SITE-SPECIFIC INVESTIGATION REPORT
FOR
4835 GLENBROOK ROAD

SPRING VALLEY FORMERLY USED DEFENSE SITE

OPERABLE UNIT 3, WASHINGTON, DC

CONTRACT W912DY-04-D-0005 TO 0007

FUDS MEC/CWM PROJECT NO. C03DC091801

PREPARED FOR:

U. S. ARMY ENGINEERING AND SUPPORT CENTER, HUNTSVILLE

AND

U. S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT

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July 18, 2013

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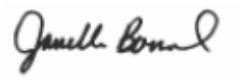

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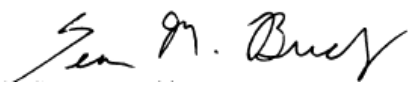

Sean Buckley, Project Manager
July 18, 2013

EXECUTIVE SUMMARY

ES.0.1 The low probability anomaly investigations at 4835 Glenbrook Road were conducted in accordance with the Site-Wide Work Plan for the Spring Valley Formerly Used Defense Site (FUDS), Washington, D.C., and the Final Site-Specific Work Plan for the Test Pit Investigations at 4825 and 4835 Glenbrook Road, Spring Valley, Washington, D.C.

ES.0.2 The test pit investigation preparation started in August 2007, intrusive operations began in October 2007, and investigations were completed in December 2008. A total of 76 out of 77 test pits (TP) planned for the property were completed. Investigation of TP 91 was unable to be completed because of the presence of utilities in the vicinity of the proposed TP location. The TP investigations were performed in open air with near real-time air monitoring for various chemicals of potential concern (COPCs). Soil sampling was performed when conditions warranted (e.g., suspected American University Experiment Station (AUES)-related debris or munitions, discolored soil, or strange odor).

ES.0.3 No suspected AUES-related debris was recovered in 62 TP excavations. Cultural debris was recovered from some of these 62 TPs. These excavations were cleared, backfilled, and the cultural debris was disposed at a Resource Conservation and Recovery Act (RCRA) non-hazardous landfill.

ES.0.4 In 14 TP excavations and the area north of TP 17, suspect AUES-related items were recovered. Of these 14 TPs, 13 TPs included suspect AUES-related labware component fragments (glass tubing, stoppers, glass fragments, etc.), and one TP (TP 49) included a Livens projectile.

ES.0.5 Soil excavation was performed and approximately 539 cubic yards of arsenic impacted soil at concentrations exceeding the Spring Valley remedial action level of 20 milligrams per kilogram (mg/kg) were removed from the property and disposed off-site at the King and Queen County Landfill as non-RCRA hazardous waste based on the Toxicity Characteristic Leaching Procedure (TCLP) analytical results (Appendix G, disposal data folder).

ES.0.6 Grab soil samples and soil confirmation samples collected during soil removal indicated that benzo(a)pyrene, aluminum, copper, nickel, cobalt, and thallium detected in one or more samples exceeded their respective Spring Valley comparison levels. These data, along with the other data collected from the previous investigations (1992, 1996, 1999, and 2000), were evaluated in a Human Health Risk Assessment (HHRA) for the property. The HHRA concluded that the cumulative cancer risk estimates for child residents, adult residents, and outdoor workers are well below the United States Environmental Protection Agency point of departure risk level of 1×10^{-6}. Thus, unacceptable cancer risks to the human receptors are not expected from assumed exposures to COPCs in soil at this property. Additionally, the hazard indexes estimated for assumed exposures do not exceed the benchmark level of concern of 1. This latter result indicates that unacceptable non-carcinogenic health effects are not expected from assumed exposures to COPCs in the soil at the property.

ES.0.7 Aluminum, cobalt, thallium, and vanadium were detected in geotechnical soil samples at concentrations exceeding their respective Spring Valley comparison levels. The geotechnical soil samples were collected after performing the HHRA; therefore, results were not included in

the HHRA. Additional risk evaluations for aluminum, cobalt, thallium, and vanadium were conducted based on data collected from the geotechnical soil borings. The risk evaluation demonstrated that aluminum, cobalt, and vanadium concentrations were below the exposure point concentrations and that the recalculated thallium 95 percent Upper Confidence Limit (UCL) was close to the exposure point concentration for thallium used in the HHRA. Therefore, the conclusions of the HHRA are valid for the property.

ES.0.8 Based on results and conclusions of these investigations and the HHRA, no further investigations at this property are recommended.

