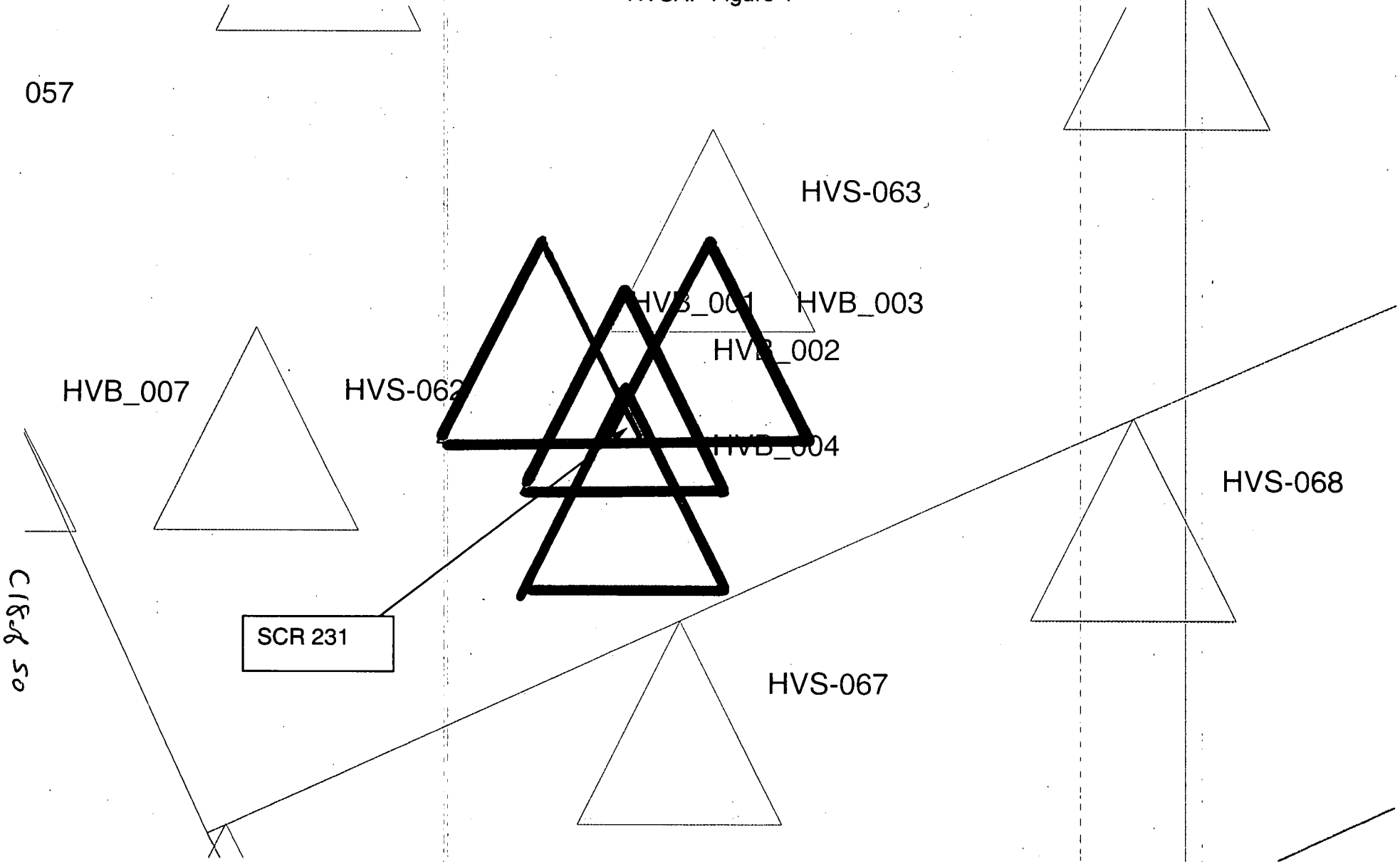
FIGURES

HVSAP Figure 1



H Building VSAP Sample Locations

057


HVS-063
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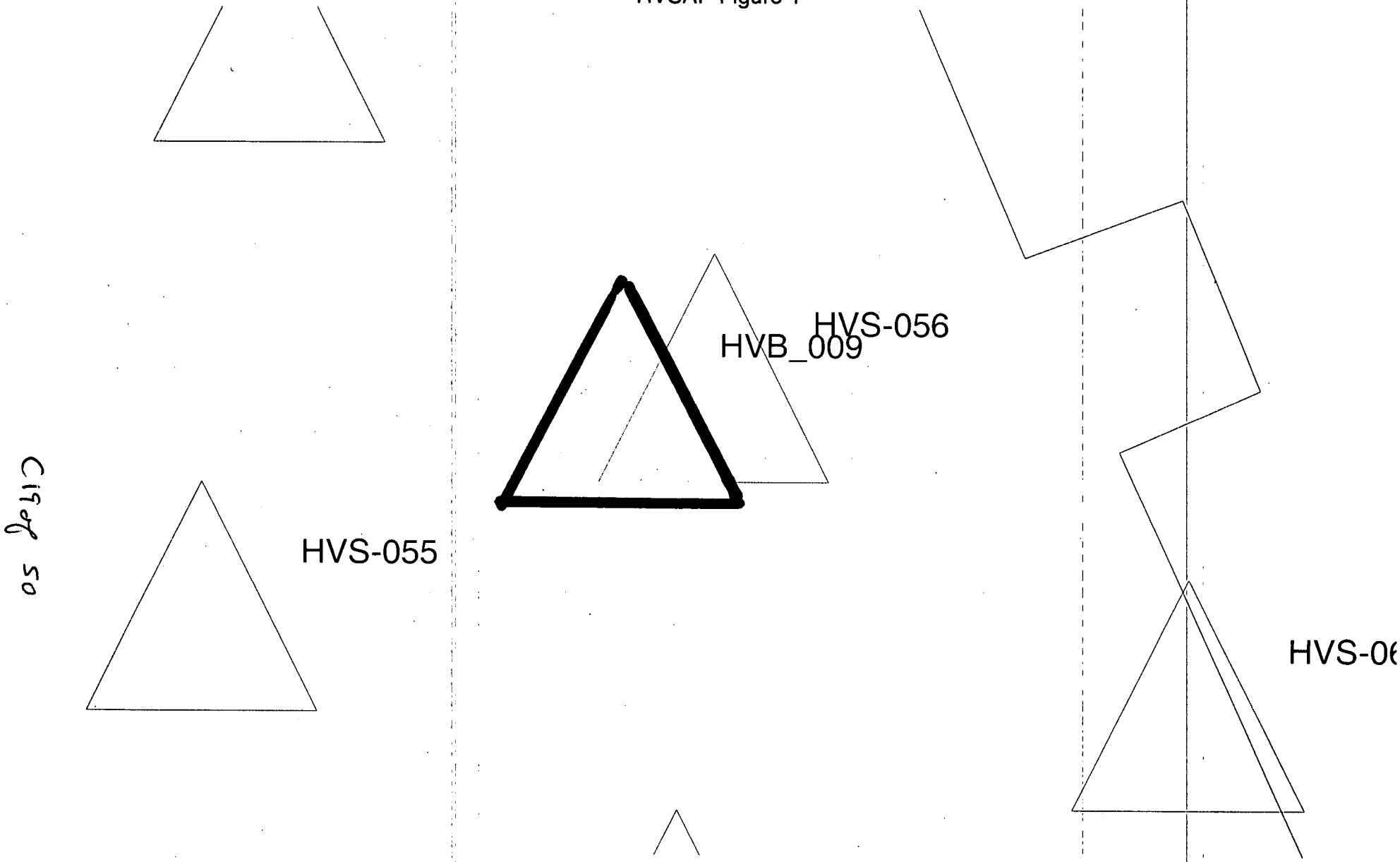
HVB_002
HVB_007
HVS-062
HVB_004
HVS-068
SCR 231
HVS-067

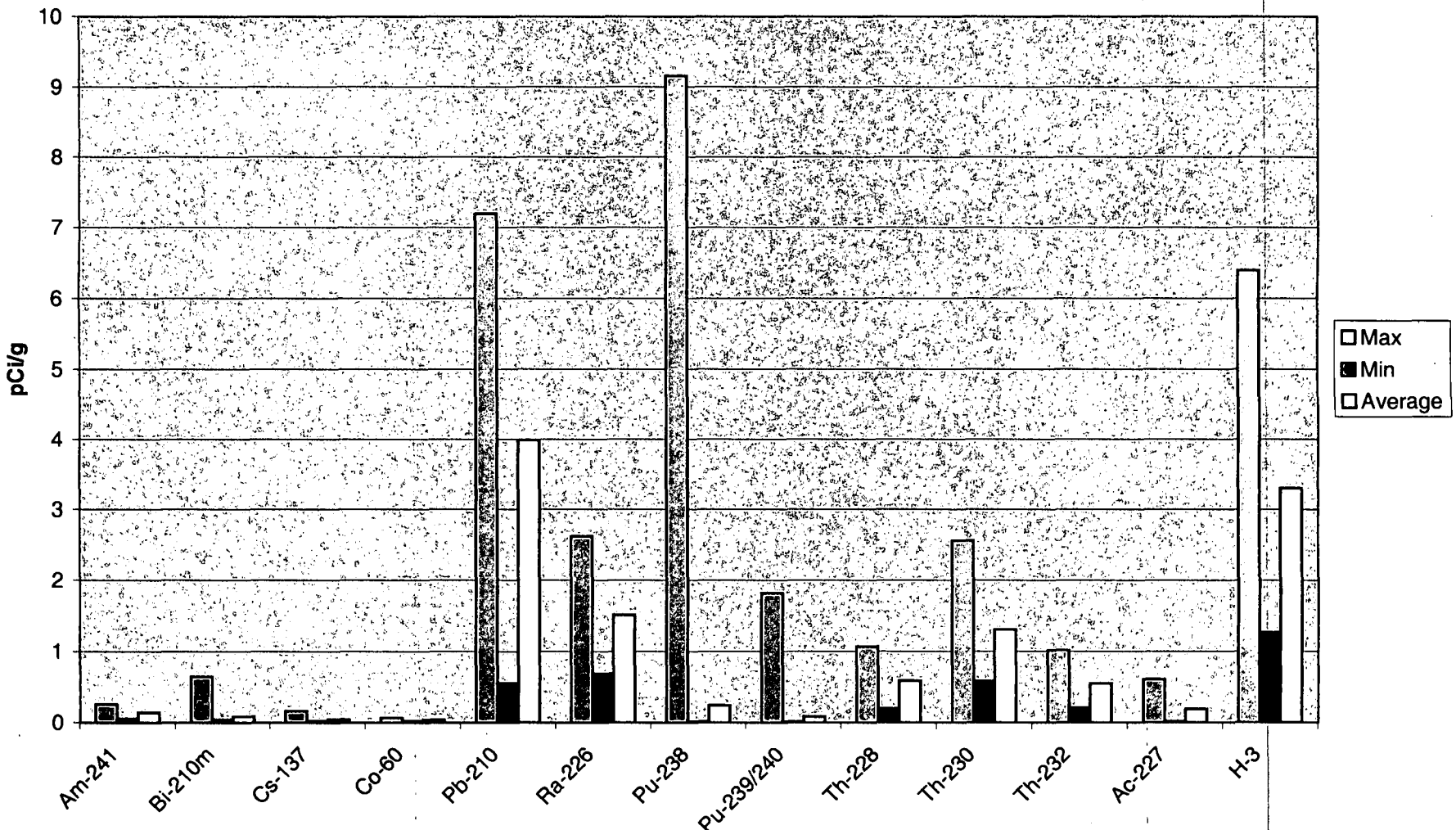
Detail 1

HVSAP Figure 1



Detail 2

HVSAP Statistical Sample Results
Figure 2



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ATTACHMENTS

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RADIOLOGICAL SURVEY DATA SHEET

LOCATION: (BLDG./AREA/ROOM) H-FOOTPRINT	SURVEY NO. 04-TF-0162
PURPOSE: H-YSAP 100% WALKOVER SCAN SURVEY	RWP NO. N/A
	DATE: 6-1-04
	TIME: 1630

MAP / DRAWING

COPY

SEE ATTACHED

*NOTE: FIDLER USED FOR INDICATION ONLY. LOCATIONS #1, #2 AND #3, WERE INDICATED AS ABOVE BACKGROUND. #4, #5 AND #6 WERE PICKED AS TRENCH SAMPLES

LEGEND:
= mrem/hr (γ) whole body
#E = mrem/hr (β+η+γ) extremity on contact
K = factor of 1000
—·—·— = radiological boundary
△# = mrem/hr neutron
(#) = swipe number
[#] = air sample number
(#/α) or /β = direct contamination measurement in dpm/100 cm²

INSTRUMENTS USED

Instrument	Serial Number	Cal. Due Date
FIDLER	5872/3964	1-14-05
	N/A	

[redacted]	HP# 6178	Date: 6-21-04
Completed by: (Pri[redacted]		
Counted by: (Signature) N/A	HP#	Date:
Counted by: (Print Name)		
Reviewed/Approv[redacted]	HP# 7452	Date: 6/28/04
Reviewed/Approved by: (Print Name) [redacted]		

ML-9620 (2-98) Computer Generated

Survey No. 04-TF-0162

RADIOLOGICAL SURVEY DATA SHEET

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments

N A

COMMENTS: #1 - FOUND ABOVE BKG ON METAL - REMOVED #2 - 2000 cpm
#3 - 1500 cpm

NOTES:
1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.
2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of results are attached, write "see attached" in column.
3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If needed, mark N/A.

