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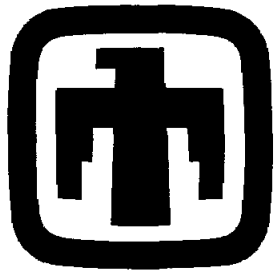
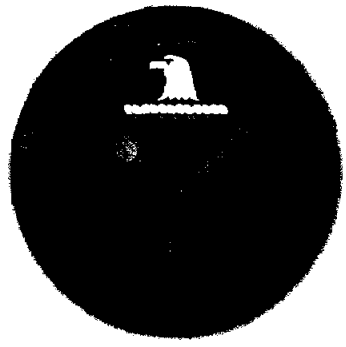


Sandia National Laboratories/New Mexico
Environmental Restoration Project

PHASE TWO VOLUNTARY CORRECTIVE ACTION PLAN FOR SOLID WASTE MANAGEMENT UNIT 105 BUILDING 6536

DECEMBER 2005



United States Department of Energy
Sandia Site Office

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

EXECUTIVE SUMMARY

Sandia National Laboratories/New Mexico is proposing a Phase II Voluntary Corrective Action (P2VCA) at Solid Waste Management Unit 105, located in Technical Area III (TA-III). A release of mercury to the environment was discovered in June 2005 in soil adjacent to Building 6536. Planned activities in the P2VCA include excavation and off-site disposal of mercury-contaminated soil, characterization of the extent of mercury contamination, and collection of confirmatory soil samples. A risk assessment will be performed using the analytical results of the confirmatory soil samples. The activities of the P2VCA will be consistent with the overall corrective action objectives set forth in Section VI of the Compliance Order on Consent from the New Mexico Environment Department.

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
CAC	Corrective Action Complete
cu yd	cubic yard(s)
D&D	decontamination and demolition
DQO	data quality objective(s)
ER	Environmental Restoration
ft	foot
HASP	health and safety plan
MVA	mercury vapor analyzer
mg/m^3	milligrams per cubic meter
mg/kg	milligrams per kilogram
NMED	New Mexico Environment Department
P1VCA	Phase I Voluntary Corrective Action
P2VCA	Phase II Voluntary Corrective Action
QAP	Quality Assurance Plan
QC	Quality Control
SNL/NM	Sandia National Laboratories/New Mexico
SWMU	Solid Waste Management Unit
U.S.	United States

1.0 INTRODUCTION

Sandia National Laboratories/New Mexico (SNL/NM) is located on the federally owned Kirtland Air Force Base and permitted to the U.S. Department of Energy (Figure 1-1). Solid Waste Management Unit (SWMU) 105 is located in Technical Area III (TA-III). SNL/NM is proposing a Phase II Voluntary Corrective Action (P2VCA) at SWMU 105 to characterize the extent of mercury contamination in the soil adjacent to Building 6536 and to conduct an expedited remediation of the contamination (Figure 1-2). A Phase I VCA (P1VCA), limited to a portion of the site, was conducted in September, 2005 (SNL/NM 2005). However, mercury contamination was found to be more extensive than initially thought and a second phase is needed to address the entire site.

1.1 Objectives and Scope

The objectives of this proposed action are consistent with the overall corrective action objectives and requirements set forth in Section VI of the Compliance Order on Consent (the Order) from the New Mexico Environment Department (NMED) (NMED April 2004), instituting timely remediation efforts to address the mercury release at SWMU 105. This remedial action consists of excavation and removal of mercury-contaminated soil from the source area, confirmatory soil sampling of the entire SWMU 105 site, and disposal of generated waste. It includes a contingency plan for excavation and disposal of additional soil that may be revealed to have unacceptable mercury concentrations after confirmatory sampling has been completed. This P2VCA is intended to be the final remedy for SWMU 105. Remediation goals defined for the cleanup will ensure that human health and the environment are protected over the long term and health and safety measures will ensure that workers are protected during the P2VCA activities. The following factors were considered in determining the need for a P2VCA at SWMU 105:

- Known mercury contamination within Building 6536 was released to the environment (soil outside of the building),
- Mercury vapor readings indicated additional areas under the building that may have had a mercury release to the environment,
- The proposed remedy can be readily applied,
- The remedial action is intended as a final resolution to eliminate source material and prevent potential release or migration of contamination from the site, and
- Environmental, safety, and health risk reductions will be achieved.

1.2 Approach and Implementation

The nature and extent of contamination associated with SWMU 105 will be defined as part of the P2VCA activities. The P2VCA will consist of the following primary activities:

- Excavation and removal of mercury-contaminated soil,
- Collection of confirmatory soil samples that will be analyzed for total mercury,
- Review and summary of analytical results,
- Calculation of human health and environmental risks, and