TABLE OF CONTENTS

LIST OF APPENDICES

APPENDIX L SITE SPECIFIC WORK PLANS (ELECTRONIC ONLY)

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ABP	Agent Breakdown Product
ALSI	Analytical Laboratory Service, Inc.
Apex	Apex Environmental, Inc.
ASTM	American Society of Testing and Materials
AU	American University
AUES	American University Experiment Station
B(a)P	Benzo(a)pyrene
Bgs	below ground surface
CA	Chemical Agent
CARA	CBRNE Analytical Remediation Activity
CBRNE	Chemical Biological Radiological Nuclear and Explosives
CENAB	U.S. Army Corps of Engineers, Baltimore District
COPC	Chemical of Potential Concern
CPJA	Charles P. Johnson and Associates
CWM	Chemical Warfare Materiel
DAAMS	Depot Area Air Monitoring System
DDOE	District Department of Environment
DERP	Defense Environmental Restoration Program
ECBC	Edgewood Chemical Biological Center
EE/CA	Engineering Evaluation/Cost Analysis
EMS	Environmental Management Systems
Ft	Feet/Foot
FUDS	Formerly Used Defense Site
GC/MS	Gas chromatography-mass spectroscopy
GPL	GPL Laboratories, LLLP
HD	Mustard Agent
HHRA	Human Health Risk Assessment
HI	Hazard Index
HTW	Hazardous Toxic Waste
ICAM	Improved Chemical Agent Monitor
ID	Identification
IDW	Investigation-derived Waste
in.	Inch or inches
Kg	Kilogram
L	Lewisite
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
Mg	Milligram
Mk	Mark
Mm	Millimeter
MINICAMS	Miniature Continuous Air Monitoring System
ND	Not Detected
OSR	Operation Safe Removal

OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated Biphenyl
PDT	Project Delivery Team
PHR&A	Patton Harris Rust & Associates
PID	Photo Ionization Detector
Ppb	parts per billion
PPE	Personal Protective Equipment
Ppm	parts per million
PVC	Polyvinyl chloride
QA	Quality Assurance
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
SSHP	Site Safety and Health Plan
SSWP	Site-Specific Work Plan
SWWP	Site-Wide Work Plan
SVFUDS	Spring Valley Formerly Used Defense Site
SVOC	Semi-volatile Organic Compound
TAL	Target Analyte List
TE	Technical Escort
TES	Traffic Engineering Service
TP	Test Pit
TCLP	Toxicity Characteristic Leaching Procedure
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
ZES	Zimmer Environmental Services

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

1.1.0.1 The purpose of this Site-Specific Investigation Report is to summarize findings of the low probability test pit (TP) investigations and arsenic soil removal conducted in 2007 and 2008 as well as geotechnical soil sampling performed in December 2009 at 4835 Glenbrook Road. This property is part of the Spring Valley Formerly Used Defense Site (SVFUDS), Operable Unit-3 (OU-3) in Washington, D.C. This project falls under the Defense Environmental Restoration Program/Formerly Used Defense Sites (DERP/FUDS).

1.1.0.2 Parsons performed this project under Contract No. W912DY-04-D-0005, Task Order 0007, with the U.S. Army Engineering and Support Center, Huntsville (USAESCH). The U.S. Army Corps of Engineers (USACE), Baltimore District (CENAB) provided the overall operations support. For purposes of this report, USAESCH and CENAB are referred to jointly as "USACE." Other organizations that provided technical input for this project include the U.S. Environmental Protection Agency (USEPA) and the District of Columbia Department of Environment (DDOE). USAESCH subcontracted Edgewood Chemical Biological Center (ECBC), a Contract Surety Laboratory to perform air monitoring and agent/agent breakdown product (ABP) analysis. Chemical Biological Radiological Nuclear and Explosives (CBRNE) Analytical Remediation Activity (CARA) served as Technical Escort (TE) and provided X-ray, analytical, and transportation support when closed cavity items were recovered during investigations. Parsons subcontracted Charles P. Johnson and Associates (CPJA) for the site surveyor, and GPL Laboratories, LLP (GPL), Analytical Laboratory Service Inc. (ALSI), and Clayton Laboratories as analytical laboratories. ECBC was on call during the field effort to provide agent clearance services for headspacing glassware, munitions debris (MD) and soil samples. Parsons subcontracted with Zimmer Environmental Services (ZES) for site support activities, including waste disposal. Bloch Consulting Inc. performed landscape evaluation services. Columbia Technology performed direct push soil geotechnical borings and sampling support. Compaction testing was also provided by Patton Harris Rust & Associates (PHR&A). Traffic Engineering Services (TES) performed traffic control and permit expediting services. Table 1.1 lists the site parties and their responsibilities.

TABLE 1.1 KEY SITE INVESTIGATION ORGANIZATIONS

ORGANIZATION	RESPONSIBILITY
CENAB	Geographic Military District (Project Manager, Site Operations Officer)
USAESCH	Implementing Agency
Parsons	Contractor (Site Manager, Project Safety and Health Officer, and Site Safety Health Officer)
ECBC	Air Monitoring Team/Contract Surety Laboratory
CARA	TE for Close Cavity Item Assessment and Transportation
CPJA	Site Surveyor
Bloch Consulting Group	Landscape Estimator
PHR&A	Compaction Services
Traffic Engineering Services	Traffic Control and Permit Expediting Services
ZES	Site support activities including disposal
GPL and ALSI (Soil), Clayton Laboratories (Air)	Analytical Laboratories
Columbia Technology	Geotechnical Soil Borings

1.2 OBJECTIVE AND SCOPE

1.2.1.1 The objective of this investigation was to investigate potential burial areas and remove contaminated soil from the 4835 Glenbrook Road property. The potential risks to human receptors were evaluated under a separate task, but are summarized in this report to support recommendations for this property.