ML-9620A (4-98)

JUNE 1ST

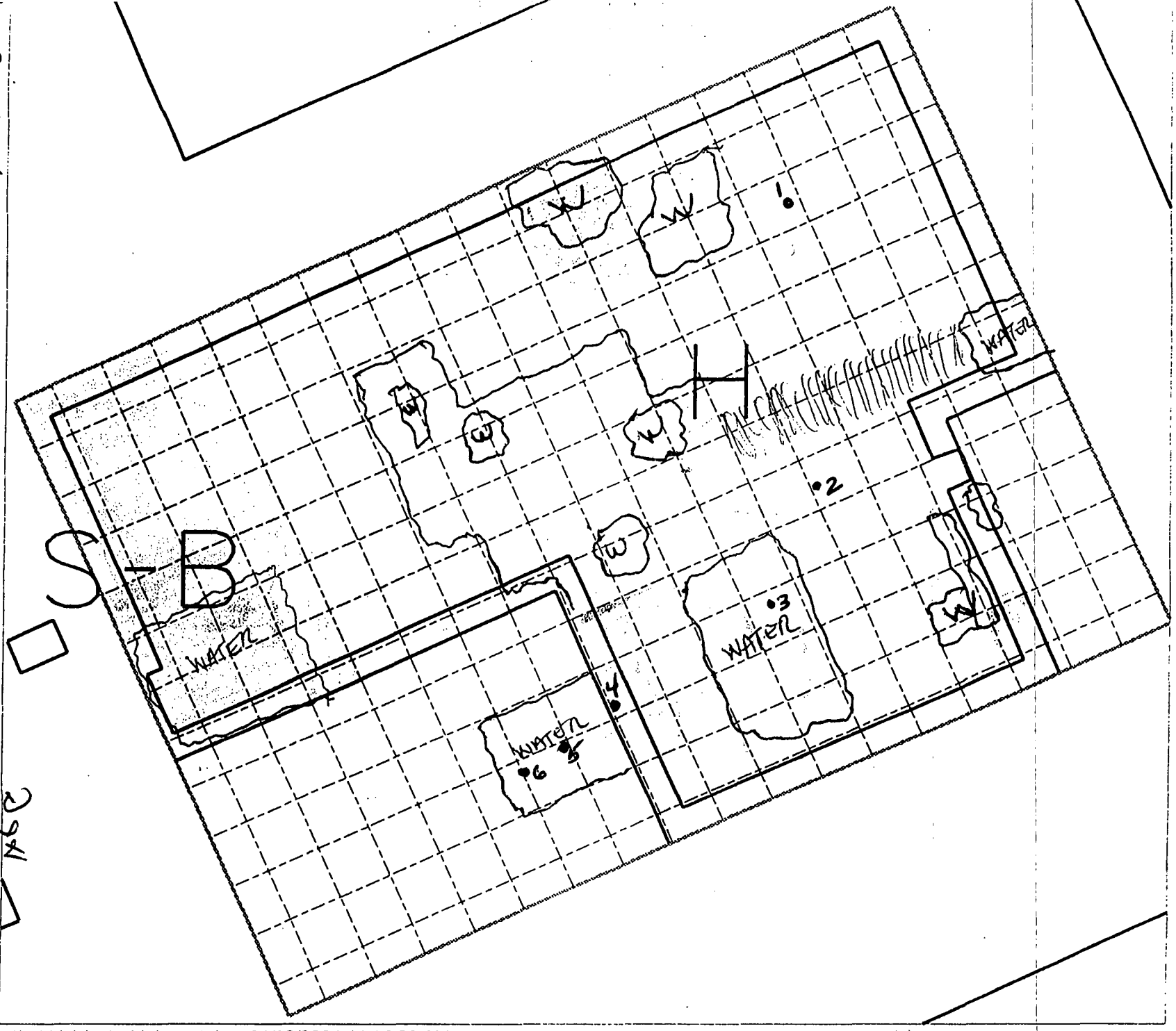
JUNE 2ND

JUNE 3RD

JUNE 7th

JUNE 8th

JUNE 9th



04-TF-0162

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1.0 Introduction

Analytical data assessment can be performed on two quality control levels. Data Review involves an assessment of the quality controls used by the laboratory during the performance of the analysis. These include such things as laboratory blanks, system monitoring compound (surrogate) recoveries, matrix spikes, etc. Which controls are assessed and what criteria are applied depend on the analysis performed. The results of field quality control measures such as field duplicates and trip blanks may also be evaluated. Data Review is normally performed on 100% of the analytical data.

Data Validation is a much more detailed review of the entire laboratory data package. It includes all the elements of the Data Review plus verification of such things as proper instrument calibration, proper use of standards and correct performance of data calculations. Data Validation is used to identify systemic problems with the way the laboratory performs and reports analyses.

2.0 Description of the Data Set

After removal of H Building a verification sampling was performed per the H Building VSAP. Surface soil samples were collected from a total of 80 locations. These include 70 grid samples, 10 bias samples. An additional 6 field duplicate samples were collected. There was no deviation from the VSAP

Samples were screened at the Mound Soil Screening Facility.

Since no equipment was field decontaminated, no equipment rinsates samples were collected.

Offsite sample analysis was performed at GEL of Ohio. There were no problems in achieving the analyte detection goals.

Table 1 Laboratory Sample Delivery Groups

LSDG	Number of Samples	Mound Sample IDs
115554	8	HVS-001, 002, 011, 012, 022, 032, 033, & 033FD
115772	20	HVS-016, 017, 018, 019, 020, 023, 024, 025, 025FD, 026, 027, 028, 029, 030, 035, 038, 039, 040, 041, & 044
115854	12	HVS-003, 004, 005, 006, 007, 008, 009, 010, 013, 014, 021, & 031
115934	22	HVS-034, 031FD, 036, 037, 042, 043, 045, 046, 046FD, 047, 048, 049, 050, 051, 052, 053, 054, 057, HVB-005, 006, 007, & 010
116057	14	HVS-055, 056, 058, 059, 060, 061, 062, 064, 065, 066, 067, 068, 069, & 070
116267	10	HVS-015, 054FD, 063, HVB-001, 002, 003, 004, 008, 008FD, & 009

3.0 Data Review

The quality control data submitted with the analytical data packages were reviewed and assessed. The results of the assessment are presented in this section. The following qualification flags are used to indicate data quality problems identified during the data review process.

Table 2 Data Review Qualifications

Flag	Description
J	Estimated sample result
U	Non-detect sample result
UJ	Estimated non-detected sample result
R	Rejected (unusable) sample result

3.1 Blanks

The laboratory analyzes one blank for every 20 samples or LSDG. Laboratory blanks are analyzed to determine if laboratory processes are contributing to the detected sample activities.

The method blanks for all LSDGs met QC criteria.

3.2 Laboratory Duplicate

A laboratory duplicate analysis is performed to assess the precision and accuracy of the laboratory analysis. One duplicate is performed for every 20 samples or LSDG.

The Relative Error Ratio of the duplicate analyses for all LSDG's was within QC criteria.

3.3 Laboratory Control Sample

The Laboratory Control Sample (LCS) is a standard sample with a known quantity of the analyte of concern. The LCS recovery is an indication of whether the analytical process was in control during the analysis.

The LCS recoveries associated with these samples were all within QC criteria.

3.4 Equipment Rinsates

Equipment rinsates are used to ensure efficacy of equipment field decontamination procedures, and that the sample collection process is not causing cross contamination. Only isotopes at background levels were found in the four equipment rinsates.

No equipment rinsates were collected.

3.5 Field Duplicates

Field Duplicates give an indication of the degree of homogeneity within the sample material. As with Laboratory duplicates they are reported as RPD.

Agreements between field duplicates were within acceptable range.

4.0 Data Validation

The results of LSDG 116057 were fully data validated. In addition to the items discussed above, the following items were evaluated:

1. Instrument calibration
2. Daily Source checks
3. Background measurement
4. Proper frequency and use of blanks
5. All calculations

No additional qualification resulted from this assessment. There was no indication of a systemic deficiency.

5.0 Certification

Based upon this review the gamma spectroscopy analysis data maybe used as presented with no further qualifications.

Table 3 H Building Foundation Gamma Spec Results (pCi/g)

Sample ID	Am-241		Bi-210m		Cs-137		Co-60		Pb-210		Ra-226	
Cleanup Goal	**63**		**8.3**		**3.8**		**0.7**		**7.4**		**2.9**	
HVB-001	< 0.147	U	< 0.047	U	< 0.021	U	< 0.024	U	< 6.41	U	1.19	
HVB-002	< 0.071	U	< 0.079	U	< 0.043	U	< 0.041	U	< 0.656	U	1.31	
HVB-003	< 0.222	U	< 0.070	U	< 0.029	U	< 0.034	U	< 8.84	U	2.07	
HVB-004	< 0.167	U	< 0.053	U	< 0.022	U	< 0.025	U	< 7.06	U	1.11	
HVB-005	< 0.181	U	< 0.091	U	< 0.042	U	< 0.040	U	< 4.70	U	< 1.22	U
HVB-006	< 0.232	U	< 0.120	U	< 0.061	U	< 0.047	U	< 6.05	U	2.41	
HVB-007	< 0.183	U	< 0.093	U	< 0.048	U	< 0.048	U	< 4.83	U	< 1.29	U
HVB-008	< 0.056	U	< 0.064	U	< 0.031	U	< 0.036	U	0.848		1.38	
HVB-008 FD	< 0.144	U	< 0.048	U	< 0.021	U	< 0.023	U	< 5.84	U	1.36	
HVB-009	< 0.177	U	< 0.058	U	< 0.023	U	< 0.029	U	< 7.22	U	1.39	
HVB-010	< 0.171	U	< 0.080	U	< 0.043	U	< 0.045	U	< 4.43	U	1.11	
HVS-001	< 0.179	U	< 0.089	U	< 0.041	U	< 0.042	U	< 4.67	U	< 0.86	U
HVS-002	< 0.145	U	< 0.074	U	< 0.037	U	< 0.036	U	< 3.93	U	1.72	
HVS-003	< 0.149	U	< 0.077	U	< 0.039	U	< 0.034	U	< 4.07	U	< 1.06	U
HVS-004	< 0.146	U	< 0.076	U	< 0.037	U	< 0.035	U	< 3.68	U	< 0.973	U
HVS-005	< 0.147	U	< 0.078	U	< 0.035	U	< 0.035	U	< 3.91	U	1.27	
HVS-006	< 0.194	U	< 0.100	U	0.053		< 0.039	U	< 5.30	U	2.04	
HVS-007	< 0.159	U	< 0.079	U	< 0.041	U	< 0.039	U	< 4.19	U	< 1.10	U
HVS-008	< 0.153	U	< 0.078	U	< 0.040	U	< 0.034	U	< 3.87	U	1.42	
HVS-009	< 0.257	U	< 0.131	U	0.162		< 0.063	U	< 6.84	U	< 1.82	U
HVS-010	< 0.156	U	< 0.078	U	< 0.034	U	< 0.034	U	< 4.24	U	1.90	
HVS-011	< 0.139	U	< 0.076	U	0.082		< 0.035	U	< 3.98	U	< 1.03	U
HVS-012	< 0.176	U	< 0.083	U	< 0.040	U	< 0.041	U	< 4.49	U	< 1.20	U
HVS-013	< 0.145	U	< 0.074	U	< 0.035	U	< 0.033	U	< 4.00	U	< 1.07	U
HVS-014	< 0.159	U	< 0.085	U	< 0.041	U	< 0.040	U	< 4.18	U	< 1.09	U
HVS-015	< 0.059	U	< 0.650	U	< 0.037	U	< 0.034	U	< 0.563	U	1.25	
HVS-016	< 0.152	U	< 0.080	U	< 0.037	U	< 0.037	U	< 3.95	U	< 1.10	U
HVS-017	< 0.154	U	< 0.080	U	< 0.041	U	< 0.036	U	< 4.05	U	2.14	
HVS-018	< 0.152	U	< 0.084	U	< 0.038	U	< 0.038	U	< 4.15	U	2.42	
HVS-019	< 0.166	U	< 0.086	U	0.045		< 0.034	U	< 4.41	U	1.68	
HVS-020	< 0.179	U	< 0.090	U	< 0.043	U	< 0.042	U	< 4.64	U	1.46	
HVS-021	< 0.197	U	< 0.093	U	0.152		< 0.050	U	< 5.45	U	2.08	

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Sample ID	Am-241		Bi-210m		Cs-137		Co-60		Pb-210		Ra-226	
Cleanup Goal	63		8.3		3.8		0.7		7.4		2.9	
HVS-022	< 0.161	U	< 0.079	U	< 0.041	U	< 0.038	U	< 4.25	U	< 1.15	U
HVS-023	< 0.161	U	< 0.083	U	< 0.034	U	< 0.037	U	< 4.20	U	1.13	
HVS-024	< 0.149	U	< 0.079	U	< 0.038	U	< 0.028	U	< 4.00	U	< 1.04	U
HVS-025	< 0.139	U	< 0.070	U	< 0.032	U	< 0.033	U	< 3.69	U	1.03	
HVS-025 FD	< 0.139	U	< 0.070	U	0.088		< 0.032	U	< 3.86	U	< 0.992	U
HVS-026	< 0.153	U	< 0.079	U	< 0.037	U	< 0.036	U	< 4.20	U	2.34	
HVS-027	< 0.156	U	< 0.076	U	< 0.036	U	< 0.037	U	< 4.19	U	1.43	
HVS-028	< 0.158	U	< 0.080	U	< 0.038	U	< 0.033	U	< 4.25	U	1.33	
HVS-029	< 0.060	U	< 0.069	U	< 0.034	U	< 0.035	U	< 0.555	U	1.79	
HVS-030	< 0.150	U	< 0.049	U	< 0.023	U	< 0.023	U	< 6.39	U	1.61	
HVS-031	< 0.165	U	< 0.082	U	0.052		< 0.042	U	< 4.36	U	< 1.18	U
HVS-031 FD	< 0.165	U	< 0.084	U	0.130		< 0.037	U	< 4.57	U	1.82	
HVS-032	< 0.134	U	< 0.072	U	< 0.032	U	< 0.031	U	< 3.92	U	< 0.700	U
HVS-033	< 0.165	U	< 0.081	U	< 0.040	U	< 0.041	U	< 4.32	U	< 1.17	U
HVS-033 FD	< 0.162	U	< 0.079	U	< 0.036	U	< 0.038	U	< 4.25	U	< 1.12	U
HVS-034	< 0.193	U	< 0.094	U	< 0.048	U	< 0.044	U	< 4.91	U	< 1.31	U
HVS-035	< 0.054	U	< 0.061	U	< 0.031	U	< 0.033	U	0.619		0.928	
HVS-036	< 0.197	U	< 0.096	U	< 0.049	U	< 0.048	U	< 5.43	U	< 1.01	U
HVS-037	< 0.188	U	< 0.098	U	< 0.046	U	< 0.042	U	< 4.94	U	2.23	
HVS-038	< 0.121	U	< 0.039	U	< 0.018	U	< 0.019	U	< 4.88	U	1.29	
HVS-039	< 0.060	U	< 0.068	U	< 0.035	U	< 0.036	U	0.921		1.84	
HVS-040	< 0.129	U	< 0.044	U	< 0.020	U	< 0.021	U	< 5.76	U	1.85	
HVS-041	< 0.064	U	< 0.074	U	< 0.041	U	< 0.035	U	< 0.608	U	2.11	
HVS-042	< 0.156	U	< 0.078	U	0.038		< 0.035	U	< 4.25	U	2.62	
HVS-043	< 0.172	U	< 0.087	U	< 0.041	U	< 0.041	U	< 4.53	U	1.24	
HVS-044	< 0.151	U	< 0.046	U	< 0.023	U	< 0.023	U	< 6.26	U	2.02	
HVS-045	< 0.155	U	< 0.079	U	< 0.033	U	< 0.035	U	< 3.94	U	1.20	
HVS-046	< 0.160	U	< 0.082	U	< 0.040	U	< 0.035	U	< 4.31	U	1.87	
HVS-046 FD	< 0.065	U	< 0.074	U	< 0.040	U	< 0.039	U	< 0.616	U	1.81	
HVS-047	< 0.172	U	< 0.084	U	< 0.040	U	< 0.042	U	< 4.55	U	2.08	
HVS-048	< 0.150	U	< 0.074	U	0.038		< 0.035	U	< 3.98	U	0.964	
HVS-049	< 0.200	U	< 0.102	U	0.063		< 0.045	U	< 5.39	U	2.26	
HVS-050	< 0.185	U	< 0.095	U	< 0.046	U	< 0.047	U	< 4.85	U	1.30	
HVS-051	< 0.149	U	< 0.075	U	< 0.035	U	< 0.036	U	< 3.84	U	< 1.07	U
HVS-052	< 0.159	U	< 0.084	U	< 0.038	U	< 0.038	U	< 4.23	U	1.62	

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Sample ID	Am-241		Bi-210m		Cs-137		Co-60		Pb-210		Ra-226	
Cleanup Goal	**63**		**8.3**		**3.8**		**0.7**		**7.4**		**2.9**	
HVS-053	< 0.153	U	< 0.078	U	< 0.042	U	< 0.040	U	< 4.10	U	< 0.780	U
HVS-054	< 0.147	U	< 0.072	U	0.065		< 0.036	U	< 3.78	U	1.86	
HVS-054 FD	< 0.146	U	< 0.048	U	< 0.022	U	< 0.021	U	< 6.42	U	1.35	
HVS-055	< 0.065	U	< 0.078	U	< 0.037	U	< 0.038	U	< 0.618	U	< 0.688	U
HVS-056	< 0.163	U	< 0.052	U	< 0.024	U	< 0.026	U	< 6.68	U	1.19	
HVS-057	< 0.191	U	< 0.101	U	< 0.049	U	< 0.043	U	< 4.89	U	1.61	
HVS-058	< 0.151	U	< 0.047	U	< 0.020	U	< 0.022	U	< 6.03	U	1.45	
HVS-059	< 0.069	U	< 0.079	U	< 0.042	U	0.035		< 0.650	U	2.33	
HVS-060	< 0.146	U	< 0.050	U	< 0.022	U	< 0.024	U	< 5.77	U	1.67	
HVS-061	< 0.076	U	< 0.087	U	< 0.049	U	< 0.044	U	0.812		1.38	
HVS-062	< 0.176	U	< 0.055	U	< 0.027	U	< 0.028	U	< 7.20	U	1.60	
HVS-063	< 0.074	U	< 0.086	U	< 0.044	U	< 0.045	U	0.979		1.94	
HVS-064	< 0.057	U	< 0.063	U	< 0.036	U	< 0.036	U	< 0.563	U	1.97	
HVS-065	< 0.166	U	< 0.053	U	< 0.025	U	< 0.024	U	< 6.88	U	1.48	
HVS-066	< 0.072	U	< 0.083	U	< 0.044	U	< 0.044	U	0.956		1.91	
HVS-067	< 0.150	U	< 0.049	U	< 0.023	U	< 0.025	U	< 6.06	U	1.94	
HVS-068	< 0.064	U	< 0.073	U	< 0.038	U	< 0.039	U	0.847		1.21	
HVS-069	< 0.162	U	< 0.054	U	< 0.024	U	< 0.023	U	< 6.76	U	1.80	
HVS-070	< 0.066	U	< 0.076	U	< 0.041	U	< 0.038	U	< 0.622	U	1.59	

A "U" qualifier signifies non-detects
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1.0 Introduction

Analytical data assessment can be performed on two quality control levels. Data Review involves an assessment of the quality controls used by the laboratory during the performance of the analysis. These include such things as laboratory blanks, system monitoring compound (surrogate) recoveries, matrix spikes, etc. Which controls are assessed and what criteria are applied depend on the analysis performed. The results of field quality control measures such as field duplicates and trip blanks may also be evaluated. Data Review is normally performed on 100% of the analytical data.