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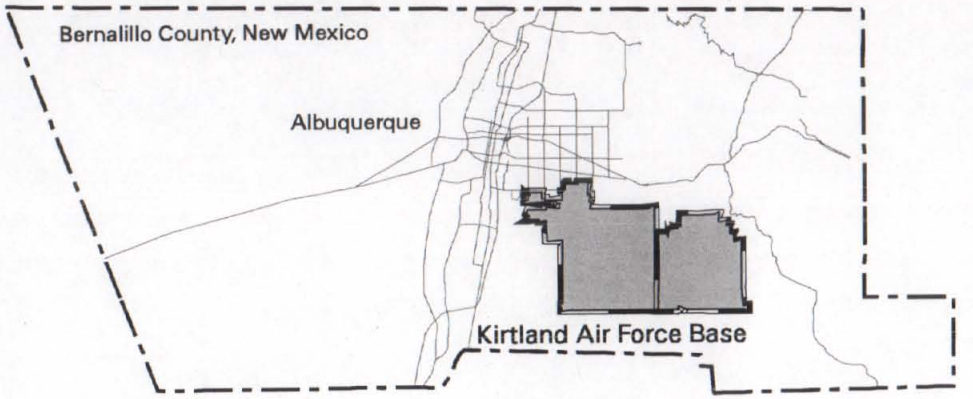
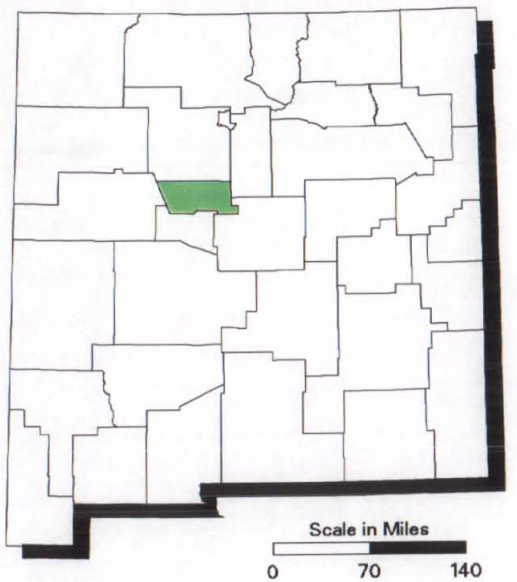


Figure 1-1 Location Map of Sandia National Laboratories / New Mexico & Technical Area III