1.2.1.2 The overall scope of this project was to:

a) Locate potential burial areas on 4835 Glenbrook Road. Due to landscape and cultural features, as well as the presence of fill material, geophysical surveys performed at these properties were inconclusive and USACE determined that a test pit investigation was warranted. **The test pit locations were selected to provide 95 percent confidence in determining the location of potential burial pits or trenches with dimensions of not less than 10 feet (ft) by 20 ft on the 4835 Glenbrook Road property.**

b) Excavate and dispose of arsenic-contaminated soil.

c) Perform associated mobilization and demobilization efforts for these tasks.

1.2.1.3 This work was performed in accordance with the Final Site-Wide Work Plan (SWWP), Spring Valley DERP/FUDS, Washington, D.C. (USACE 2007a) and the Final Site-Specific Work Plan (SSWP) for the Test Pit Investigations at 4825 and 4835 Glenbrook Road Properties, Spring Valley, Washington, D.C. (USACE 2007b and c; 2008a and b; and 2009b). The activities performed using the procedures presented in the SSWP are discussed in Section 2 of this report. Results from these activities are provided in Section 3. A summary of the investigation, conclusions, and recommendations are provided in Section 4.

1.3 BACKGROUND

1.3.1 Site Location

The 4835 Glenbrook Road property is located in the south central portion of the SVFUDS, which is located in the northwest section of Washington, D.C. (see Figure 1-1).

1.3.2 Site History

1.3.2.1 During World War I, the U.S. Government established the American University Experiment Station (AUES) to investigate the testing, production, and effects of noxious gases, antidotes, and protective masks. The AUES, located on the grounds of the current American University (AU), used additional property in the vicinity to conduct this research and development on chemical warfare materiel (CWM), including mustard (HD) and lewisite (L) agents, as well as adamsite, irritants, and smokes. After the war, these activities were transferred to other locations and the property was returned to the owners.

1.3.2.2 The history of the SVFUDS is described in Subchapter 1.6 of the Site-Wide Work Plan (SWWP) (USACE 2007a). Additional information on the history of the AUES operations is provided in the *Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington, D.C.* (USACE 1995) and the website of CENAB at http://www.nab.usace.army.mil/.

1.3.3 Previous Investigation Activities

Previous investigations at the entire SVFUDS are described in detail in Subchapter 1.8 of the SWWP (USACE 2007a). Previous investigations carried out on the 4835 Glenbrook Road property are summarized below.

1.3.3.1 Environmental Management Systems (EMS) Soil Sampling (1992)

1.3.3.1.1 During construction of the homes at 4825 and 4835 Glenbrook Road in 1992, a 55-gallon drum and obsolete laboratory equipment were found in an area presumed to be in the driveway of 4825 Glenbrook Road. Environmental Management Systems (EMS), on behalf of AU, performed a soil gas survey and exploratory hand excavations and determined that there were neither hazardous or volatile substances nor explosive ordnance at the site (EMS 1992).

1.3.3.1.2 Within a month of the initial EMS investigation, construction workers experienced eye and respiratory irritation from an unknown source. EMS returned to investigate a white substance in the soil. The physical properties and laboratory analysis concluded that the suspect material was Silvex, an herbicide. The houses were completed without any further documented incidents. The soil analytical results were summarized and evaluated in the HHRA for 4835 Glenbrook Road (USACE 2009a).

1.3.3.2 Geophysical Investigations (1993 and 2002)

Geophysical surveys were performed at 4835 Glenbrook Road in 1993 and 2002. These surveys were not conclusive due to the presence of landscape and cultural features, as well as fill material. USACE, therefore, determined that a test pit investigation was warranted (USACE 2007b).