Data Validation is a much more detailed review of the entire laboratory data package. It includes all the elements of the Data Review plus verification of such things as proper instrument calibration, proper use of standards and correct performance of data calculations. Data Validation is used to identify systemic problems with the way the laboratory performs and reports analyses.

2.0 Description of the Data Set

After removal of H Building a verification sampling was performed per the H Building VSAP. Surface soil samples were collected from a total of 80 locations. These include 70 grid samples, 10 bias samples. An additional 6 field duplicate samples were collected. There was no deviation from the VSAP

Samples were screened at the Mound Soil Screening Facility.

Since no equipment was field decontaminated, no equipment rinsates samples were collected.

Offsite sample analysis was performed at GEL of Ohio. There were no problems in achieving the analyte detection goals.

Table 1 Laboratory Sample Delivery Groups

LSDG	Number of Samples	Mound Sample IDs
115554	8	HVS-001, 002, 011, 012, 022, 032, 033, & 033FD
115772	20	HVS-016, 017, 018, 019, 020, 023, 024, 025, 025FD, 026, 027, 028, 029, 030, 035, 038, 039, 040, 041, & 044
115854	12	HVS-003, 004, 005, 006, 007, 008, 009, 010, 013, 014, 021, & 031
115934	22	HVS-034, 031FD, 036, 037, 042, 043, 045, 046, 046FD, 047, 048, 049, 050, 051, 052, 053, 054, 057, HVB-005, 006, 007, & 010
116057	14	HVS-055, 056, 058, 059, 060, 061, 062, 064, 065, 066, 067, 068, 069, & 070
116267	10	HVS-015, 054FD, 063, HVB-001, 002, 003, 004, 008, 008FD, & 009

3.0 Data Review

The quality control data submitted with the analytical data packages were reviewed and assessed. The results of the assessment are presented in this section. The following qualification flags are used to indicate data quality problems identified during the data review process.

Table 2 Data Review Qualifications

Flag	Description
J	Estimated sample result
U	Non-detect sample result
UJ	Estimated non-detected sample result
R	Rejected (unusable) sample result

3.1 Blanks

The laboratory analyzes one blank for every 20 samples or LSDG. Laboratory blanks are analyzed to determine if laboratory processes are contributing to the detected sample activities.

The method blanks for all LSDGs met QC criteria.

3.2 Laboratory Duplicate

A laboratory duplicate analysis is performed to assess the precision and accuracy of the laboratory analysis. One duplicate is performed for every 20 samples or LSDG.

The Relative Error Ratio of the duplicate analyses for all LSDG's were with QC criteria.

3.3 Matrix Spike

A matrix spike (MS) analysis is performed to assess the precision and accuracy of the laboratory analysis. One matrix spike is performed for every 20 samples or LSDG. It also may indicate analysis bias due to sample matrix effects.

The matrix spike recoveries for all LSDG's were with QC criteria.

3.4 Laboratory Control Sample

The Laboratory Control Sample (LCS) is a standard sample with a known quantity of the analyte of concern. The LCS recovery is an indication of whether the analytical process was in control during the analysis.

The LCS recoveries associated with these samples were all within QC criteria.

3.5 Equipment Rinsates

Equipment rinsates are used to ensure efficacy of equipment field decontamination procedures, and that the sample collection process is not causing cross contamination. Only isotopes at background levels were found in the four equipment rinsates.

No equipment rinsates were collected.

3.6 Field Duplicates

Field Duplicates give an indication of the degree of homogeneity within the sample material. As with Laboratory duplicates they are reported as RPD.

Agreements between field duplicates were within acceptable range.

4.0 Data Validation

The results of LSDG 116057 were fully data validated. In addition to the items discussed above, the following items were evaluated:

1. Instrument calibration
2. Daily Source checks
3. Background and efficiency measurement
4. Proper frequency and use of blanks
5. All calculations

No additional qualification resulted from this assessment. There was no indication of a systemic deficiency.

5.0 Certification

Based upon this review the tritium analysis data maybe used as presented with no qualifications.

Table 3 H Building Foundation Tritium Results

pCi/g	LSC	Flag
Sample ID	**H-3**	**Qualifier**
Cleanup Goal	2,350,000	
HVB-001	< 3.00	U
HVB-002	< 3.00	U
HVB-003	< 3.00	U
HVB-004	< 2.93	U
HVB-005	< 2.78	U
HVB-006	< 2.88	U
HVB-007	< 2.84	U
HVB-008	< 2.81	U
HVB-008 FD	< 2.97	U
HVB-009	< 2.93	U
HVB-010	< 2.93	U
HVS-001	< 2.39	U
HVS-002	< 2.38	U
HVS-003	3.33	
HVS-004	5.70	
HVS-005	5.45	
HVS-006	4.83	
HVS-007	5.20	
HVS-008	4.52	
HVS-009	4.91	
HVS-010	4.76	
HVS-011	2.43	
HVS-012	< 2.42	U
HVS-013	6.19	
HVS-014	4.66	
HVS-015	3.96	
HVS-016	< 2.34	U
HVS-017	2.79	
HVS-018	3.86	
HVS-019	< 1.90	U
HVS-020	< 2.38	U
HVS-021	3.70	
HVS-022	4.00	
HVS-023	3.07	
HVS-024	2.80	
HVS-025	< 1.57	U
HVS-025 FD	< 2.28	U
HVS-026	2.68	
HVS-027	2.98	
HVS-028	< 2.47	U
HVS-029	< 2.37	U
HVS-030	< 1.85	U
HVS-031	4.95	

pCi/g	LSC	Flag
Sample ID	**H-3**	**Qualifier**
Cleanup Goal	2,350,000	
HVS-031 FD	5.13	
HVS-032	< 2.45	U
HVS-033	2.50	
HVS-033 FD	< 2.44	U
HVS-034	< 2.84	U
HVS-035	2.50	
HVS-036	4.85	
HVS-037	4.83	
HVS-038	2.44	
HVS-039	1.27	
HVS-040	2.34	
HVS-041	2.64	
HVS-042	3.91	
HVS-043	6.40	
HVS-044	5.22	
HVS-045	5.09	
HVS-046	4.01	
HVS-046 FD	4.31	
HVS-047	< 2.85	U
HVS-048	< 2.76	U
HVS-049	< 2.83	U
HVS-050	< 2.87	U
HVS-051	< 2.86	U
HVS-052	< 2.86	U
HVS-053	< 2.87	U
HVS-054	< 2.75	U
HVS-054 FD	< 2.85	U
HVS-055	< 2.93	U
HVS-056	< 2.89	U
HVS-057	< 2.74	U
HVS-058	< 2.79	U
HVS-059	< 2.88	U
HVS-060	< 2.96	U
HVS-061	< 2.97	U
HVS-062	< 2.91	U
HVS-063	< 2.96	U
HVS-064	< 2.93	U
HVS-065	< 2.90	U
HVS-066	< 2.85	U
HVS-067	< 2.99	U
HVS-068	< 2.95	U
HVS-069	< 2.76	U
HVS-070	< 2.88	U

Values listed as "<" are below the Minimum Detectable Activity (MDA)

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1.0 Introduction

Analytical data assessment can be performed on two quality control levels. Data Review involves an assessment of the quality controls used by the laboratory during the performance of the analysis. These include such things as laboratory blanks, system monitoring compound (surrogate) recoveries, matrix spikes, etc. Which controls are assessed and what criteria are applied depend on the analysis performed. The results of field quality control measures such as field duplicates and trip blanks may also be evaluated. Data Review is normally performed on 100% of the analytical data.

Data Validation is a much more detailed review of the entire laboratory data package. It includes all the elements of the Data Review plus verification of such things as proper instrument calibration, proper use of standards and correct performance of data calculations. Data Validation is used to identify systemic problems with the way the laboratory performs and reports analyses.

2.0 Description of the Data Set

After removal of H Building a verification sampling was performed per the H Building VSAP. Surface soil samples were collected from a total of 80 locations. These include 70 grid samples, 10 bias samples. An additional 6 field duplicate samples were collected. There was no deviation from the VSAP

Samples were screened at the Mound Soil Screening Facility.

Since no equipment was field decontaminated, no equipment rinsates samples were collected.

Offsite sample analysis was performed at GEL of Ohio. There were no problems in achieving the analyte detection goals.

Table 1 Laboratory Sample Delivery Groups

LSDG	Number of Samples	Mound Sample IDs
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115854	12	HVS-003, 004, 005, 006, 007, 008, 009, 010, 013, 014, 021, & 031
115934	22	HVS-034, 031FD, 036, 037, 042, 043, 045, 046, 046FD, 047, 048, 049, 050, 051, 052, 053, 054, 057, HVB-005, 006, 007, & 010
116057	14	HVS-055, 056, 058, 059, 060, 061, 062, 064, 065, 066, 067, 068, 069, & 070
116267	10	HVS-015, 054FD, 063, HVB-001, 002, 003, 004, 008, 008FD, & 009

3.0 Data Review

The quality control data submitted with the analytical data packages were reviewed and assessed. The results of the assessment are presented in this section. The following qualification flags are used to indicate data quality problems identified during the data review process.

Table 2 Data Review Qualifications

Flag	Description
J	Estimated sample result
U	Non-detect sample result
UJ	Estimated non-detected sample result
R	Rejected (unusable) sample result

3.1 Tracer Recovery

The laboratory spikes every sample with Pu-242. The percent recovery of Pu-242 is then used to scale the detected presence of the other Pu isotopes. To fully meet QC criteria the Pu-242 isotope recovery must be between 30 – 110 % and have an accumulated count of at least 200 counts.

Tracer recovery for all LSDGs met QC criteria.

3.2 Blanks

The laboratory analyzes one blank for every 20 samples or LSDG. Laboratory blanks are analyzed to determine if laboratory processes are contributing to the detected sample activities.

The method blanks for all LSDGs met QC criteria.

3.3 Laboratory Duplicate

A laboratory duplicate analysis is performed to assess the precision and accuracy of the laboratory analysis. One duplicate is performed for every 20 samples or LSDG.

The Relative Error Ratio of the duplicate analyses for all LSDG's were within QC criteria.

3.4 Matrix Spike

A matrix spike (MS) analysis is performed to assess the precision and accuracy of the laboratory analysis. One matrix spike is performed for every 20 samples or LSDG. It also may indicate analysis bias due to sample matrix effects.

The matrix spike recoveries for all LSDG's were with QC criteria.

3.5 Laboratory Control Sample

The Laboratory Control Sample (LCS) is a standard sample with a known quantity of the analyte of concern. The LCS recovery is an indication of whether the analytical process was in control during the analysis.

The LCS recovery for all data sets met QC requirements.

3.6 Equipment Rinsates

Equipment rinsates are used to ensure efficacy of equipment field decontamination procedures, and that the sample collection process is not causing cross contamination. Only isotopes at background levels were found in the four equipment rinsates.

No equipment rinsates were collected.

3.7 Field Duplicates

Field Duplicates give an indication of the degree of homogeneity within the sample material. As with Laboratory duplicates they are reported as RPD.

Agreement between field duplicates was within acceptable range.

4.0 Data Validation

The results of LSDG 116057 were fully data validated. In addition to the items discussed above, the following items were evaluated:

1. Instrument calibration
2. Daily Source checks
3. Background and efficiency measurement
4. Proper frequency and use of blanks
5. All calculations

No additional qualification resulted from this assessment. There was no indication of a systemic deficiency.

5.0 Certification

Based upon this review the plutonium analysis data maybe used as presented with no further qualifications.