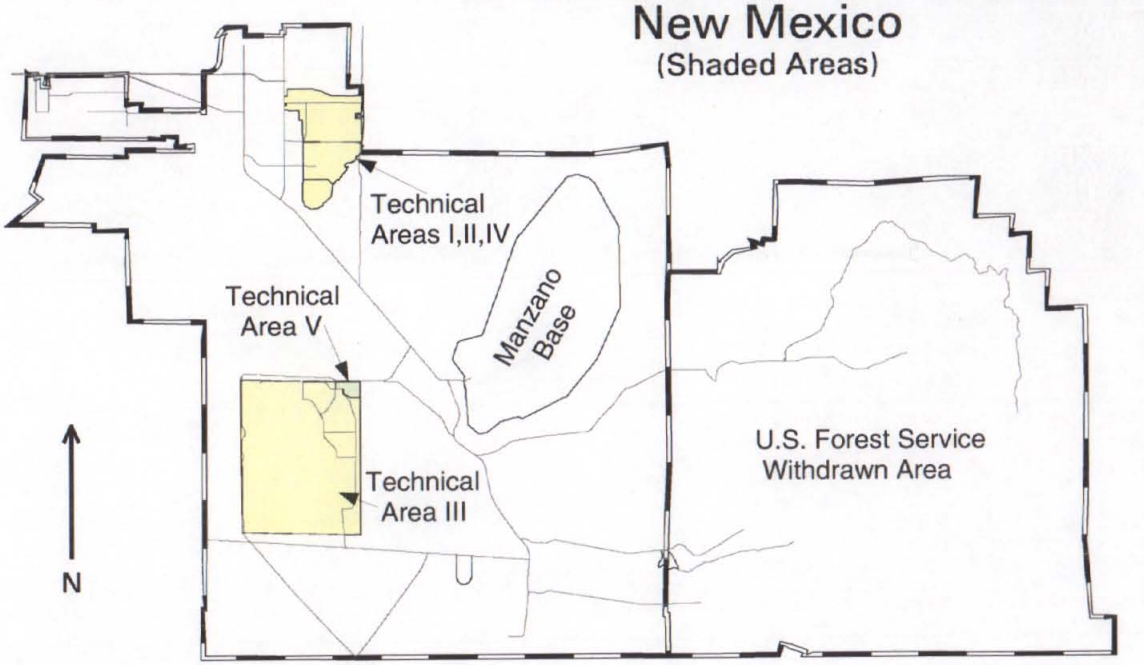
Scale in Miles
0 6 12

Bernalillo County, New Mexico



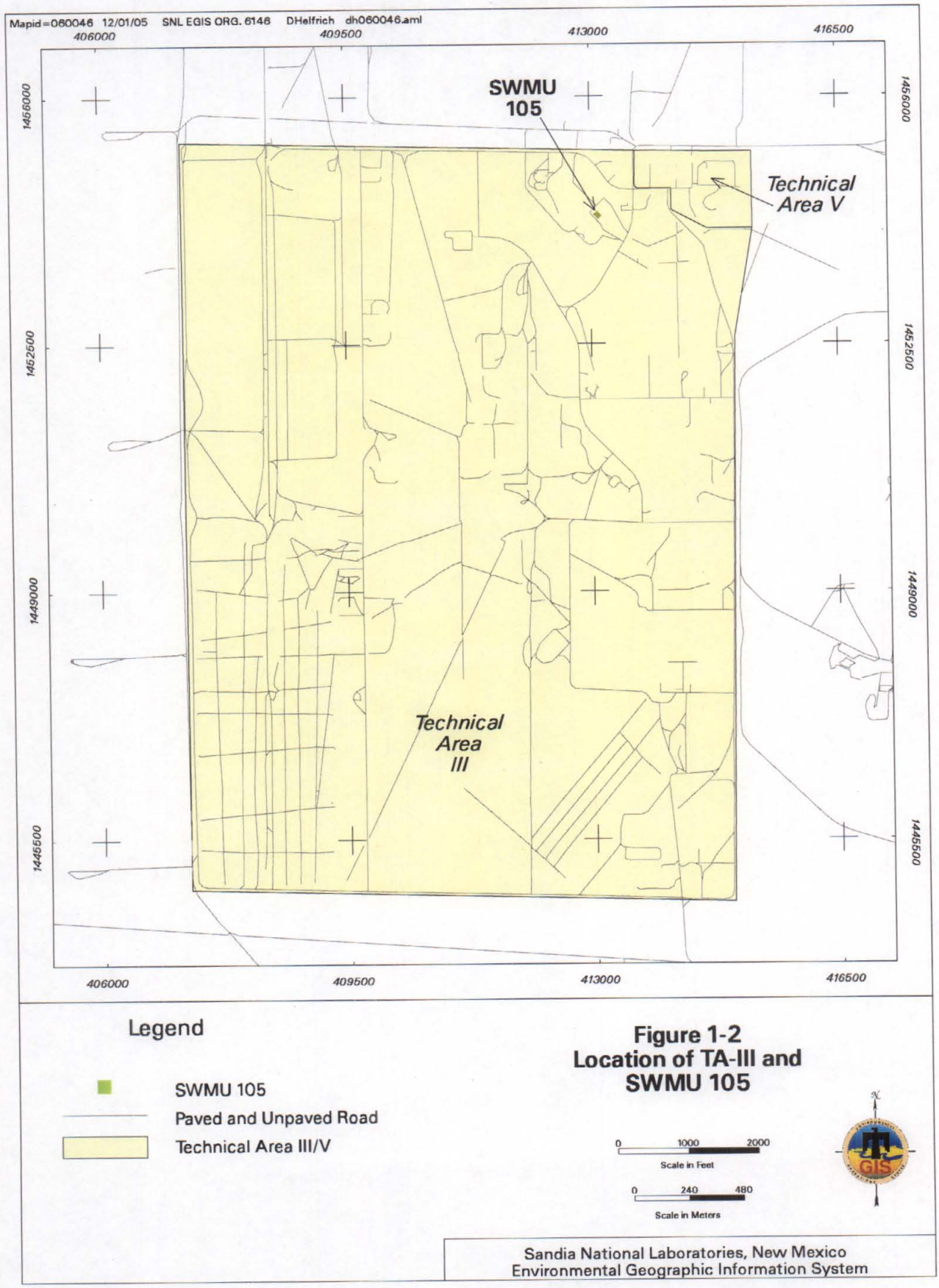
Scale in Miles
0 70 140

Sandia National Laboratories New Mexico
(Shaded Areas)



Scale in Miles
0 2.5 5

Source: SNL EGIS Database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406000
409500
413000
416500
1456000
1452500
1449000
1445500
SWMU 105
Technical Area V
Technical Area III
Legend
SWMU 105
Paved and Unpaved Road
Technical Area III/V
Figure 1-2
Location of TA-III and SWMU 105
0 1000 2000
Scale in Feet
0 240 480
Scale in Meters
N
GIS
Sandia National Laboratories, New Mexico
Environmental Geographic Information System

- All waste streams will be managed and disposed of according to SNL/NM policy.

1.3 Regulatory Issues

The P2VCA will be conducted under Sections VI.H.3 and 4 of the Order and will not pose an unacceptable risk to human health or the environment. The objectives for this P2VCA have been designed to achieve source reduction and are consistent with the overall corrective action objectives and requirements. As required by Sections VI.H and XI of the Compliance Order, this P2VCA Plan will be submitted to the NMED at least 15 days prior to the start of the fieldwork. A Corrective Action Complete (CAC) Report will present the results of this P2VCA, the complete investigation history of SWMU 105, and a final site risk assessment. The CAC report will serve as the basis for a CAC determination.

1.4 Mercury Remediation Goal

The back-calculated preliminary remediation goal for mercury in soil is less than or equal to 22.8 milligram per kilogram (mg/kg) for a residential receptor based on current SNL/NM risk methodology. For SWMU 105, a soil remediation goal will be an upper confidence limit (UCL) of 22.8 mg/kg for all discrete samples collected. Thus, the site will qualify for "Corrective Action Complete without Controls" (equivalent to residential land-use status) by meeting this goal.

1.5 Data Quality Objectives

This P2VCA will be conducted in accordance with data quality objectives (DQOs) developed by SNL/NM's Environmental Restoration (ER) Project. The DQOs are documented in the Quality Assurance Plan (QAP) (SNL April 1996). The primary data requirement for this P2VCA is to have data of sufficient quality to verify that the remediation goal is met. The DQO process for this P2VCA follows these general steps:

- Compile and evaluate site background information,
- Develop and refine a conceptual model based on field investigation and laboratory data, and
- Establish corrective action objectives and remediation goals,
- Establish confirmatory methods to ensure corrective action objectives have been achieved,
- Data validation procedures to assure that laboratory analytical data are defensible and can provide the basis for a "Corrective Action Complete without Controls" determination.

2.0 DESCRIPTION AND HISTORY OF SWMU 105 – BUILDING 6536

Building 6536 was built prior to 1967 for use in testing aerospace nuclear safety equipment. Personnel interviews indicated that a mercury bath used to measure pressure in equipment was examined and it was determined that the bath contained 10 to 13 pounds less mercury than the full volume capacity. According to additional interviews, it was not known if the bath had ever been at full capacity. A 1982 industrial hygiene report indicated that mercury (elemental [free] mercury and mercury vapor) was present within the Equipment Room (McKelvey 1982). At a later unknown date, the mercury bath was removed.

A No Further Action (NFA) proposal was submitted the U.S. Environmental Protection Agency (the regulatory authority at the time) in August 1994 (SNL/NM 1994). SWMU 105 received a NFA determination in July 1995 and was removed from the permit in December 1995 (Davis 1995). Written notification of the newly-discovered subsurface release at SWMU 105 was transmitted to the NMED Hazardous Waste Bureau on July 13, 2005. Due to the nature of the subsurface release (see below), any surface investigation prior to July 2005 would not have revealed the contamination.