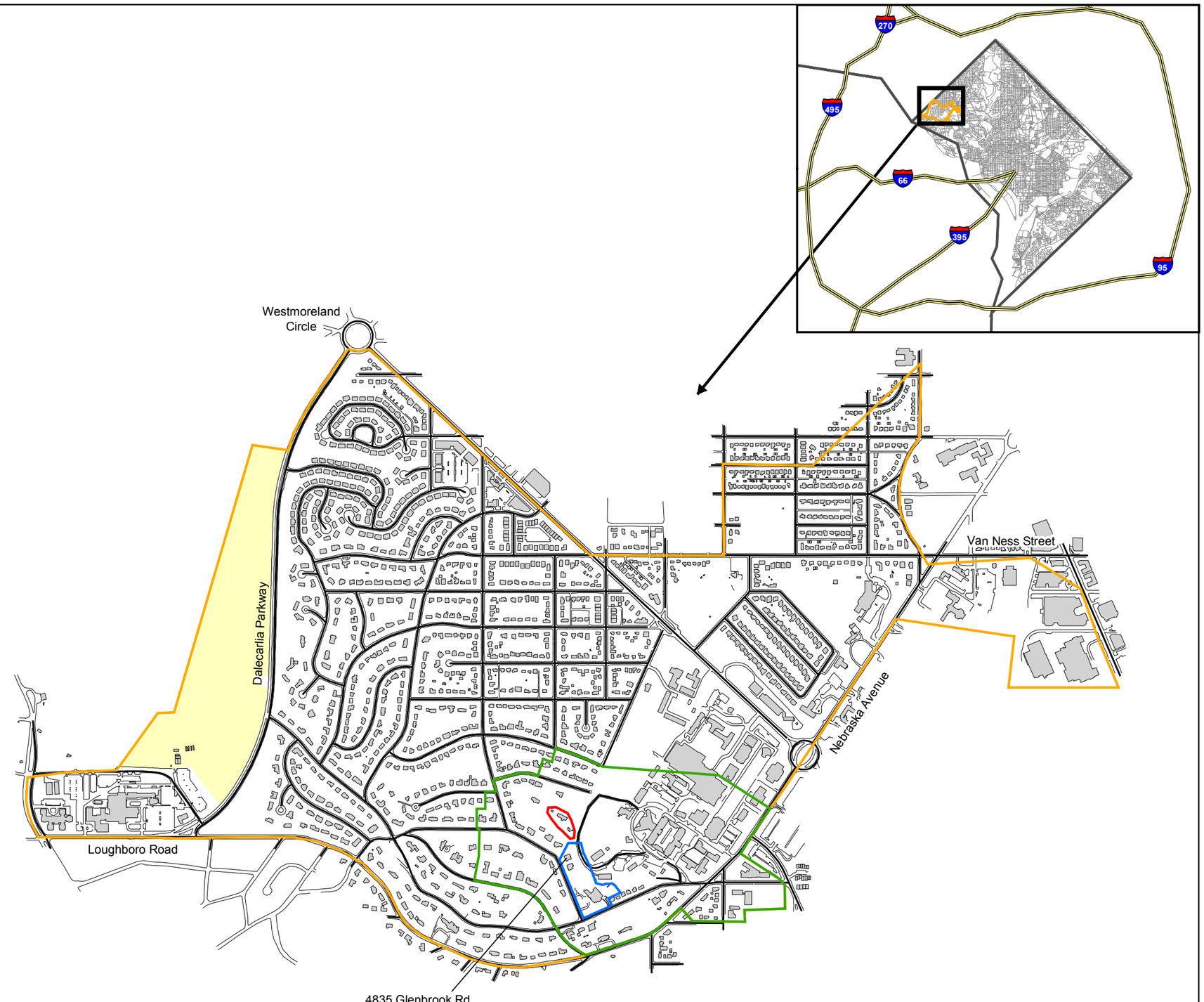

Figure 1-1
Spring Valley FUDS Location

Spring Valley
Washington, D.C.

Legend

- Buildings
- Road
- Federal Property

Operable Unit(s)

- OU-2
- OU-3
- OU-4
- OU-5

Notes:

1. OU-1 encompasses all of the areas depicted as OU-3, 4, and 5.

2. OU-4 and OU-5 do not include the smaller operable units shown within their boundaries (e.g., OU-4 does not include the areas shown as OU-2 and OU-3).

1,200 600 0 1,200 Feet

Scale:	1:12,250
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Figure Number:	1-1
Page Number:	1-4

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1.3.3.3 Soil Investigation Activities (1996)

1.3.3.3.1 In June 1996, landscape workers at 4835 Glenbrook Road were excavating a large hole (about 6 ft diameter and 4 ft depth) to plant a tree in the front yard near the southwest corner of the house when workers were overcome by an odor and experienced irritation of the eyes and respiratory system. Related activities ceased. Apex Environmental, Inc. (Apex) under contract with AU completed an investigation of the front yard with a grid of 24 soil gas vapor probes on 2.5-ft centers, to a depth of 4 ft, and collected four soil samples in addition to the 24 soil gas vapor probes to delineate an area of excavation.

1.3.3.3.2 Soil samples indicated elevated levels of certain metals and volatile organic compounds (VOC), with arsenic being of most concern. Apex over-excavated the hole where the tree was to be planted to approximately 12 ft diameter and 6-ft depth, and removed laboratory glassware about 2 ft below ground surface (bgs). Removal of contaminated soil was confirmed with five post-excavation soil samples. Apex also intrusively investigated the back yard by digging two TPs to a depth of 9 ft and a third TP to a depth of 7 ft (these test pits were related to landscaping activities). Apex also installed a grid of 91 soil probes on 10-ft centers, to a depth of 4 ft without finding any evidence of additional contamination (Apex 1996). The soil analytical results were summarized and evaluated in a HHRA for 4835 Glenbrook Road (USACE 2009a).

1.3.3.4 Soil Sampling (1999)

To address concerns of the DDOE, the USEPA Region III collected surface and subsurface soil samples in and around the 4801, 4825, and 4835 Glenbrook Road properties to supplement its risk assessment (USEPA 1999). On April 20, 1999, USEPA collected surface soil samples (0 to 6 inches [in.] bgs) G-01, G-02, and G-03 from 4835 Glenbrook Road. The approximate locations of these samples collected from 4835 Glenbrook Road property are shown on Figure 1-2. The soil analytical results show exceedance of the 1999 Risk Based Concentration of 0.43 mg/kg. The highest arsenic concentration of 26.7 mg/kg was detected in one surface soil sample from G-01 location.