Table 3 H Building Foundation Pu Results (pCi/g)

Sample ID	Pu-238	Flag	Pu-239/240	Flag
Cleanup Goal	55	Qualifier		Qualifier
HVB-001	0.341		< 0.090	U
HVB-002	< 0.083	U	0.039	
HVB-003	0.277		< 0.098	U
HVB-004	< 0.129	U	< 0.106	U
HVB-005	39.9		1.10	
HVB-006	6.35		< 0.090	U
HVB-007	0.677		< 0.079	U
HVB-008	< 0.119	U	0.047	
HVB-008 FD	0.086		0.038	
HVB-009	< 0.136	U	< 0.089	U
HVB-010	< 0.131	U	< 0.064	U
HVS-001	< 0.053	U	0.018	
HVS-002	0.053		< 0.012	U
HVS-003	0.088		< 0.038	U
HVS-004	0.093		< 0.051	U
HVS-005	< 0.137	U	< 0.073	U
HVS-006	0.100		< 0.079	U
HVS-007	< 0.112	U	< 0.044	U
HVS-008	< 0.085	U	< 0.049	U
HVS-009	0.170		< 0.043	U
HVS-010	< 0.117	U	< 0.037	U
HVS-011	0.128		< 0.054	U
HVS-012	0.079		< 0.061	U
HVS-013	< 0.083	U	< 0.043	U
HVS-014	0.249		< 0.069	U
HVS-015	< 0.157	U	< 0.087	U
HVS-016	< 0.038	U	0.029	
HVS-017	< 0.068	U	< 0.012	U
HVS-018	< 0.054	U	< 0.037	U
HVS-019	< 0.054	U	< 0.042	U
HVS-020	< 0.072	U	< 0.047	U
HVS-021	< 0.077	U	0.037	
HVS-022	< 0.067	U	< 0.052	U
HVS-023	0.097		0.014	
HVS-024	< 0.093	U	< 0.097	U
HVS-025	< 0.042	U	< 0.049	U
HVS-025 FD	< 0.056	U	0.037	
HVS-026	< 0.055	U	0.032	
HVS-027	< 0.095	U	< 0.098	U
HVS-028	0.046		0.017	
HVS-029	0.054		0.024	
HVS-030	0.066		0.022	
HVS-031	< 0.032	U	0.013	
HVS-031 FD	< 0.117	U	0.048	

Sample ID	Pu-238	Flag	Pu-239/240	Flag
Cleanup Goal	55	Qualifier		Qualifier
HVS-032	0.369		< 0.097	U
HVS-033	0.068		0.019	
HVS-033 FD	0.085		< 0.051	U
HVS-034	0.176		0.071	
HVS-035	< 0.098	U	< 0.061	U
HVS-036	< 0.093	U	< 0.066	U
HVS-037	< 0.081	U	< 0.064	U
HVS-038	0.014		< 0.036	U
HVS-039	< 0.089	U	< 0.049	U
HVS-040	< 0.076	U	< 0.034	U
HVS-041	0.130		< 0.036	U
HVS-042	< 0.110	U	< 0.074	U
HVS-043	0.139		0.057	
HVS-044	< 0.098	U	< 0.058	U
HVS-045	< 0.129	U	< 0.134	U
HVS-046	0.109		< 0.076	U
HVS-046 FD	0.352		< 0.062	U
HVS-047	< 0.140	U	< 0.145	U
HVS-048	< 0.059	U	< 0.026	U
HVS-049	9.16		1.82	
HVS-050	0.067		< 0.134	U
HVS-051	< 0.128	U	< 0.075	U
HVS-052	< 0.109	U	< 0.052	U
HVS-053	< 0.136	U	< 0.060	U
HVS-054	< 0.164	U	< 0.101	U
HVS-054 FD	< 0.095	U	< 0.069	U
HVS-055	< 0.085	U	< 0.052	U
HVS-056	< 0.078	U	0.038	
HVS-057	< 0.180	U	< 0.100	U
HVS-058	< 0.079	U	< 0.032	U
HVS-059	0.120		< 0.054	U
HVS-060	0.178		< 0.063	U
HVS-061	0.304		< 0.075	U
HVS-062	< 0.109	U	0.06	
HVS-063	< 0.101	U	< 0.060	U
HVS-064	< 0.082	U	< 0.047	U
HVS-065	0.177		< 0.044	U
HVS-066	0.284		< 0.037	U
HVS-067	0.311		< 0.043	U
HVS-068	< 0.073	U	< 0.065	U
HVS-069	< 0.069	U	0.033	
HVS-070	0.279		0.033	

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1.0 Introduction

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115854	12	HVS-003, 004, 005, 006, 007, 008, 009, 010, 013, 014, 021, & 031
115934	22	HVS-034, 031FD, 036, 037, 042, 043, 045, 046, 046FD, 047, 048, 049, 050, 051, 052, 053, 054, 057, HVB-005, 006, 007, & 010
116057	14	HVS-055, 056, 058, 059, 060, 061, 062, 064, 065, 066, 067, 068, 069, & 070
116267	10	HVS-015, 054FD, 063, HVB-001, 002, 003, 004, 008, 008FD, & 009

3.0 Data Review

The quality control data submitted with the analytical data packages were reviewed and assessed. The results of the assessment are presented in this section. The following qualification flags are used to indicate data quality problems identified during the data review process.

Table 2 Data Review Qualifications

Flag	Description
J	Estimated sample result
U	Non-detect sample result
UJ	Estimated non-detected sample result
R	Rejected (unusable) sample result

3.1 Tracer Recovery

The laboratory spikes every sample with Th-229. The percent recovery of Th-229 is then used to scale the detected presence of the other Th isotopes. To fully meet QC criteria the Th-229 isotope recovery must be between 30 – 110 % and have an accumulated count of at least 200 counts.

The laboratory had a persistent, low recovery problem meeting the QC percent tracer recovery criterion. In every instance the total count criterion was met. Even samples that met the tracer recovery criterion tended to be in the low recovery range. Tracer recovery for samples not containing the Mound sample matrix (i.e., blanks and Laboratory Control Samples) did not exhibit low tracer recovery. Low tracer recovery also causes the error associated with each measurement to increase due to scaling effects.

The laboratory's explanation of the low tracer recovery was the presence of something (possible a metal) in the sample matrix, which inhibits tracer recovery. It should be noted that even with low tracer recovery the Th results are not abnormally low (< than background), but about what would be expected from Mound background level soil.

A number of the Th results have been qualified as "estimates" (J) due to low tracer recovery. See Table 3 below.

3.2 Blanks

The laboratory analyzes one blank for every 20 samples or LSDG. Laboratory blanks are analyzed to determine if laboratory processes are contributing to the detected sample activities.

The method blanks for all LSDGs met QC criteria.

3.3 Laboratory Duplicate

A laboratory duplicate analysis is performed to assess the precision and accuracy of the laboratory analysis. One duplicate is performed for every 20 samples or LSDG.

The laboratory duplicate samples were effected by poor tracer recovery as discussed in section 3.1 above. The Relative Error Ratio of the duplicate analyses for most LSDG's were with QC criteria.

3.4 Matrix Spike

A matrix spike (MS) analysis is performed to assess the precision and accuracy of the laboratory analysis. One matrix spike is performed for every 20 samples or LSDG. It also may indicate analysis bias due to sample matrix effects.

The matrix spike samples were effected by the poor tracer recovery as discussed in section 3.1. The matrix spike recoveries for all LSDG's were with QC criteria.

3.5 Laboratory Control Sample

The Laboratory Control Sample (LCS) is a standard sample with a known quantity of the analyte of concern. The LCS recovery is an indication of whether the analytical process was in control during the analysis.

Recoveries from the LCS associated with these samples were all within QC limits.

3.6 Equipment Rinsates

Equipment rinsates are used to ensure efficacy of equipment field decontamination procedures, and that the sample collection process is not causing cross contamination. Only isotopes at background levels were found in the four equipment rinsates.

No equipment rinsates were collected.

3.7 Field Duplicates

Field Duplicates give an indication of the degree of homogeneity within the sample material. As with Laboratory duplicates they are reported as RPD.

Although some of field duplicates were effected by the poor tracer recovery discussed in section 3.1, the agreement between field duplicates was within acceptable range.

4.0 Data Validation

The results of LSDG 116057 were fully data validated. In addition to the items discussed above, the following items were evaluated:

1. Instrument calibration
2. Daily Source checks
3. Background and efficiency measurement
4. Proper frequency and use of blanks
5. All calculations

No additional qualification resulted from this assessment beyond those already discussed. There was no indication of a systemic deficiency.

5.0 Certification

Sample HVB-005, which had the highest Th-228 result was also run by alpha spectroscopy for uranium isotopes on the same sample in attempt to discover a possible source of the Th-228.

PCi/g	U-233/234	U-235/236	U-238	Th-228	Th-230	Th-232	Ac-227
HVB-005	0.887	0.145	0.841	3.34	1.25	0.801	< 0.182

Base upon this analysis it does not appear that the Th-228 is a result of a uranium decay chain.

Based upon this review the thorium analysis data maybe used as presented with the indicated qualifications.

Table 3 H Building Foundation Th Results (pCi/g)

Sample ID	Th-228	Flag	Th-230	Flag	Th-232	Flag	Ac-227	Flag
Cleanup Goal			2.8		2.1		4.6	
HVB-001	0.495		1.25		0.427		0.224	
HVB-002	0.698		1.12		0.497		0.145	
HVB-003	0.728		1.16		0.553		0.137	
HVB-004	0.530	J	1.19	J	0.529	J	0.235	J
HVB-005	3.34		1.25		0.801		< 0.182	
HVB-006	1.32		1.32		0.662		< 0.206	
HVB-007	0.803		1.04		0.991		< 0.186	
HVB-008	0.342		0.889		0.260		< 0.149	
HVB-008 FD	0.276		1.08		0.092		< 0.130	
HVB-009	0.495		0.870		0.358		< 0.287	
HVB-010	0.616		1.22		0.616		< 0.197	
HVS-001	0.737		1.34		0.877		0.085	
HVS-002	0.656	J	0.809	J	0.559	J	0.081	J
HVS-003	0.587		1.37		0.473		0.069	
HVS-004	0.444		1.44		0.521		0.057	
HVS-005	0.435		1.02		0.522		0.056	
HVS-006	0.684		1.39		0.650		0.068	
HVS-007	0.562		1.56		0.542		< 0.082	U
HVS-008	0.551		1.16		0.511		< 0.073	U
HVS-009	0.793		1.85		0.641		< 0.065	U
HVS-010	0.657		0.992		0.537		0.082	
HVS-011	0.441	J	1.15	J	0.440	J	< 0.189	U J
HVS-012	0.643	J	1.45	J	0.855	J	< 0.165	U J
HVS-013	0.539		1.45		0.527		< 0.057	U
HVS-014	0.627		1.65		0.544		0.050	
HVS-015	0.583		0.855		0.437		< 0.221	U
HVS-016	0.714		1.70		0.517		< 0.019	U
HVS-017	< 0.556	U J	1.56	J	0.363	J	< 0.023	UJ
HVS-018	0.743	J	0.918	J	0.459	J	< 0.205	UJ
HVS-019	0.782	J	2.09	J	0.521	J	< 0.284	UJ
HVS-020	0.941		1.11		0.743		< 0.113	U
HVS-021	0.833		1.60		0.722		0.078	
HVS-022	0.518		1.27		0.517		< 0.174	U
HVS-023	0.579	J	1.36	J	0.538	J	< 0.148	UJ
HVS-024	0.514	J	1.26	J	0.513	J	< 0.159	UJ
HVS-025	0.499	J	1.91	J	0.436	J	0.231	J
HVS-025 FD	0.715	J	1.45	J	0.488	J	< 0.163	UJ
HVS-026	0.786	J	1.31	J	0.604	J	< 0.219	UJ
HVS-027	< 0.342	UJ	1.49	J	0.453	J	< 0.202	UJ
HVS-028	0.606	J	2.56	J	0.819	J	< 0.265	UJ
HVS-029	0.591		1.14		0.517		< 0.051	U
HVS-030	0.456	J	1.27	J	0.582	J	0.179	J
HVS-031	0.454		1.22		0.556		< 0.035	U
HVS-031 FD	0.321		1.38		0.464		< 0.174	U

C4S07 50

Sample ID	Th-228	Flag	Th-230	Flag	Th-232	Flag	Ac-227	Flag
Cleanup Goal			2.8		2.1		4.6	
HVS-032	0.692	J	1.40	J	0.440	J	< 0.167	UJ
HVS-033	0.514	J	0.665	J	0.418	J	< 0.185	UJ
HVS-033 FD	0.513	J	0.823	J	0.402	J	0.058	J
HVS-034	0.614	J	1.39	J	0.811	J	< .186	UJ
HVS-035	0.392	J	0.876	J	0.369	J	0.116	J
HVS-036	0.392	J	1.29	J	0.346	J	0.186	J
HVS-037	0.631	J	2.22	J	0.822	J	0.277	J
HVS-038	0.728	J	1.48	J	0.448	J	0.226	J
HVS-039	0.447	J	1.05	J	0.424	J	< 0.612	UJ
HVS-040	1.07	J	2.22	J	1.02	J	< 0.181	UJ
HVS-041	0.653	J	1.33	J	0.653	J	< 0.174	UJ
HVS-042	0.524		1.36		0.643		< 0.182	U
HVS-043	0.854	J	1.63	J	0.585	J	< 0.265	UJ
HVS-044	0.445	J	1.16	J	0.600	J	< 0.165	UJ
HVS-045	0.573	J	1.68	J	0.636	J	< 0.258	UJ
HVS-046	0.423		1.18		0.722		0.267	
HVS-046 FD	0.790	J	1.33	J	0.539	J	< 0.181	UJ
HVS-047	0.834	J	1.50	J	0.512	J	< 0.288	UJ
HVS-048	0.569		1.49		0.693		0.162	
HVS-049	0.567		1.89		0.794		0.191	
HVS-050	0.312		1.30		0.433		< 0.188	U
HVS-051	0.590		1.32		0.489		0.174	
HVS-052	0.771	J	1.09	J	0.566	J	< 0.213	UJ
HVS-053	0.866		0.897		0.818		< 0.224	U
HVS-054	< 0.428	U	1.32		0.205		< 0.226	U
HVS-054 FD	0.328		0.953		0.289		0.136	
HVS-055	0.426	J	0.981	J	0.468	J	0.314	J
HVS-056	< 0.354	UJ	1.05	J	0.450	J	< 0.264	UJ
HVS-057	0.721		0.877		0.580		< 0.117	U
HVS-058	< 0.196	U	0.886		0.289		0.212	
HVS-059	0.517	J	0.803	J	0.556	J	< 0.224	UJ
HVS-060	< 0.559	UJ	0.584	J	< 0.478	UJ	< 0.447	UJ
HVS-061	0.632	J	1.38	J	0.411	J	< 0.209	UJ
HVS-062	0.304		1.23		0.473		0.465	
HVS-063	0.615		1.54		0.577		0.215	
HVS-064	0.540		1.06		0.538		< 0.195	U
HVS-065	< 1.05	UJ	1.04	J	< 0.864	UJ	< 0.564	UJ
HVS-066	0.730	J	1.29	J	0.636	J	0.133	J
HVS-067	< 0.309	UJ	0.954	J	0.477	J	< 0.223	UJ
HVS-068	< 0.342	UJ	1.13	J	0.333	J	< 0.213	UJ
HVS-069	0.552	J	0.924	J	0.475	J	< 0.272	UJ
HVS-070	0.667	J	1.04	J	0.290	J	< 0.343	UJ

Values listed as "<" are below the Minimum Detectable Activity (MDA)

GroupWise message from John Gill to Robert Ransbottom:

>>> John Gill 08/04/04 06:56PM >>>

See attached. I hope it makes sense.

>>> Robert Ransbottom 08/05/04 05:52AM >>>

Thanks, John. That was very clear to me. The only question I have is with point 5. In your previous points you basically say we are below clean-up objectives for those scenarios, and therefore I would assume no action is required. Does point 5 lead us into any issues that would require a remedial action?

No. Point 5 interprets the result as stand-alone excess Th-228.

Interestingly, the Th-228 result is 2.54 pCi/g greater than Th-232 (3.34-0.80). It is really this excess that should be compared (favorably!) to the Th-228 CO (2.6 pCi/g). This is because the risk from that portion of the Th-228 result that is equal to (in secular equilibrium with) Th-232 has already been accounted for in the derivation of the CO for Th-232(+Daughters). This is why the CO for Th-232 is so damn conservative.

You could use this as another argument with the regulators.

(Attachment to GroupWise message from John Gill to Robert Ransbottom, 8/4/04)

Th-228 concentration in excess of Th-232 concentration

Th-232 decays through Th-228 via the following scheme:

Th-232 (1.4E10 years) → Ra-228 (6.7 years) → Ac-228 (6.1 hours) →
Th-228 (1.91 years) → → → → → → → Pb-208

If completely separated from its daughters and then stored, Th-232 begins to give rise to those same daughters in the above decay scheme. Within 30 years (4.5 half-lives of Ra-228), daughters attain 95% of the concentration of Th-232 (all given in dpm/g or pCi/g). Almost all Thorium ores stored historically at Mound were never separated. Equal concentrations of Th-228 and Th-232 are thus virtually assured when the Th-228 is the daughter of Th-232. When Th-228 concentration is observed in excess of Th-232 concentration, a number of causes are possible.

1. Analytical data are of poor quality.

   Check carefully the analytical QA/QC report. Perform data validation if possible.

2. Analytical data are of different quality.

   Th-228 reported by gamma spectroscopy can have a many-fold higher MDA than Th-232. When values of 50% of MDA are adapted for use in risk evaluations, Th-228 can appear to be of a higher concentration than Th-232 in a sample. Thorium analysis by alpha spectroscopy does not typically have this problem.