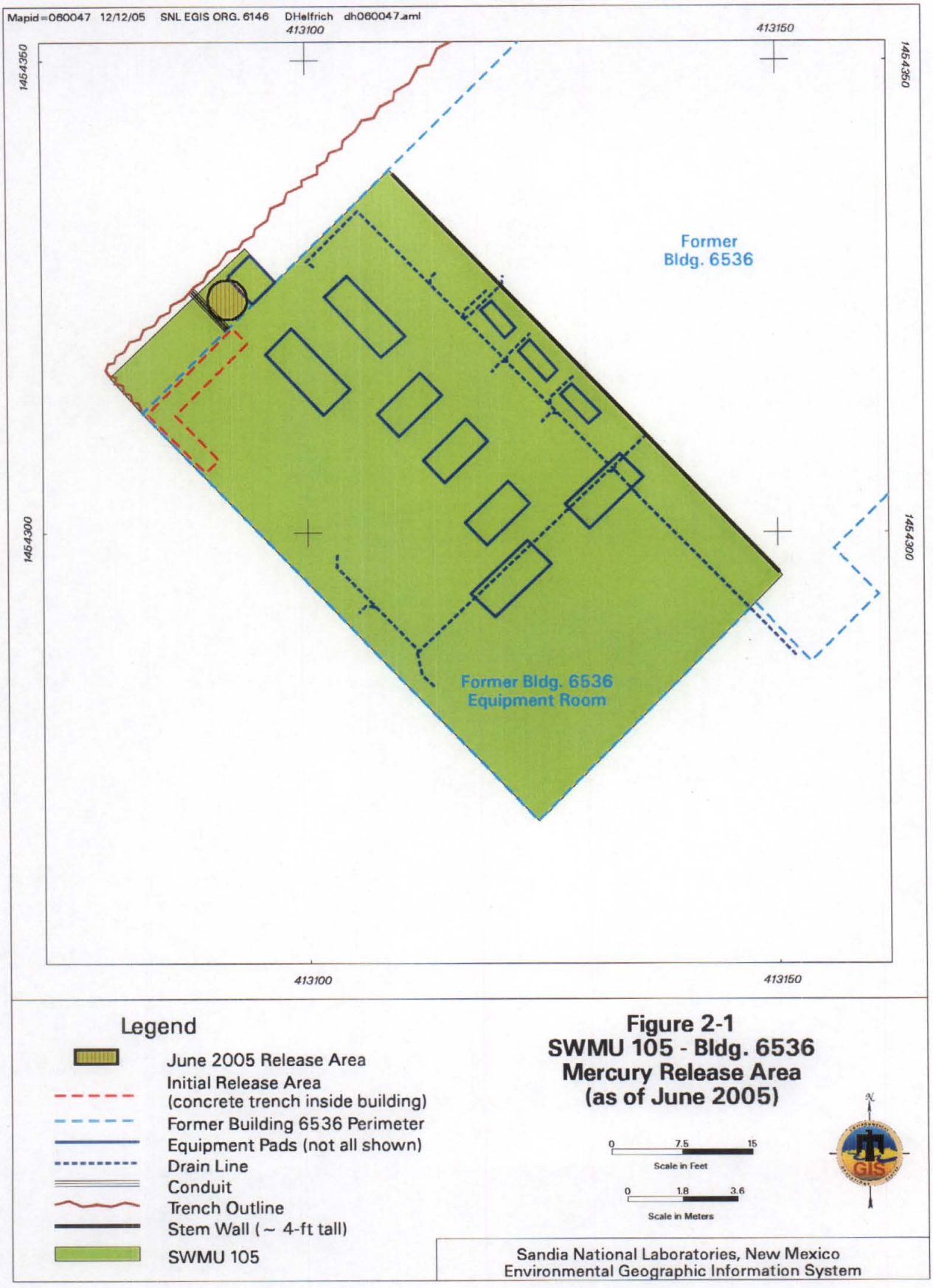
2.1 History of Release

On May 9, 2005, during decontamination and demolition (D&D) activities at Building 6536, mercury contamination was found inside the building within a concrete trench, located along the northwest wall of the Equipment Room (Figure 2-1). On June 29, 2005, free mercury was found in soil outside the building. The release probably originated from a crack in the building foundation adjacent to the interior concrete trench. An exterior trench was excavated along the northwest wall of the building (Figure 2-1), and soil from the trench was stockpiled on site. Free mercury was visible in the soil and in large pores in a subsurface concrete block adjacent to the building.

2.2 Soil Sampling and Additional Investigation

Discrete soil samples were collected from the exterior trench on July 6 and 21, 2005 (Figure 2-2). Analytical results for the soil samples indicated mercury concentrations ranged from 0.17 mg/kg to 39.6 mg/kg next to the exposed concrete block. This investigation was performed by the SNL/NM Facilities Management and Operations Center that was conducting the D&D activities.