1.3.3.5 Operable Unit 3 Engineering Evaluation/Cost Analysis (EE/CA) (4801, 4825, and 4835 Glenbrook Road) (2000)

1.3.3.5.1 Based on results of the USEPA Region III sampling, the soil of these properties was determined to have been affected by AUES activities in the vicinity of Burial Pits 1 and 2 at 4801 Glenbrook Road. Consequently, the USACE performed an EE/CA for the three OU-3 properties (USACE 2000). This EE/CA included extensive sampling to determine the nature and extent of contamination identified in the surface and subsurface soil of the three OU-3 properties. On October 31, 2000, Parsons used the quadrant procedure to collect surface soil samples at 4835 Glenbrook Road for the mustard agent breakdown products (ABPs) dithiane, oxathiane, and thiodiglycol.

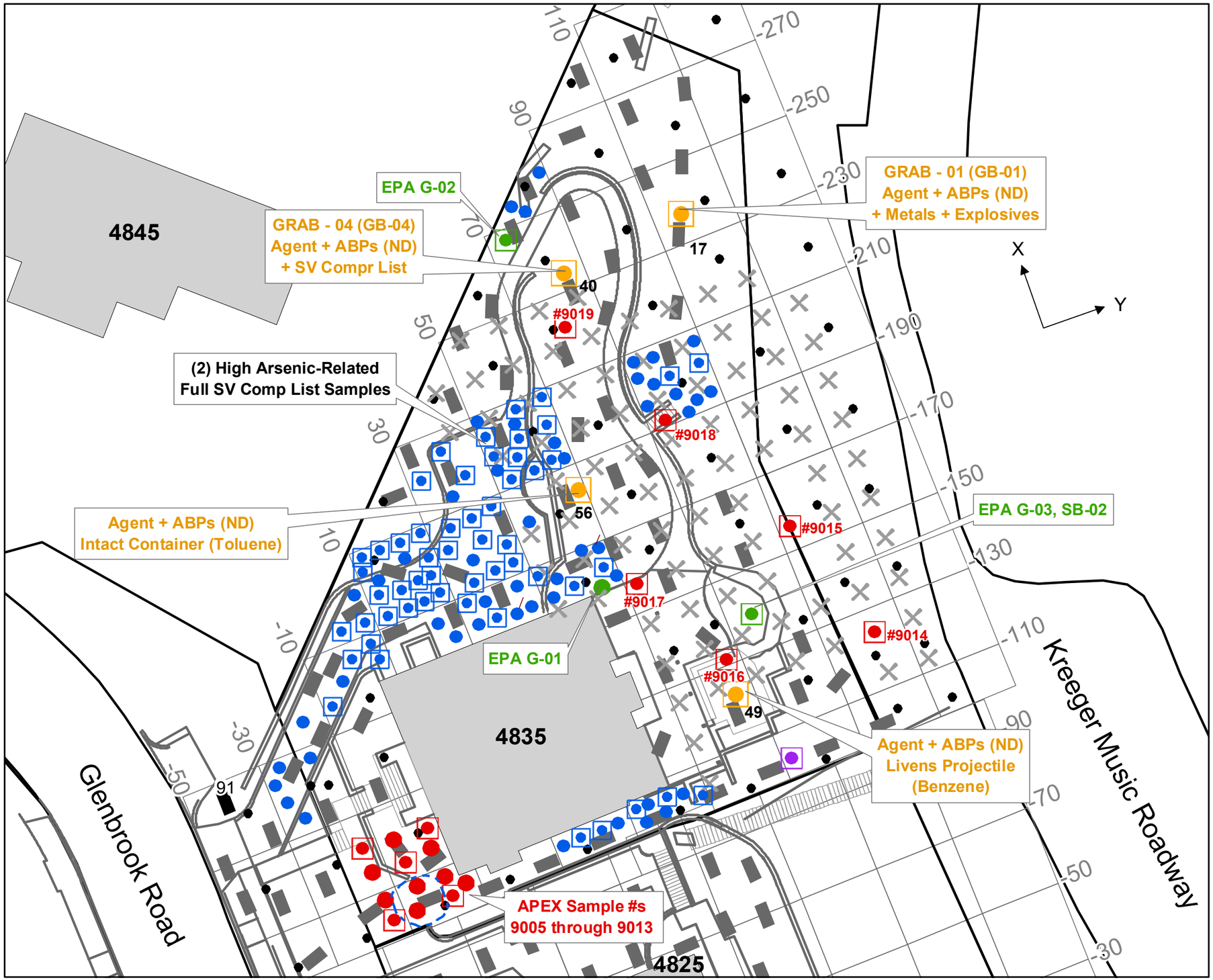

Figure 1-2
Sampling at
4835 Glenbrook Road

Spring Valley
Washington, D.C.