3. The difference is a product of statistical fluctuation.

   Variability (standard deviations) of Th-228 and Th-232 analysis results from a cohort of samples can provide an indication of the significance of a given difference.

4. Th-228 is derived from a different parent than Th-232.

   a. Th-228 is derived from U-232, which is a contaminant in U-233.

      U-232 was present at roughly 16 ppmw in U-233 that was handled at Mound. Th-228 is the immediate daughter of U-232. The short half-life of U-232 (69 years) and the long half-life of U-233 (1.6E5 years), causes about 3% of the Uranium decays in a typical U-232/233 mixture to be from U-232. Material of 30 years age exhibits a ratio of dpm(U-233)/dpm(U-232) = 36.

      Because Th-228 has a short half-life, U-232 and Th-228 attain equilibrium in material derived from a U-233 source within 5-10 years. If an excess of Th-228 over Th-232 is observed in a sample, the excess may be due to U-232 (and U-233) present. The

excess, expressed in pCi/g, gives the amount of U-232 possibly present. In addition, the excess multiplied by 36, will give a reasonable estimate of the possible concentration of U-233 in the sample.

When a (Th-228 - Th-232) difference of 2.5 pCi/g is observed, as is the case with sample HVB-005, a U-232 concentration of 2.5 pCi/g may be present. This value is below the Cleanup Objective of U-232 (not including daughters, since they are already evaluated via the Th-228 concentration) of 29 pCi/g. A U-233 concentration of 2.5 x 36 = 90 pCi/g may also be present. This value is below the Cleanup Objective of U-233 (not including daughters, since they are long-lived) of 103 pCi/g.

Measuring samples for Uranium isotopes by alpha spectrometry, specifically for U-233/234, can eliminate the possibility of the U-232 / U-233 mixture being present and giving rise to excess Th-228.

b. Th-228 is derived from U-232, which is a daughter of Pu-236, which was a contaminant in Pu-238.

Small amounts of Pu-236 were present in the Pu-238 source material shipped to Mound historically. The Pu-236 decays as follows:

Pu-236 (2.87 years) → U-232 (69 years) → Th-228 (1.91 years)

The Pu-236 has long ago decayed away from Mound Pu-238 residues. It has been replaced by U-232, which is in equilibrium with Th-228. Excess Th-228 (versus Th-232) can indicate an equal amount of U-232, as noted above.

In sample HVB-005, the amount of U-232 possibly present due to Pu-236 contaminant is well below its Cleanup Objective. No other attendant contaminants are present from this source.

5. Th-228 is present because of environmental separation effects.

Secular equilibrium in any decay chain can be disrupted by isotopic or chemical separation effects. In the case of contaminated Mound soils, chemical separation could have been environmentally induced, where intermediate daughters are removed from the vicinity of a parent by differential solubility in migrating groundwater. Ra-228 is more soluble than its parent Th-232 in water, and more soluble than its sequential daughters Ac-228 and Th-228. The dissolution of Ra-228 from soils and the re-precipitation of it or its daughters on other soils (perhaps more alkaline or more ion-exchangeable) can be the cause of an increased concentration of Th-228 over Th-232 in the "recipient" soils. In this case the excess Th-228 must be viewed simply as a soil/water solubility effect, without the attendant concerns of Uranium isotopes.

GroupWise message from John Lyons to Robert Ransbottom sent 8/5/04:

Attached is the new H Building

The new dataset and new 95%UCL, please discard the ones previously sent on 07/26/2004.

New in that while researching your Pb-210 question I was able to determine two things.

One good

One Bad, almost

The good, the reason Pb-210 does not show up in what was provided you on 07/26/2004 and NOW is because the value you are concerned about *(the 8.84 pCi/g Pb-210)* is U qualified. While U qualified data is used in the 95% UCL calculation, it is not used to determine if the 95% UCL should be performed. There are no Pb-210 values which exceed the 7.45 cleanup objective + background value that are not U qualified, therefore, I can not do the calculation. The decision to perform the calculation is based on non U qualified data only.

The Bad, almost. I ran a RRE data reduction for you just like I ran for Gill. This was incorrect so I rerun it as a Superceded data reduction. RREs adjust the result based on lab qualifications. So the values used in the 95% UCL calculation were increased slightly. This could have changed the final 95% UCL value, but it did not. That is the Bad, almost.

I am sure you will have other questions concerning this so please do not hesitate to stop in and we can discuss it.

John Lyons

MEIMS / GIS Databases

937-865-5516

lyonjj@doe-md.gov

APPENDIX D

GENERAL MEDIA INFORMATION

Miamisburg Closure Project

MIAMISBURG CLOSURE PROJECT
ACTION MEMORANDUM
Notice of Public Review Period

The following document is available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio. Public comment on this document will be accepted June 28, 2003 through July 28, 2003.

AM Building H: Environmental Laboratory, Laundry Facilities, and Change Rooms

Questions can be referred to Paul Lucas at (937) 847-8350 extension 314.

MIAMISBURG CLOSURE PROJECT

ACTION MEMORANDUM
Notice of Document Revision

The following Action Memorandum has been revised and is available (August 29, 2003) in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio.

AM Building H: Environmental Laboratory, Laundry Facilities, and Change Rooms

Document revisions include verification text on page 9, tritium footnote on Table 4, and revised project schedule.

Questions can be referred to Paul Lucas at (937) 847-8350 ext. 314

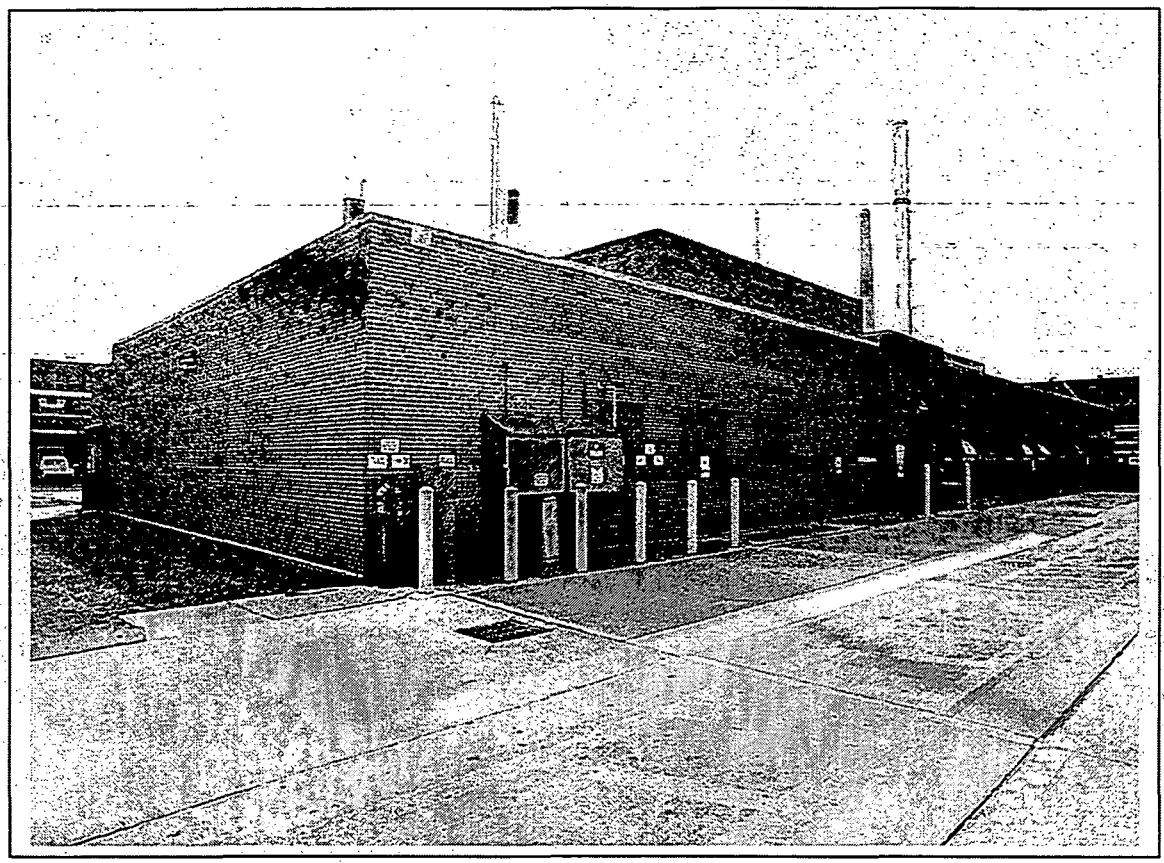
U.S. Department of Energy
U.S. Environmental Protection Agency
Ohio Environmental Protection Agency