During the week of September 6, 2005, D&D personnel removed the concrete block located adjacent to the northwest wall of Building 6536 and residual free mercury was collected from the concrete block surface and from the soil surrounding the block. The mercury-contaminated soil was excavated to 4 feet (ft) in the area of the June 2005 release, but more mercury-contaminated soil remained. Despite careful hand digging to avoid transferring mercury contamination deeper, visible mercury and elevated mercury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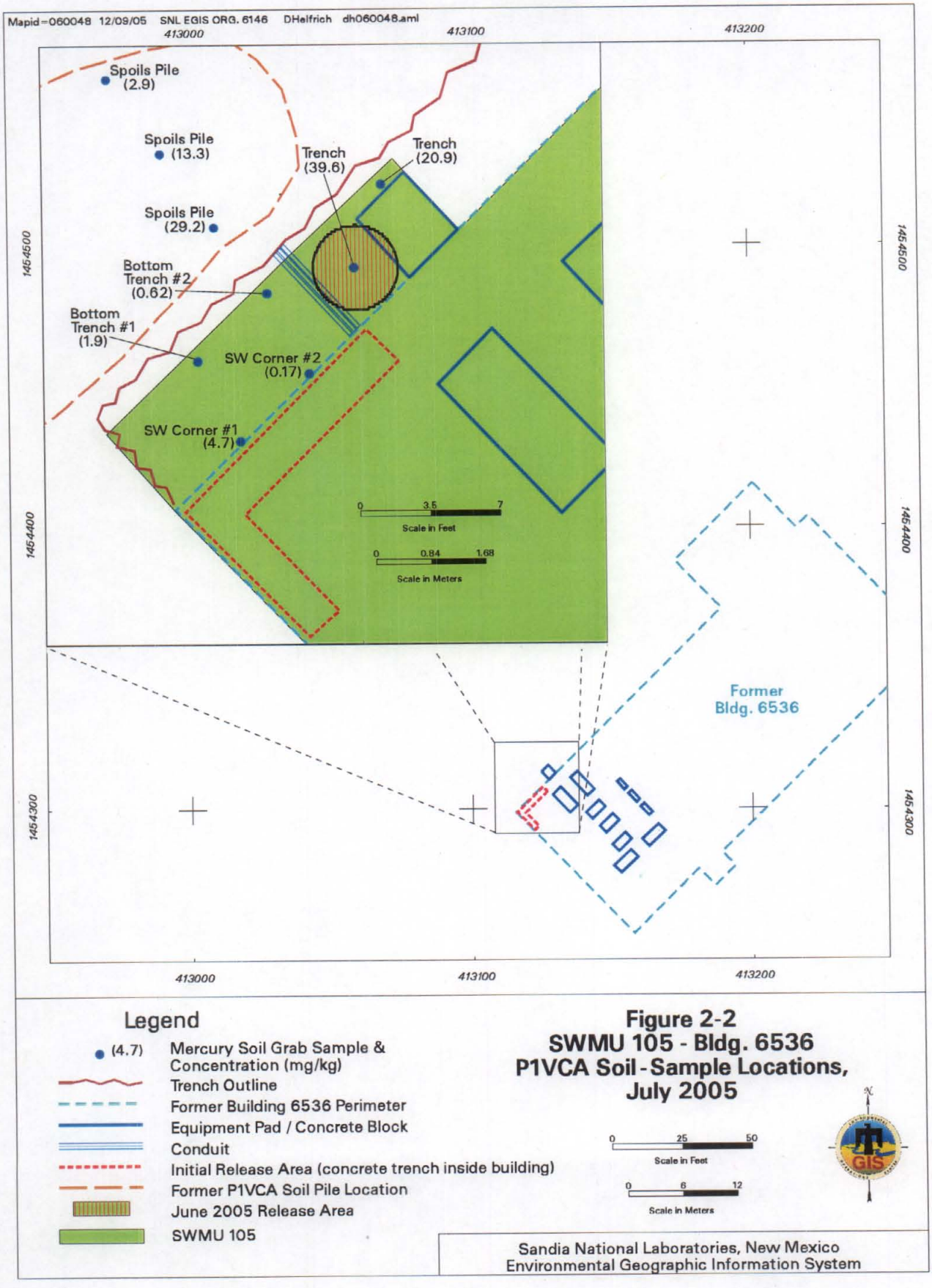
413100
413150
1454350
1454300
Former
Bldg. 6536
Former Bldg. 6536
Equipment Room
Legend
June 2005 Release Area
Initial Release Area
(concrete trench inside building)
Former Building 6536 Perimeter
Equipment Pads (not all shown)
Drain Line
Conduit
Trench Outline
Stem Wall (~ 4-ft tall)
SWMU 105
Figure 2-1
SWMU 105 - Bldg. 6536
Mercury Release Area
(as of June 2005)
0 7.5 15
Scale in Feet
0 1.8 3.6
Scale in Meters
N
GIS
Sandia National Laboratories, New Mexico
Environmental Geographic Information System


Mapid=060048 12/09/05 SNL EGIS ORG. 6146 DHelfrich dh060048.aml
413000
413100
413200
1454500
1454400
1454300
Spoils Pile (2.9)
Spoils Pile (13.3)
Spoils Pile (29.2)
Trench (39.6)
Trench (20.9)
Bottom Trench #2 (0.62)
Bottom Trench #1 (1.9)
SW Corner #2 (0.17)
SW Corner #1 (4.7)
0 3.5 7
Scale in Feet
0 0.84 1.68
Scale in Meters
Former Bldg. 6536
Legend
(4.7) Mercury Soil Grab Sample & Concentration (mg/kg)
Trench Outline
Former Building 6536 Perimeter
Equipment Pad / Concrete Block
Conduit
Initial Release Area (concrete trench inside building)
Former P1VCA Soil Pile Location
June 2005 Release Area
SWMU 105
Figure 2-2
SWMU 105 - Bldg. 6536
P1VCA Soil-Sample Locations,
July 2005
0 25 50
Scale in Feet
0 6 12
Scale in Meters
N
GIS
Sandia National Laboratories, New Mexico
Environmental Geographic Information System

soil-vapor meter readings still persisted. Additional evidence of mercury-contaminated soil was found in other areas beneath the slab.