Legend

- Test Pit 91 Not Excatated Due to Proximity to Utility
- Test Pits (Completed with No Significant Findings)
- APEX Soil Probes: 6 of these converted to soil samples based on high PID readings (AU Consultant)
- Organics and Metals - Surface (1996)
- Organics and Metals - Sub-Surface (1996)
- Organics and Metals - Surface (1999)
- Organics and Metals - Sub-Surface (1999)
- Metals - Surface (2007-08)
- Metals - Sub-Surface (2007-08)
- Agent (HD,L) + ABPs + Metals and Organics - Sub-Surface (2007)
- Arsenic Grid Samples - (2000)
- HD ABPs and Arsenic - Sub-Surface (2000)
- Property Boundaries
- Buildings
- 20' Grid
- APEX Tree Removal Perimeter

Notes:

1.) During Test Pit Investigations in 2007 and 2008, air monitoring was performed for Mustard, Lewisite, Arsine, Phosgene, Chloropicrin, and Cyanogen Chloride with no confirmed detections.

2.) Additional Sampling Not Shown: 1992 EMS Investigation (Specifics Unavailable). 2000 Parsons Quadrant Sampling for HD ABPs (Composited Locations).

0 12.5 25 50 Feet

1 inch = 25 feet

Scale:	1:300
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Date:	12/29/2010
Figure Number:	1-2
Page Number:	1-6

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1.3.3.5.2 Thiodiglycol, which is a non-specific mustard ABP that also can originate from sources other than mustard agent, was detected at low levels in all four samples; dithiane and oxathiane were not detected in any of the samples. A soil boring was also sampled at 0-2 ft bgs, 2-4 ft bgs, and 4-6 ft bgs near the southeast corner of the house at 4835 Glenbrook Road. These subsurface samples were analyzed for the three mustard ABPs, all of which were non-detect in all three boring samples. Arsenic was not included as an analyte for this quadrant sampling because the decision had been made to proceed directly to grid-level sampling for arsenic. The arsenic grid sampling was also performed on October 31, 2000. The risk assessment for 4835 Glenbrook Road (USACE 2002) presents the results of these sampling events.

1.3.3.6 Risk Assessment for 4835 Glenbrook Road (2002)

The OU-3 EE/CA and baseline risk assessments for 4801, 4825, and 4835 Glenbrook Road addressed the potential hazard associated with arsenic contamination in the soil (USACE 2002). The EE/CA was conducted to recommend and justify the preferred alternative for cleanup of the arsenic contamination in the soil. The conclusion of the risk assessment was that there was unacceptable risk with regard to human exposure to arsenic in the surface soil.

1.3.3.7 Human Health Risk Assessment (HHRA) for 4835 Glenbrook Road (2009)

A HHRA for 4835 Glenbrook Road was finalized in September 2009 (USACE 2009a). Grab samples and soil confirmation samples from the test pits at 4835 Glenbrook Road investigations and all previously collected data were evaluated in the HHRA, except the geotechnical boring samples collected in December 2009. The HHRA concluded that the residual constituents detected in soil did not pose an unacceptable risk to human receptors such as residential adult and child. The soil sampling locations evaluated in the HHRA are illustrated in Figure 1-2 of this report.

2. DESCRIPTION OF INVESTIGATION ACTIVITIES

2.1 INTRODUCTION

This section describes the test pit investigation and arsenic soil removal activities performed between August 2007 and December 2008 at 4835 Glenbrook Road. Activities included pre-mobilization, mobilization, test pit investigations, arsenic soil removal and disposal, site restoration, and demobilization. A geotechnical soil boring investigation was performed on December 10 and 11, 2009.

2.2 PRE-MOBILIZATION ACTIVITIES

2.2.1 Utility Survey

Prior to commencement of intrusive activities, Miss Utility marked the locations of known utility lines at the property. The utility lines were re-marked throughout the investigation as needed. The AU was also contacted regarding the location of private utilities throughout the property. The owner provided as-built drawings that illustrated the location of water, sewer, storm water, electric, and cable lines at the property. The property owner cut power to electrical and water associated with landscape features around the property (i.e., landscape lighting and irrigation systems). USACE concurred that these lines would be removed (i.e., not preserved) if encountered during the TP investigation.

2.2.2 Site Survey

2.2.2.1 A site survey was completed at 4835 Glenbrook Road in April 2007 to provide an accurate site map for use during the TP investigation. The site survey included the major site improvements (e.g., houses and driveways), vegetation, landscape features (e.g., retaining walls, patios, and water features), and site contours.

2.2.2.2 In August 2007, the Parsons land survey contractor, CPJA, located and marked the selected 77 test pit locations and the arsenic-contaminated grids at 4835 Glenbrook Road. The locations of TPs 54, 62, 67, 72, and 75 were re-marked in November 2008 prior to intrusive operations for these test pits because the original markings were no longer visible.

2.2.3 Landscape

2.2.3.1 Trees, shrubs, and hardscape features were removed in several stages in coordination with TP investigations at 4835 Glenbrook Road. A pre-excavation landscape survey was conducted by Parsons in April 2007. Selected photographs from the survey are presented in Appendix A.