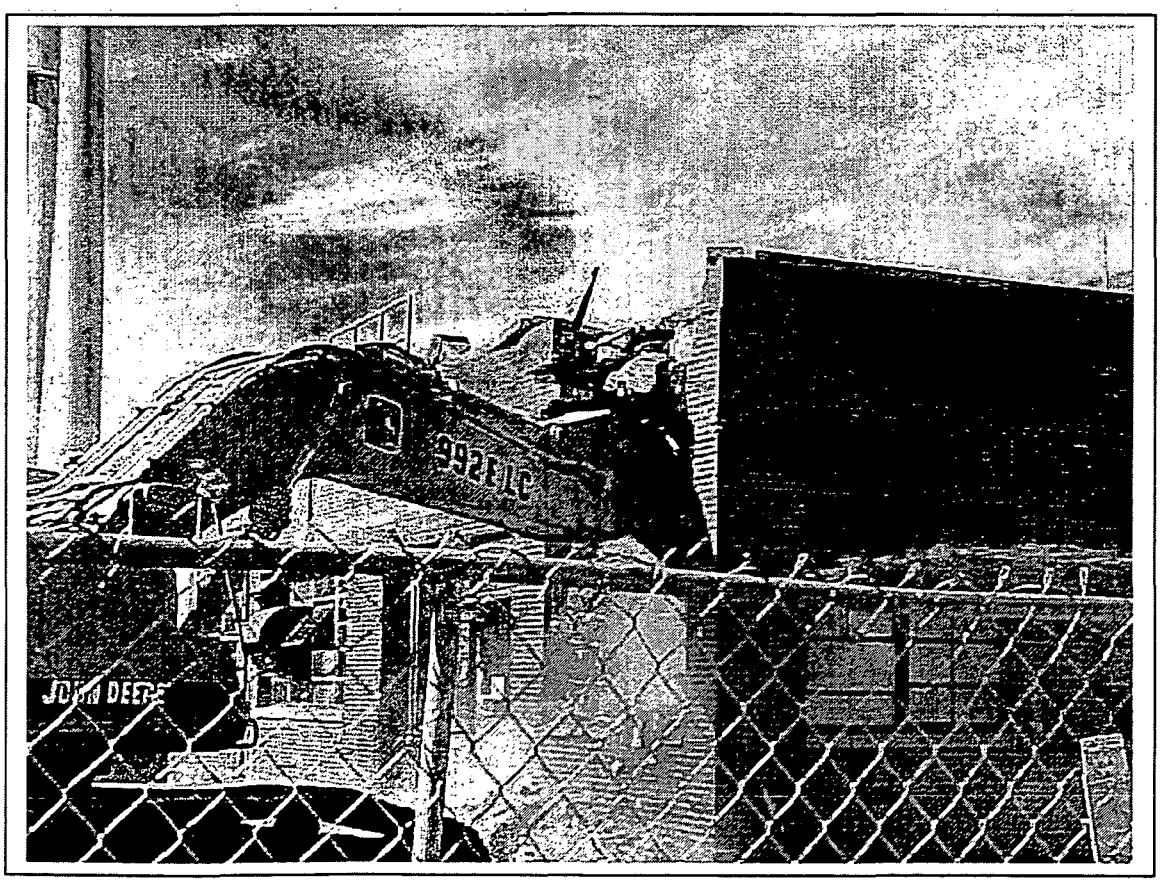
C 1 of 1

APPENDIX E

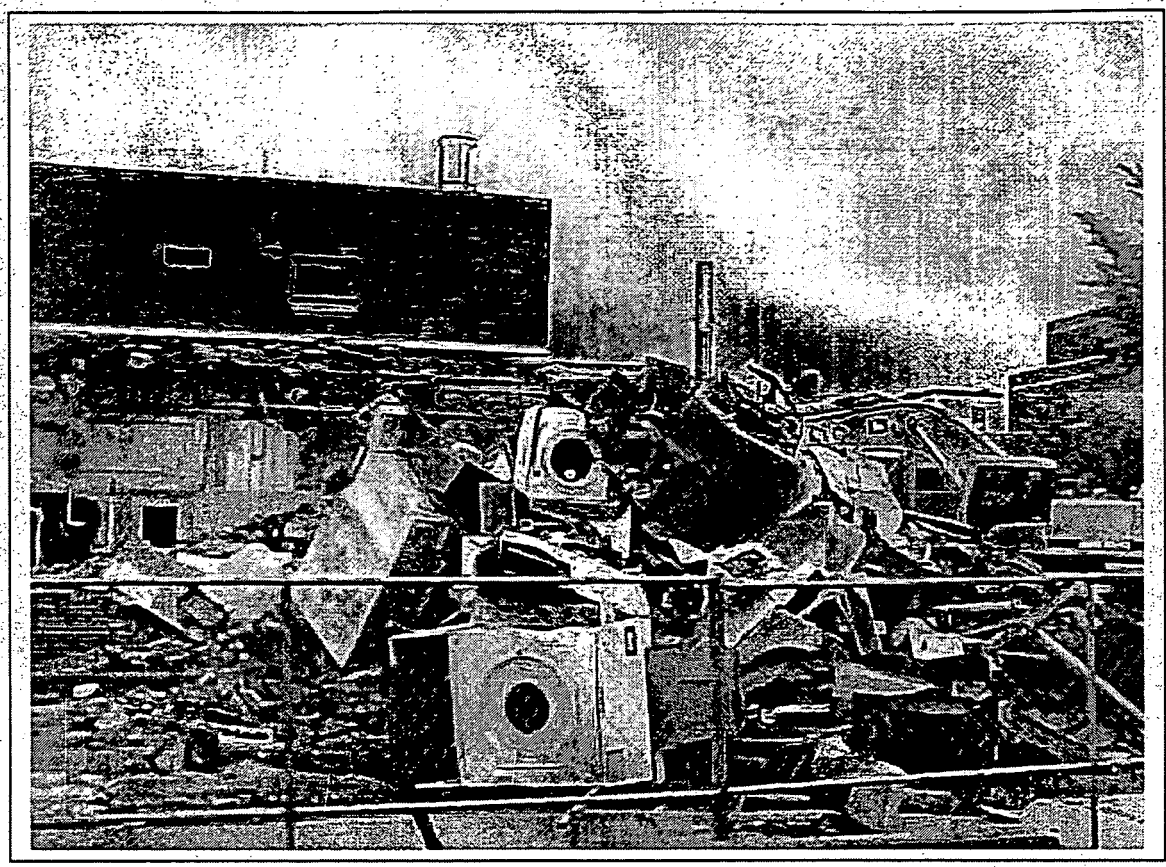
PHOTOGRAPHIC DOCUMENTATION

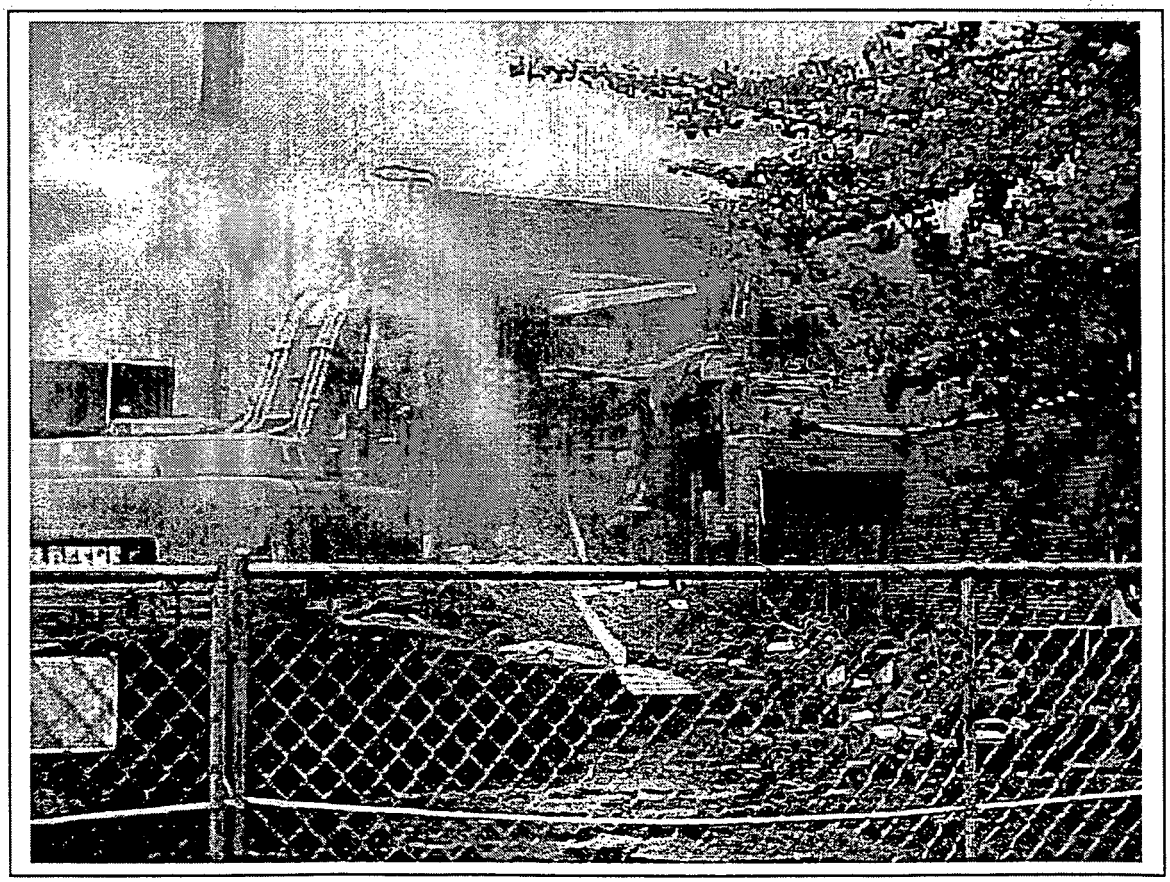
H Building Structure Demolition





H Building Structure Demolition





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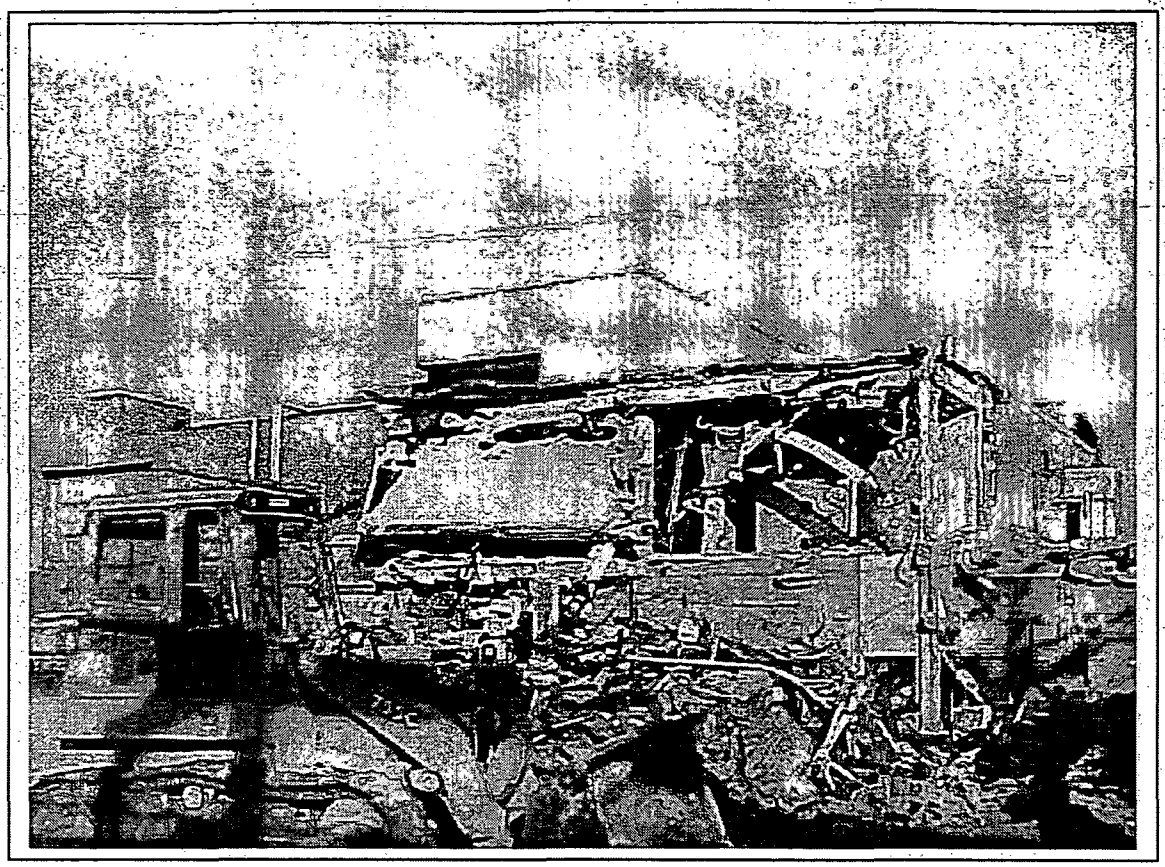

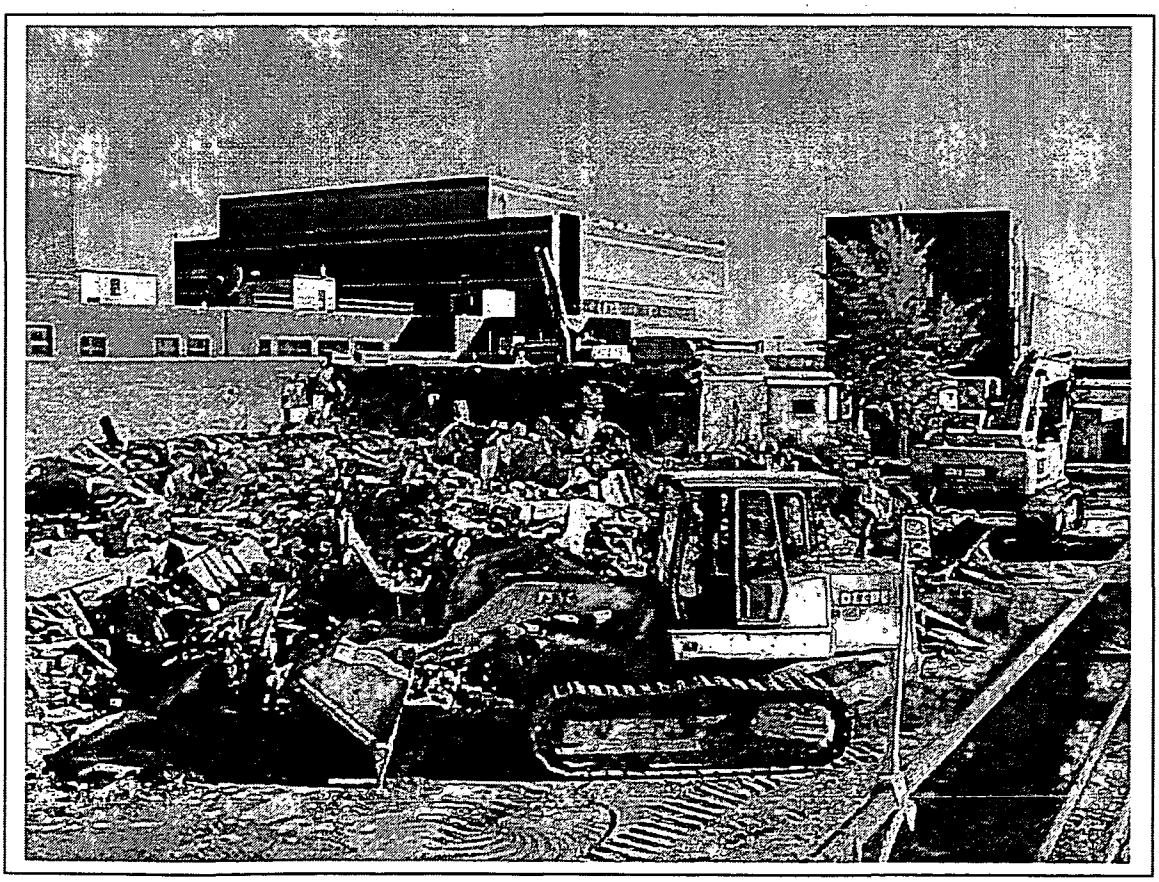

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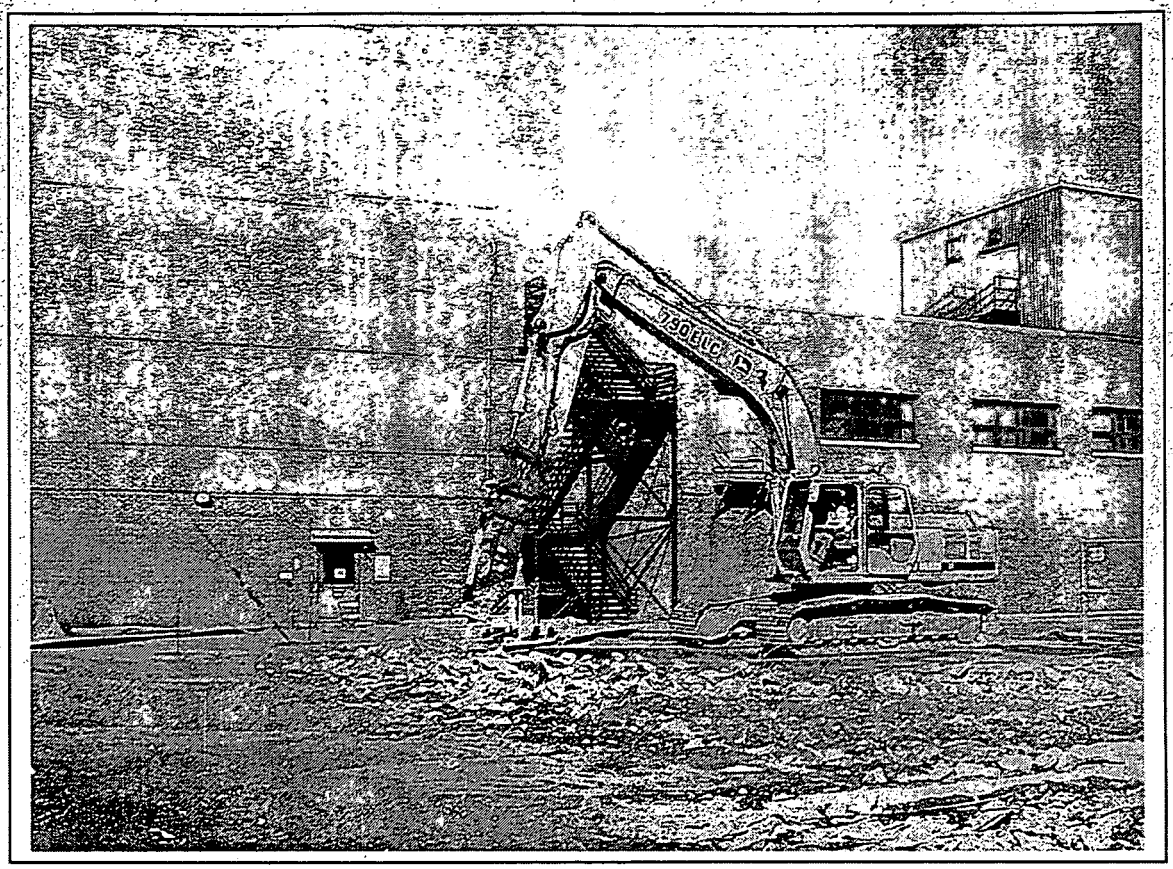
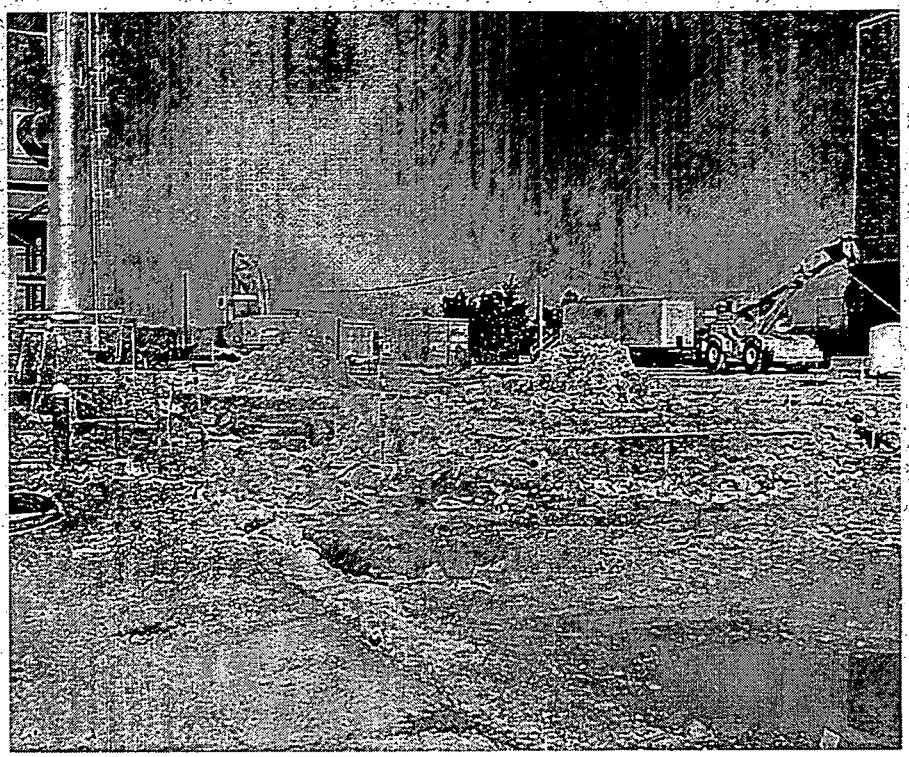
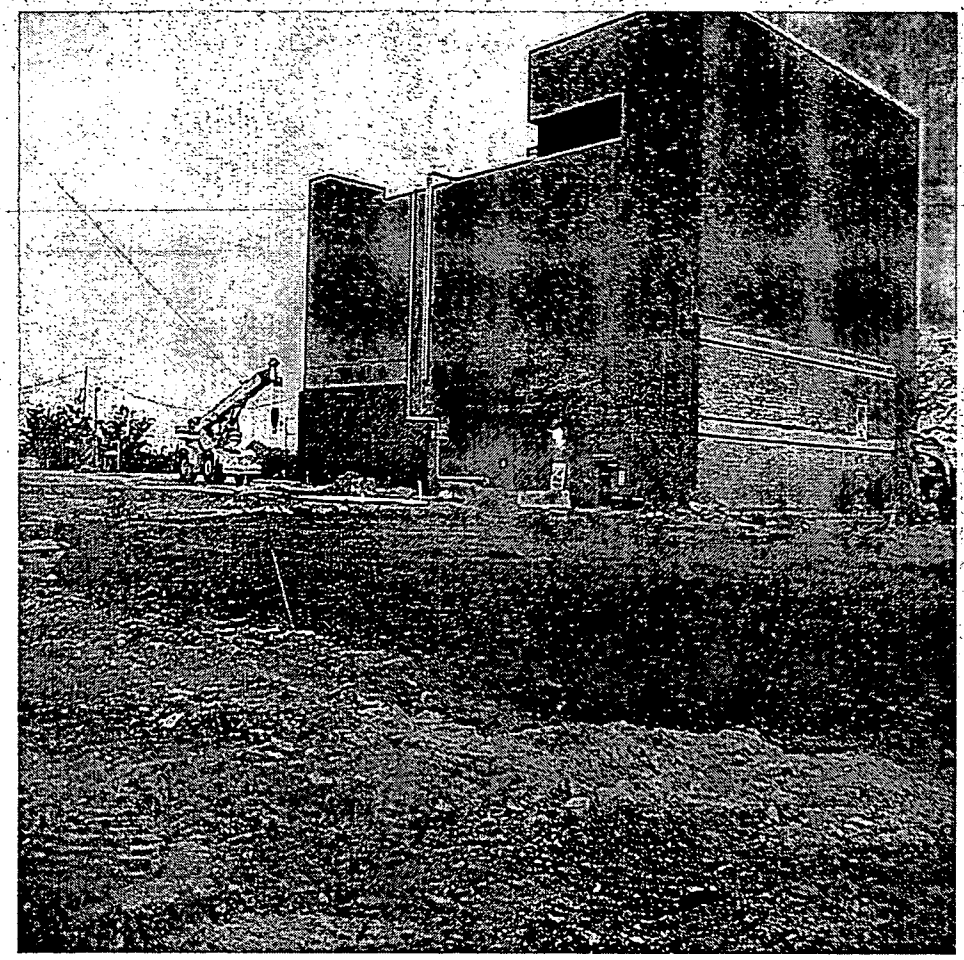