On October 6, 2005, the concrete foundation of the Building 6536 Equipment Room was removed. The removal began at the northwest corner of the building. After approximately 15 horizontal ft of the concrete foundation along the southwest side of the building was removed, in-situ soil vapor readings were taken with a mercury vapor analyzer (MVA). Initial readings were non-detect. However, as the foundation removal continued to the south/southeast, positive MVA readings were detected in the soils beneath the foundation. Upon completion of removal of the building foundation, a 5-ft by 5-ft grid was established in the area of the former building footprint. In-situ soil vapor reading were collected from the surface with the MVA. Readings were collected in the center of each grid in an attempt to better define the extent of the mercury contamination (Figure 2-3). Positive MVA readings ranging from 0.003 mg/cubic meter (m^3) to 0.093 mg/m^3 were detected along the middle of the northeast side of the grid area. A possible mechanism of release in this area may have been concrete joints surrounding equipment pads located within the room. The pads were isolated from the main slab and supported an air compressor and other equipment. Mercury that had been released in the room may have migrated down into the joints between the building foundation (floor) and the equipment pads, assisted by the vibratory action of an operating air compressor.

The survey points with positive MVA readings were flagged for future investigation activities. All construction debris, concrete rubble, and mercury-contaminated soil (removed during the trench excavation) were removed from the site. These waste streams were managed by D&D personnel and disposed of in accordance with SNL/NM waste management policy.

The above activities and analytical results represent all investigations, a summary of all existing data, and site assessments completed during the initial P1VCA. ER Project personnel will complete the P2VCA activities at SWMU 105.

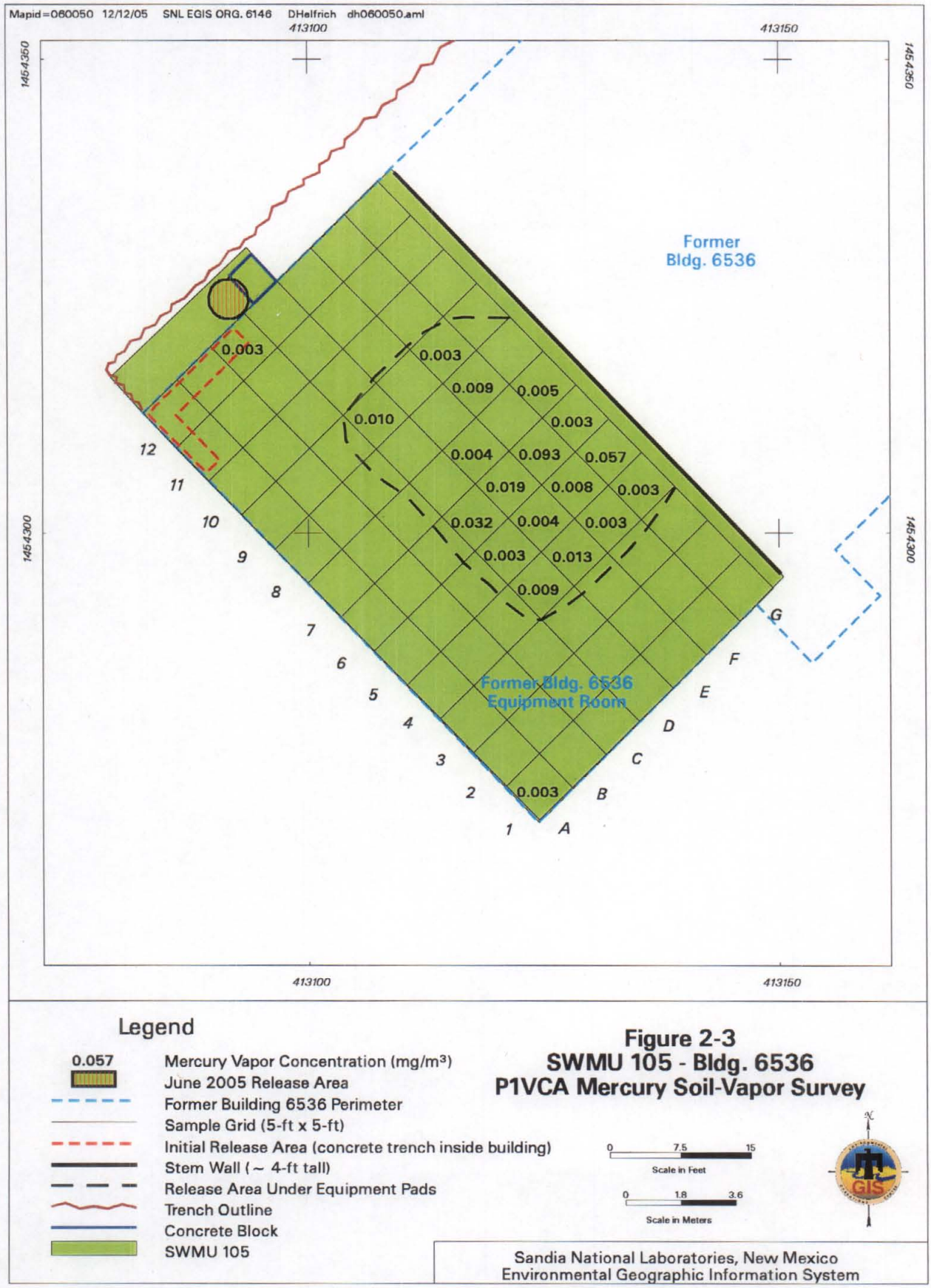


Figure 2-3
SWMU 105 - Bldg. 6536
P1VCA Mercury Soil-Vapor Survey

3.0 SCOPE OF VOLUNTARY CORRECTIVE ACTION ACTIVITIES

Based on the findings of mercury contamination in the soil during the initial P1VCA activities, it will be necessary for ER Project personnel to conduct additional sampling in the area of the trench and beneath the former Building 6536 foundation. ER Project personnel will determine the extent of the contamination, remove mercury-contaminated soils in the originally identified area, containerize and dispose of excavated material at an off-site waste disposal facility, and evaluate analytical results to determine if mercury is present in the soil at levels considered hazardous to human health for either the industrial or residential land-use risk scenarios. Below is a discussion of the proposed P2VCA activities which will occur at SWMU 105.