2.2.3.2 On August 8, 2007, 10 trees were removed between the house at 4835 Glenbrook Road and the driveway at 4825 Glenbrook Road to facilitate placement of equipment in the 4825 Glenbrook Road driveway for a separate high probability investigation of Burial Pit 3 at that property. CENAB's contractor, Lew Bloch Consulting, Inc. evaluated the vegetation at 4835 Glenbrook Road in August 2007 prior to commencement of the TP investigations. In September 2007, the property owner and CENAB agreed that the values provided by Lew Bloch

would be used in determining reimbursement to the property owner for vegetation yet to be removed for the TP investigation.

2.2.3.3 Trees and shrubs identified in the rear and northern side yard were removed in late September 2007. Vegetation removal in the front yard was performed in January 2008. Vegetation removal in the southern side yard was conducted in November 2008. Figure 2-1 shows vegetation removed from the 4835 Glenbrook Road property.

2.2.4 Hardscape

2.2.4.1 A pre-excavation hardscape survey was conducted at 4835 Glenbrook Road by Parsons in April 2007. Parsons and CENAB reached an agreement with the property owner concerning reimbursement values prior to commencement of the TP investigation.

2.2.4.2 In August 2007, AU removed landscape lighting fixtures throughout the property and patio furniture from the rear yard.

2.2.4.3 Hardscape removal during the investigation was minimized and completed progressively as the investigation proceeded across the property. Road mats were used in some areas in an effort to minimize damage. Granite curbs were removed and set aside for AU's use during their restoration. Bluestone pavers used on the sidewalks and patio were removed with care in an effort to keep them whole; unbroken pavers were set aside for AU's use during their restoration.

2.2.5 Backfill

2.2.5.1 Backfill for use in the arsenic excavations was stockpiled at the federal property located at 5201 Little Falls Road, NW, Washington D.C. in September 2007. The material was obtained from a source sampled by Sevenson Environmental and approved by USACE and the other Spring Valley Partners, including USEPA, and DDOE for use at SVFUDS. Approximately 2,000 cubic yards were delivered and staged. A soil sample was taken of the backfill in August 2007 and characterized in accordance with Subchapter 3.8.1.8.7 of the SWWP (USACE 2007a) (i.e., classified in accordance with American Society of Testing and Materials [ASTM] D 2487 and tested for Atterberg limits [ASTM D 4318], grain-size distribution [ASTM D 422], and compaction characteristics [ASTM 698]). Only metals were analyzed in the backfill soil sample and the results are included in Appendix B. The soil pile was hydroseeded to prevent erosion.

2.2.5.2 Based on the varying characteristics of the TP locations (e.g., wooded/vegetated areas versus constructed/hardscaped areas) and the possibility of varying soil characteristics with regard to compaction procedures, geotechnical soil samples were collected from three of the proposed TP locations during site preparation. These locations included one in the sloped vegetated area in the back yard of 4835 Glenbrook Road (TP 4835-16); one in the level vegetated area in the back yard of 4835 Glenbrook Road (TP 4835-40); and one in the front yard area (TP 4835-88). The physical characteristics of these samples were determined as described in the previous paragraph. The results are included in Appendix B.

Figure 2-1
Vegetation Removal at 4835 Glenbrook Road

Spring Valley
Washington, D.C.

Legend

- Test Pit 91 Not Excatated Due to Proximity to Utility
- Excavated Test Pits
- Test Pits Not Excavated Due to >12' Fill Material
- Arsenic Contaminated Soil Excavated in 2008

Trees & Vegetation

- Surveyed Location
- Estimated Location
- Vegetation Removed
- Vegetation Trimmed to Allow Access
- Property Boundaries
- Buildings

T# Tree and Shrub Reference ID's
S# From Landscape Evaluation

0 15 30 60 Feet

1 inch = 30 feet

Scale:	1:360
Created By:	Parsons
File:	20101216 4835 Glenbrook Vegetation Removal.mxd
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Figure Number:	2-1
Page Number:	2-3

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2.3 MOBILIZATION AND SITE SET-UP

With the exception of heavy equipment, small tools, and supplies, the equipment and other facilities required for the intrusive investigations were mobilized and demobilized each day. ZES mobilized a small excavator and small compactor. ZES also mobilized a loader and larger equipment for arsenic removal operations.

2.4 INTRUSIVE INVESTIGATION

2.4.1 Low Probability Test Pit Investigations

2.4.1.1 Low probability TP investigations were conducted at 4835 Glenbrook Road between October 10, 2007 and December 16, 2008 in accordance with procedures outlined in the SSWP (USACE 2008b) and Subchapter 3.8 of the SWWP (USACE 2007a) as appropriate, including all referenced regulations and procedures. Between October 10, 2007 and April 9, 2008, a total of 71 TPs were investigated at 4835 Glenbrook Road. The remaining five TPs (TPs 54, 62, 67, 72, and 75) were investigated in November and December 2008. Each TP was approximately 6 ft long and 3 ft wide. The depth of each TP was either 1 ft into saprolite or to the maximum reach of the excavation equipment (approximately 12 ft), whichever came first. The excavation team obtained concurrence from the USAESCH Safety Specialist and the CENAB Operations Officer regarding completion of each test pit. A digsheet was completed for each test pit to record pertinent information (see Appendix C).