H Building Slab/Soil Removal

H Building Pad Before Removal



H Building After Pad/Soil Removal



H Building Area After Backfill

APPENDIX F

H BUILDING STRUCTURE OSC REPORT

Appendix F

H Building
Structure OSC Report

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(continued)

Acronyms

ATM	Automatic Teller Machine
BOSS	Balance of Site Structures
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and decomissioning
DAC	derived air concentration
DOE	Department of Energy
ER	Environmental Restoration
MCP	Miamisburg Closure Project
MMCIC	Miamisburg Mound Community Improvement Corporation
OEPA	Ohio Environmental Protection Agency
OSC	On-Scene Coordinator
PRP	Potentially Responsible Party
PRS	Potential Release Site
RA	Removal Action
USEPA	United States Environmental Protection Agency

Document layout note: The main body of the OSC Report addresses the Soil portion of the Removal Action activities. This document (Appendix F) addresses the Structure portion of the Removal Action activities. The OSC Report documents the completion of all aspects of the Removal Action activities authorized in the Action Memorandum, H Building Removal Action, August 2003, Final.

1.0 SUMMARY OF EVENTS

This section describes the site background and events leading up to the removal action, parties involved in supporting the removal action, chronological narrative of the removal action, and resources committed to complete the project.

1.1 Site Conditions and Background

The Action Memorandum, H Building Removal Action, August 2003, Final authorized removal of H Building, PRSs 210 and 337, and the contaminated soil in the vicinity. This Structure On-Scene Coordinator (OSC) Report documents only the removal of the H Building superstructure. The closure of two Potential Release Sites (PRSs 210 and 337) and the contaminated soil in the vicinity of H Building is documented via the H Building OSC Report in the main portion of this document.

The levels of radiological contamination present in H Building warranted a Removal Action (RA) under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) and subsequent demolition of H Building.

H Building Background

H Building, also called the change house and laundry building, was one of the original buildings at Mound, constructed in 1948. H Building's original purpose was to provide a facility to prevent tracking of contamination to clean areas (change house), and to provide a facility for laundry decontamination of contaminated clothing (laundry facility). Over the years it has also housed a small maintenance shop, the site Credit Union office, and the bioassay and gamma spectroscopy laboratories.

It is believed that the contamination that led to this removal action resulted from the hot laundry operations in the building. Contaminated clothing was brought to the laundry from various site radiological buildings. The clothing was decontaminated through laundering and the wastewater was discharged to the onsite radiological waste disposal facility in WD Building via underground hot waste lines. The hot laundry piping contained the majority of the contamination that was encountered. Even though H Building had undergone extensive Decontamination and Decommissioning (D&D) cleanup in the past, radiological contamination still was present.

H Building was a two-story structure having a reinforced concrete frame, concrete floors, and concrete roof deck. The second floor of the building consisted of penthouse

rooms that housed service equipment for heating and ventilation. The walls were brick and concrete block. Floors in the high-risk areas were acid proof brick, and the walls were finished with hard plaster.

The original building dimensions were approximately 114 feet by 115 feet, comprising a floor area of 12,825 square feet. A number of additions were made to the building, and as of 2003, the total square footage was 17,334.

Appendix D provides photographs of the building before, during, and after demolition.

Associated Potential Release Sites and Previous Investigations.

No PRSs are closed out via this H Building Structure OSC Report. Refer to the main portion of this document for information regarding PRS closure.

Table 1 lists the three PRSs associated with the H Building demolition activities; their approximate locations are shown on Figure 2. PRS 210 (the Room H-133 Laundry Waste Tank) was removed in 1998 under the initial version of the Action Memorandum, before it was decided to demolish the H Building structure. PRS 337 (the H Building Condensate Sump) was located in a pit in the slab of the building and it was removed as part the H Building slab demolition. PRS 210 and PRS 337 is closed out via the H Building OSC Report (main portion of this document). A portion of PRS 423 (Main Hill Under Ground Rad Waste Line Segment 1A) was removed with the H Building slab demolition, and will be closed out via the UGL OSC Report.

Removal Action. The removal action in H Building began in 1998 with the authorization of the original action memorandum to decontaminate the Hot Laundry area of the building. It was thought at that time that the building would be transferred to the Miamisburg Mound Community Improvement Corporation (MMCIC) after decontamination was completed. PRS 210 (Laundry Waste Tank) was removed as part of the D&D activities. However, when the extent of contamination was discovered to be greater than originally anticipated, a decision was made to demolish the building. The action memorandum was revised to expand the scope of work to include demolition. The authorization of the Removal Action for H Building and contaminated soil in the vicinity was made by the Core Team on June 9, 2003 via the revised H Building Action Memorandum. This document was made available for public review and comment on June 28, 2003 (Appendix C).

Since DOE is the sole responsible party for cleanup of contamination in H Building, no Potentially Responsible Parties (PRPs) were sought to clean up the site. Monsanto Research Corporation, EG&G Mound Applied Technologies, and BWXT of Ohio, Inc. were the operating contractors at the site from 1948 to 30 September 1988, from 1 October 1988 until 30 September 1997, and from 1 October 1997 until 31 December 2002 respectively. CH2M Hill Mound, Inc. became the site contractor for the Miamisburg Closure Project (MCP) effective January 1, 2003.

1.2 Organization of the Removal Action

Table 2 (Appendix B) lists the parties supporting the removal action and their responsibilities.

1.3 Objectives

Documentation Objective. The objective of this H Building Structure OSC Report is to describe the removal action fieldwork, report the air monitoring results, and document successful completion of the structure removal portion of the project. Demolition debris quantities and disposition locations are presented in Table 3. The cost breakdown of the structure portion of the RA is presented in Table 4.

The H Building OSC Report (main portion of this document) is provided to document the soil removal portion of the project, including closure of PRSs 210 and 337.

During demolition activities, Radiological Control performed air monitoring to confirm a safe work environment and document that no radiological contamination was released from the demolition site. Air monitoring results from the building demolition are provided in Appendix E. The highest recorded air monitoring result was 0.01 DAC. All results were below the 0.3 DAC Mound posting criteria.

Structure Demolition Objectives: The objectives of the removal action included:

- Project Planning,
- Public Notification,
- Establish Work Zones,
- Decontamination,
- Demolition,
- Verification,
- Site Restoration, and
- Documentation of Completion.

The verification of superstructure removal is provided in the photographs included in Appendix D.

1.4 Chronological Narrative of the Removal Action

The following is a chronological narrative of events surrounding the H Building Structure removal action.

Timeframe	Activity
1948	H Building construction completed.
1948	Functions included laundry services for company-issued clothing, and dispersion of company-issued clothing for workers.
1948 – 1990s	Maintenance shops
1950	Penthouse filter bank addition (three smaller filter bank rooms adjacent to/west of the original penthouse room).

Timeframe	Activity
1966	Breezeway addition (enclosed breezeway to the east).
1968	Change house addition to the northwestern side of the building (added 56 feet by 53 feet to the first floor, and 21 feet by 17 feet to the penthouse).
1970	Laundry room and air conditioning units/ductwork were remodeled.
1973	Environmental Control Analytical Facility remodel: some lockers and change room facilities were removed, and the area was remodeled to house the site Environmental Laboratories. The new room uses were: Room 105 – entry; Room 106 Industrial Hygiene Lab; Room 104 Bacteriological Lab; Room 103A Counting Room, and Room 103 Environmental Radiological Lab.
December 1991 – January 1992	Sewer reroute project: routed the wastewater from the former hot laundry to the existing sanitary sewer line.
Mid-1990s	Laundry services for company-issued clothing discontinued. Subsequently used disposable clothing for work performed in contaminated areas.
Mid-1990s	Vehicle Maintenance Office moved out of H Building.
1998	Credit Union (Rooms 102, 113, 115, 116, and 117) moved out of H Building.
August 1998	Core Team signed recommendation for Removal Action to decontaminate hot laundry area of H Building.
September 1998	Verification Sampling and Analysis Plan for H Building Decontamination Project Phase I.
Late 1998	Bioassay laboratory moved to H Building from E Building.
January 1999	Action Memorandum/Engineering Evaluation/Cost Analysis, Removal Action, Building H Hot Laundry, Final, Revision 0. Authorized the decontamination of the hot laundry area of H Building.
April 1999	Project Closure Report, Phase I Removal Action Building H Hot Laundry. This documented the completion of the initial Phase I decontamination activities.
May 1999	Amendment to the Action Memo for Building H Hot Laundry (Phase I).
2000	Automatic Teller Machine (ATM) moved out of H Building.
August 2002	Laundry distribution function discontinued in H Building.
2002	Bioassay laboratory moved out of H Building. Dispersion of company-issued clothing for workers discontinued. Environmental laboratory moved out of H Building.
July – Oct. 2003	H Building safe shutdown and decontamination.
October – November 2003	H Building structure demolished.
January 2004	Structure OSC Report generated.
November 2003 – February 2004	H Building contaminated soil removal action activities, and verification sampling and analysis plan.

2.0 EFFECTIVENESS OF THE REMOVAL ACTION

The H Building superstructure has been demolished and the debris removed and properly disposed of per the EPA-approved Work Package. Photographs taken before, during, and after demolition are included in Appendix D.

2.1 Actions Taken by Site Contractor

CH2M Hill Mound, Inc. personnel planned and performed removal action oversight, building decontamination, building dismantlement and demolition, and onsite transportation and staging of debris. The project met the removal action objectives as outlined in the Action Memorandum (Final, dated August 2003). CH2M Hill Mound, Inc. personnel prepared the Structure OSC Report, which shows that the Removal Action objectives related to the building superstructure were achieved.

In accordance with the Action Memorandum/EE/CA, H Building Removal Action, August 2003, Final (Section 5.1.1), the following actions were taken: Project Planning, Public Notification, Establish Work Zones, Decontamination, and Demolition. This Structure OSC Report provides the Documentation of Completion for the structural portion of the removal action. Verification, Site Restoration, and Documentation of Completion will be provided in the H Building Soil OSC Report.

Building Dismantlement and Demolition

Photographs of H Building before, during, and after demolition are provided in Appendix D. To prevent the generation of airborne radioactive contamination during demolition activities, engineering controls were employed. These controls included (but were not limited to) fixing contamination using liquid fixatives and/or foam, acid etching fixed contamination locations to remove the contamination, and using water misting to prevent fugitive dust emissions.

Liquid and foam fixatives were used inside contaminated pipes and ductwork to prevent the contamination from becoming airborne during demolition. The resulting debris was disposed of as low level waste. Acid etching was done as part of the isotopic analysis of certain contaminated areas of concrete. The resulting samples were analyzed by gamma and/or alpha spectroscopy as appropriate. The sample was then disposed of through the appropriate waste stream. Water misting is performed to knock down fugitive dust. The walk-over surveys and verification sampling and analysis of the site include the areas where the water would knock down dust.

Prior to demolition, Radiological Controls performed an evaluation of the radiological history of the building, and radiological surveys to identify sections of the building that met surface release criteria. Figures 3 and 4 (Appendix A) show the areas of the waste disposition of the various areas of the building. The green areas were surveyed prior to demolition and were designated to meet surface release criteria per MARSSIM evaluation. The yellow areas had been surveyed prior to demolition and met surface release criteria; because these areas were adjacent to contaminated areas, the debris

from the portions of the building shown in yellow was segregated and debris pile surveys were performed to confirm that the contamination had not spread. The red areas of the building were known to be radiologically contaminated and were disposed of as Low Level Waste. Only structural material that met surface release criteria was released to Stoney Hollow Landfill. Radioactively contaminated debris was size reduced and packaged to meet the Envirocare waste acceptance criteria.

Air Monitoring for Worker Safety

During demolition activities, the Mound Radiological Control organization performed air monitoring to confirm a safe work environment, in accordance with 10 CFR 835. Air monitoring results measured during building demolition are provided in Appendix E. The monitors were repositioned up and downwind from the demolition activities in response to changes in wind direction.

The derived air concentration (DAC) is a calculated value for occupationally exposed radiological workers based on continuous, non-shielded exposure. For the purpose of the H Building demolition, the DAC was calculated based on the isotopic mix of 100% plutonium-238. The highest recorded result was 0.010 DAC. All results were well below the 0.3 DAC, which is a Mound Administrative Control level based on 10 CFR 835.

The air monitoring results indicate that there was no airborne worker radiological exposure, and therefore it can be extrapolated that the demolition activities did not pose any risk to human health and the environment.

Additional H Building Removal Action Activities

CH2M Hill Mound, Inc. performed the soil removal action, and prepared the H Building OSC Report (main portion of this document) following project completion.

2.2 Actions Taken by Local, State, and Federal Agencies

The Department of Energy (DOE)/MCP, the United States Environmental Protection Agency (USEPA), and Ohio EPA (OEPA) had oversight responsibility for the removal action. The DOE/MCP was the lead agency for the RA and provided the funding and oversight for the RA. The USEPA and OEPA had oversight responsibility for the RA and review of the Action Memorandum and OSC Reports to ensure that the objectives are/were met.

2.3 Actions Taken by Subcontractors

There were no subcontractors involved in the structure removal portion of the project.

3.0 DIFFICULTIES ENCOUNTERED

3.1 Items that Affect the Removal Action

No difficulties were encountered that affected the removal action.

3.2 Issues of Intergovernmental Coordination

All DOE/USEPA/OEPA interactions were good. The agencies were updated informally on a regular basis, and formally at monthly Core Team meetings. The Mound 2000 Process worked well.