3.1 Primary P2VCA Activities

The primary activities of the P2VCA are the removal and disposal of mercury-contaminated soil, and confirmatory sampling which involves the following:

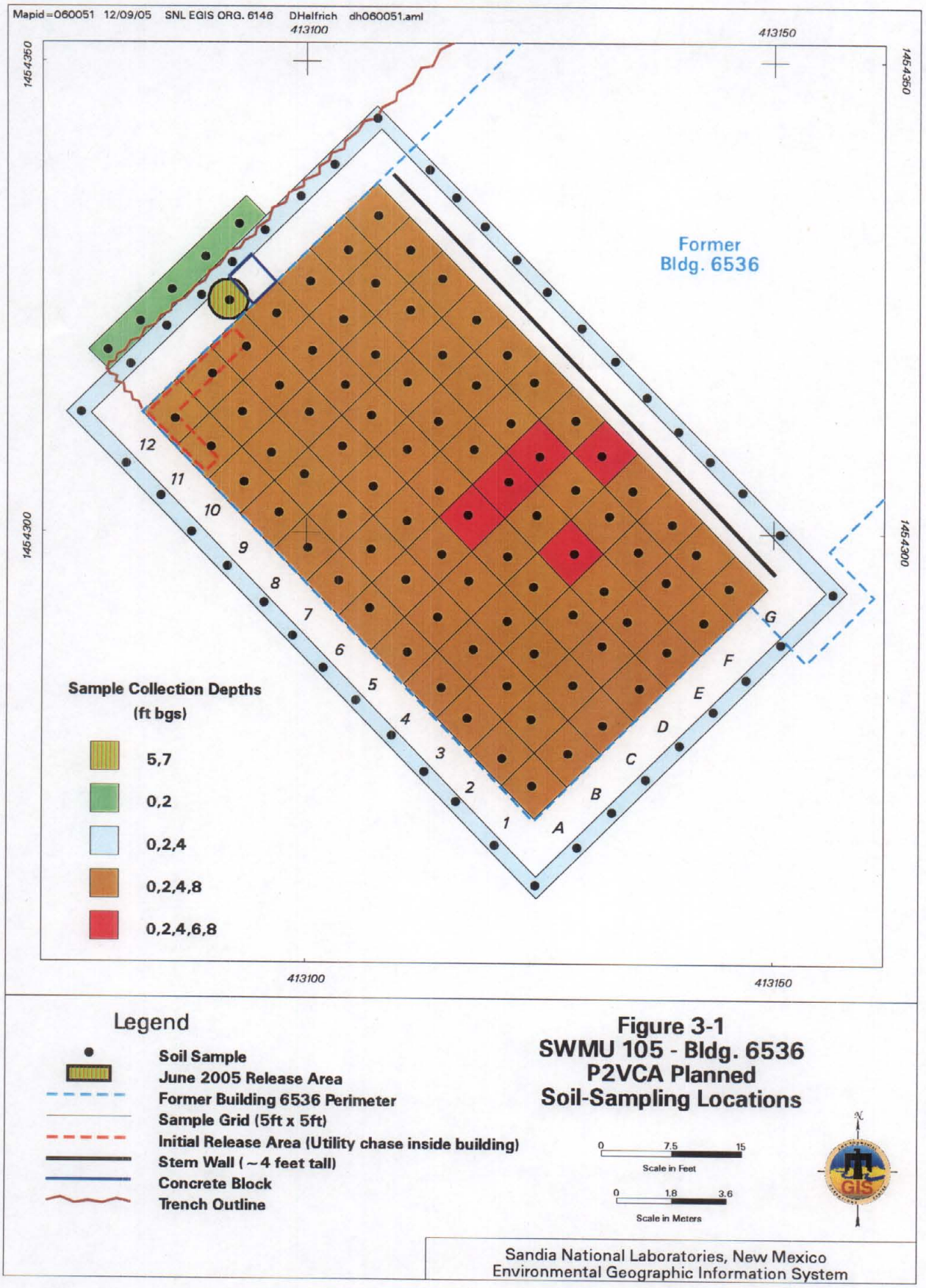
- Removal of approximately 0.3 cubic yard (cu yd) of mercury-contaminated soil from the originally identified release site in the trench. This material will be sampled and managed according to the site-specific waste management plan.
- Collection of approximately 500 confirmatory soil samples within the building footprint and 5 ft beyond it in all directions.

3.1.1 Removal of Mercury-Contaminated Soil

The trench area of the site will be expanded to the northwest and the sides sloped to allow personnel and equipment access into the excavation area, and will also eliminate confined space conditions. Soil from the area of the highest known contamination will be removed and placed in 55-gallon drums for disposal. It is estimated that approximately 0.3 cu yd of soil may be considered hazardous waste and will be managed according to SNL/NM policy.

3.1.2 Confirmatory Soil Sampling

Following the removal of soil as described above, the 5-ft by 5-ft grid area will be re-established. Samples will be collected from the center of each grid square (Figure 3-1). A Geoprobe sampling rig will be used to collect samples from each grid area. Samples will be collected at varying target depths (Table 3-1). Target depths for sampling were selected based on the results of the D&D investigation. A maximum sampling depth of 8 ft bgs was selected for the site.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413100
413150
1454350
1454300
Former
Bldg. 6536
12
11
10
9
8
7
6
5
4
3
2
1
A
B
C
D
E
F
G
Sample Collection Depths
(ft bgs)
5,7
0,2
0,2,4
0,2,4,8
0,2,4,6,8
Legend
Soil Sample
June 2005 Release Area
Former Building 6536 Perimeter
Sample Grid (5ft x 5ft)
Initial Release Area (Utility chase inside building)
Stem Wall (~4 feet tall)
Concrete Block
Trench Outline
Figure 3-1
SWMU 105 - Bldg. 6536
P2VCA Planned
Soil-Sampling Locations
0 7.5 15
Scale in Feet
0 1.8 3.6
Scale in Meters
N
GIS
Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Table 3-1. Specifications of Confirmatory Soil Sampling

Area (as designated on Figure 3-1)	Number of Sample Locations in Area	Target Depths (ft bgs)	Number of Soil Samples
Green striped	2	5, 7[a]	2
Green	5	0,2	10
Pink	5	0 ,2 ,4, 6, 8	25
Blue	42	0 ,2 ,4	132
Orange	79	0 ,2 ,4, 8	316
Total	**133**	--	**485**

[a] Target depths in this area will start at surface of the exterior trench, which is approximately four to five ft bgs.

Samples will be collected from a butyl acetate sleeve lined split-spoon sampler and transferred to sample containers. Samples will be submitted to an off-site laboratory for analysis of total mercury by U.S. Environmental Protection Agency Method SW846 7471A. All samples will be collected and managed using standard Analysis Request/Chain-of-Custody procedures. All data will be validated according to current SNL/NM data validation procedures.

Quality control (QC) requirements are specified in the QAP. Table 3-2 presents the samples needed to meet QC requirements for the SWMU 105 P2VCA.

Table 3-2. Quality Control Samples

Sample Type	Frequency	Total Number of Samples (approximated)	Matrix
Duplicate Soil Samples	5%	25	Soil
Equipment Rinsate Samples	1 per day	35	Aqueous

3.1.3 Evaluation of Analytical Results

The discrete soil-sample results will be compared to 22.8 mg/kg. If all results are below 22.8 mg/kg, no further remediation (soil removal) or soil sampling will be needed and a risk assessment will be performed. If some sample results exceed 22.8 mg/kg, a UCL for mercury will be calculated. The UCL and the discrete mercury concentrations will be used to determine if any additional remediation is needed. Increasing concentration trends in a horizontal direction and/or in depth may require excavation of the mercury-contaminated soil and/or additional sampling. Isolated areas that exceed 22.8 mg/kg may be left in place and the results will be included in the risk calculations.

3.1.4 Risk Assessment

A risk assessment will be performed after all activities have been completed using all confirmatory soil sampling data collected during the P1VCA and the P2VCA. However, the soil remaining in areas that have been excavated will be resampled for confirmation; and results will be included in the risk assessment.

3.2 Contingency Activity - Removal of Additional Soil

Following the confirmatory sampling activities discussed in this plan, a data review and evaluation will be performed to determine if SWMU 105 will pass the remediation goal. If it is determined that SWMU 105 will not meet risk criteria, additional contaminated soil may be excavated. These areas would then be resampled and included with other sample results for reevaluation to confirm that the site will meet criteria.

3.3 Auxiliary P2VCA Activities

Auxiliary activities that accompany the primary P2VCA activities include implementing a site-specific waste management plan, a site-specific health and safety plan, and a project schedule.

3.3.1 Waste Management

A site-specific waste management plan will be written and approved by ER and Environmental Regulatory Compliance personnel. The plan will define the waste streams that will be generated, the criteria needed to determine the fate of the waste, and the appropriate disposal paths for each type and level of waste generated. All waste streams generated will be managed and disposed of in accordance with SNL/NM policy.

3.3.2 Health and Safety

A site-specific health and safety plan (HASP) will be written and approved by ER, Industrial Hygiene, and Safety Engineering personnel. The HASP will identify hazards associated with each task in the P2VCA, specify requirements for personal protective equipment, and include action guidelines and contingency plans. The plan will also assign responsibilities to specific personnel and include an emergency contact list.

3.3.3 Project Schedule

The anticipated start of the P2VCA is January 11, 2006. The remediation activities and confirmatory sampling are expected to continue for five to six weeks. The CAC report will be submitted to the NMED in approximately July 2006.

4.0 REFERENCES

Davis, A.M. (U.S. Environmental Protection Agency), 1995. Letter to M.J. Zamorski (U.S. Department of Energy), "Class 3 permit modification to remove 13 Solid Waste Management Units," December 1995.

McKelvey, (Sandia National Laboratories/New Mexico [SNL/NM]), 1982. "Industrial Hygiene Services Investigation Report," February 1982.

New Mexico Environment Department (NMED), 2004. "Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act," § 74-4-10, New Mexico Environment Department, April 2004.

Sandia National Laboratories/New Mexico (SNL/NM), 1994. "Proposals for Administrative No Further Action Environmental Restoration Fiscal Year 1994," August 1994.

Sandia National Laboratories/New Mexico (SNL/NM), 1996. "Quality Assurance Plan for the SNL/NM Sample Management Office," April 1996.

Sandia National Laboratories/New Mexico (SNL/NM), 2005. "Voluntary Corrective Action Plan for SWMU 105 – Mercury Contamination in Soil Adjacent to Building 6536", September 2005.