4.0 RECOMMENDATIONS

4.1 Means to Prevent a Recurrence

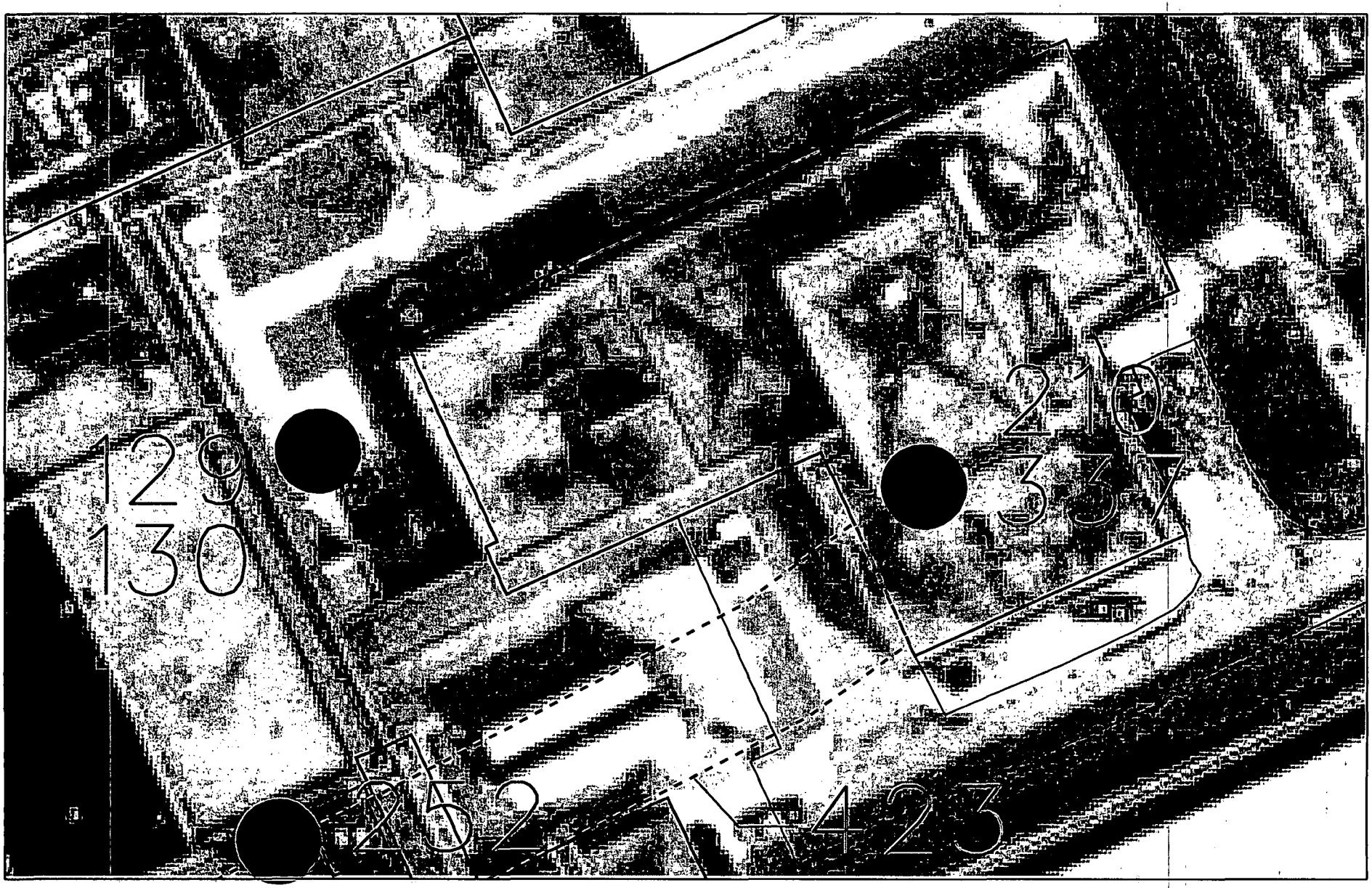
The building debris was removed and properly disposed of per the EPA-approved work plan; therefore, the spread of contamination is prevented. This soil Removal Action is documented in the main portion of this OSC Report.

Within main document Appendix F

APPENDIX A

FIGURES

Figure 1: Site Map (see main document, Appendix A)
Figure 2: H Building and Vicinity
Figure 3: H Building First Floor Waste Disposal
Figure 4: H Building Penthouse Waste Disposal



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FRR 20

PRS Point

PRS Area

PRS Line

20 10 0 20 40FT

GRAPHIC SCALE

MOUND

Environmental Restoration Geographic Information System

SHEET	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
ISSUE																					
SHEET	1	2	3	4	5	6															
ISSUE																					

PART CLASSIFICATION

Figure 2.[illegible]
Building H and Vicinity

DRAWING CLASSIFICATION: UNCLASSIFIED

SIZE | DRAWING NUMBER: vicinity.dgn | JOB NUMBER

DWG TYPE STE | PROJ ER-GIS | CADD | SCALE | SHEET 1 OF 1

STATUS MD-REL-03/25/03 | ORIGIN MSTATION / J

ISS	DATE	REVISION	BY	CHKR	ENG	LPROC	APVD	B
	03/25/03		SSF					

Figure 3: H Building First Floor Waste Disposal

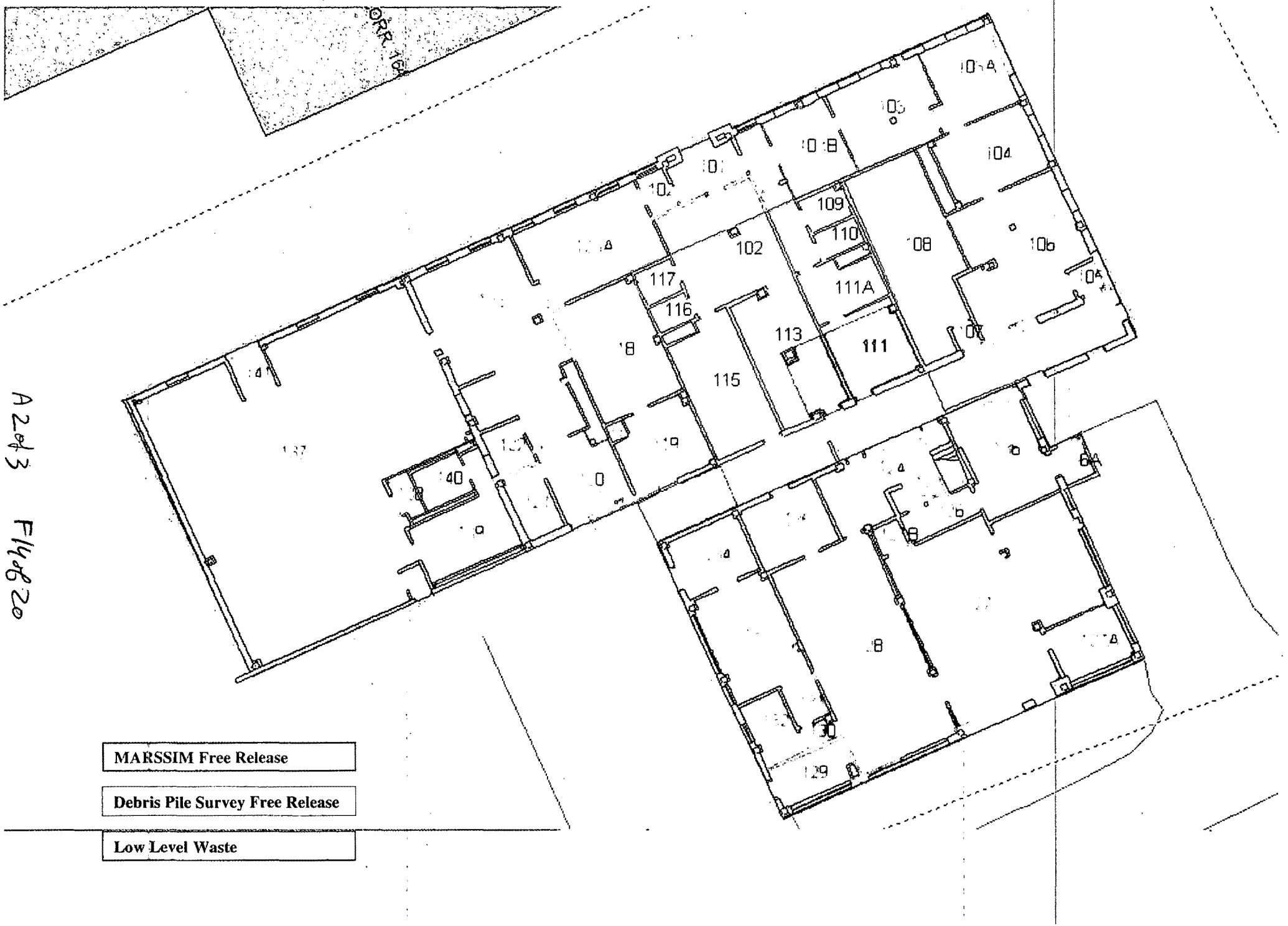

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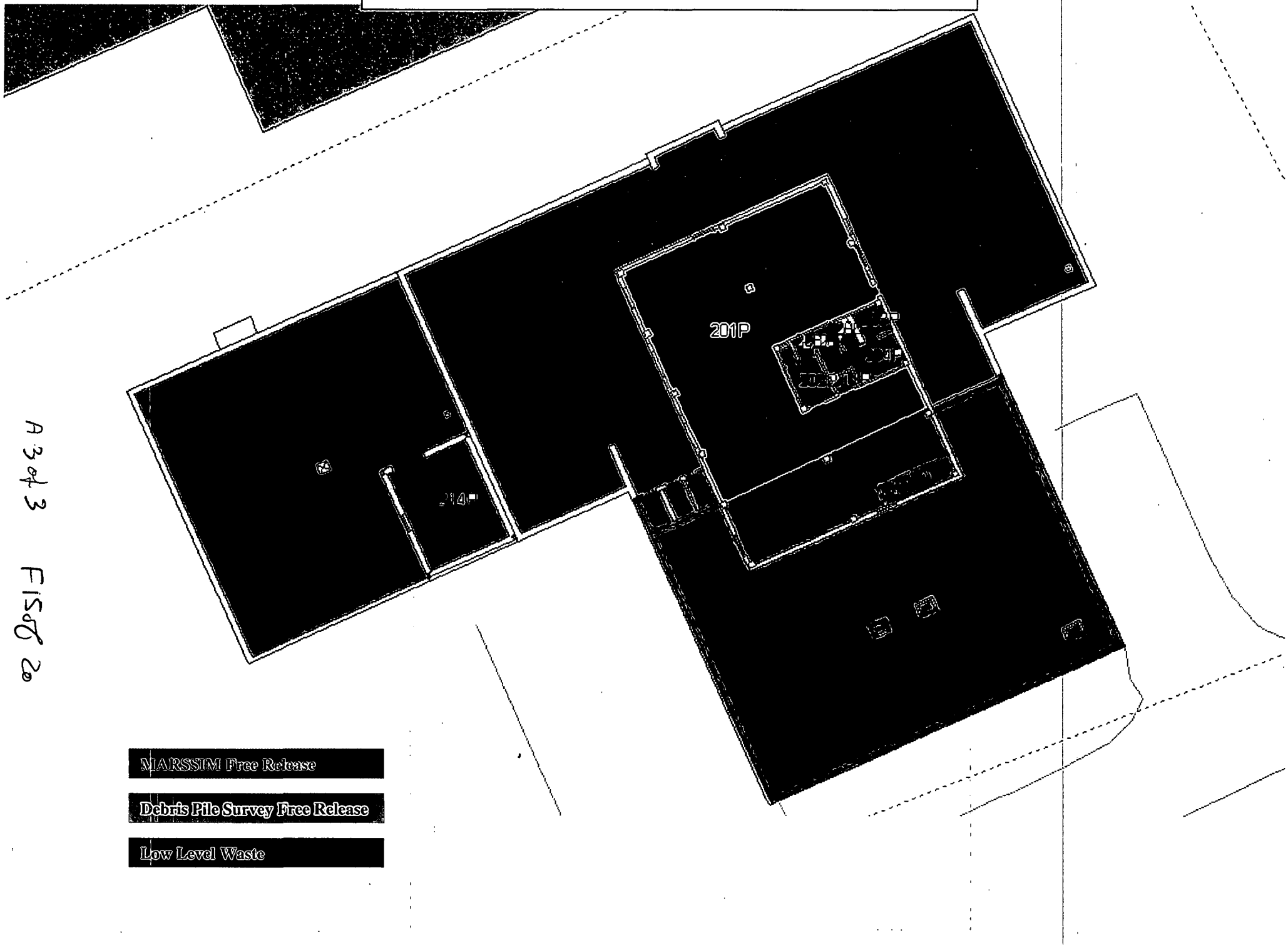
Figure 4: H Building Penthouse Waste Disposal



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Within main document Appendix F

APPENDIX B

TABLES

This appendix intentionally blank.
See Appendix B of main document for all tables.

Within main document Appendix F

APPENDIX C

GENERAL MEDIA INFORMATION

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See Appendix D of main document for all media information.

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APPENDIX D

PHOTOGRAPH DOCUMENTATION

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See Appendix E of main document for all photographic documentation.

Within main document Appendix F

APPENDIX E

RADIOLOGICAL AIR MONITORING RESULTS

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H Building Demolition Air Monitoring

RWP	RWP Revision	Sample ID	Sampler	RCT Collected Date	RSDS Year	RSDS Room/ Area	RSDS ID	Building	Room	Purpose	DAC Fraction
1455	0	22861	8382	10/13/2003	2003	H Demo	03-TF-0266	H	Building	Boundary Verification	0.00E+00
1455	0	22862	8456	10/13/2003	2003	H Demo	03-TF-0266	H	Building	Boundary Verification	3.20E-05
1455	0	22855	8382	10/14/2003	2003	H Demo	03-TF-0268	H	Building	Boundary Verification	2.60E-05
1455	0	22856	8456	10/14/2003	2003	H Demo	03-TF-0268	H	Building	Boundary Verification	3.40E-03
1455	0	22852	8382	10/15/2003	2003	H Demo	03-TF-0269	H	Building	Boundary Verification	3.00E-05
1455	0	22853	8456	10/15/2003	2003	H Demo	03-TF-0269	H	Building	Boundary Verification	2.00E-05
1455	0	22858	8382	10/16/2003	2003	H Demo	03-TF-0271	H	Building	Boundary Verification	0.00E+00
1455	0	22859	8456	10/16/2003	2003	H Demo	03-TF-0271	H	Building	Boundary Verification	1.99E-05
1455	0	22978	8382	10/20/2003	2003	H Demo	03-TF-0275	H	Building	Boundary Verification	1.80E-05
1455	0	22979	8456	10/20/2003	2003	H Demo	03-TF-0275	H	Building	Boundary Verification	3.60E-05
1455	0	22981	8382	10/21/2003	2003	H Demo	03-TF-0278	H	Building	Boundary Verification	1.50E-05
1455	0	22982	8456	10/21/2003	2003	H Demo	03-TF-0278	H	Building	Boundary Verification	0.00E+00
1455	0	22984	8382	10/22/2003	2003	H Demo	03-TF-0279	H	Building	Boundary Verification	0.00E+00
1455	0	22985	8456	10/22/2003	2003	H Demo	03-TF-0279	H	Building	Boundary Verification	3.20E-03
1455	0	22975	8382	10/23/2003	2003	H Demo	03-TF-0282	H	Building	Boundary Verification	1.00E-02
1455	0	22976	8456	10/23/2003	2003	H Demo	03-TF-0282	H	Building	Boundary Verification	0.00E+00
										Maximum Value	**1.00E-02**

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