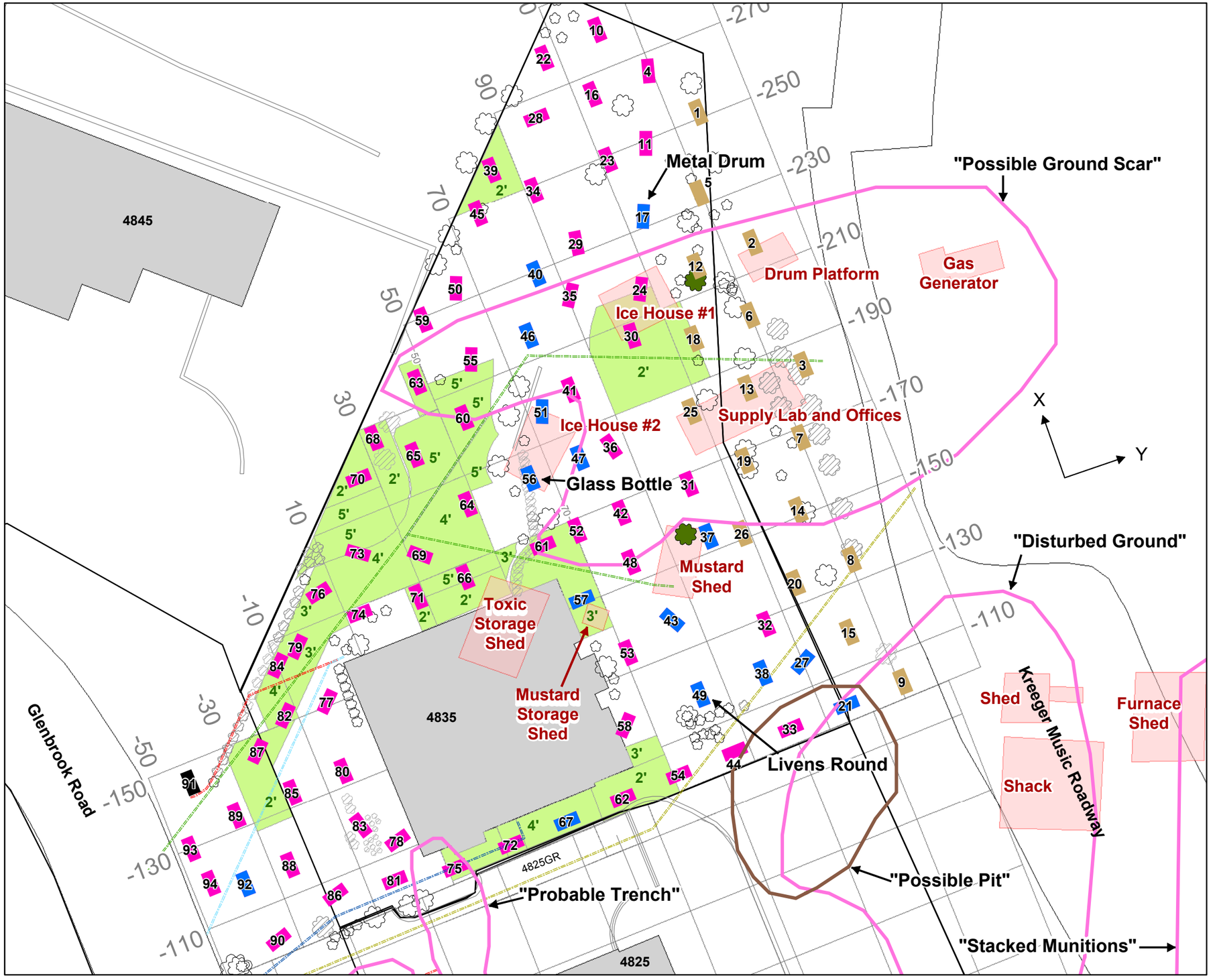
2.4.1.2 Air monitoring for this investigation included CWM using Miniature Continuous Air Monitoring System (MINICAMS), arsine, and VOC monitoring at each TP excavation; CWM using Depot Area Air Monitoring System (DAAMS) perimeter monitoring; and dust monitoring during excavation of arsenic-contaminated soil. Arsenic and dust sampling also was conducted during the initial arsenic soil removal activities. Because of the presence of heavy equipment and limited space, the exclusion zone for this investigation was the property boundary.

2.4.1.3 Figure 2-2 illustrates the site layout for the TP investigations at 4835 Glenbrook Road. The investigation began with the test pits located in the northeast corner of 4835 Glenbrook Road and proceeded southward. Generally, the TPs in the backyard of 4835 Glenbrook Road were completed first, followed by the TPs in the front yard of 4835 Glenbrook Road. The areas investigated and the associated dates are noted below:

- 4835 Glenbrook Road Back Yard - October 10, 2007 through January 11, 2008
- 4835 Glenbrook Road Side Yard – January 14 through 16, 2008
- 4835 Glenbrook Road Front Yard - January 17 through February 5, 2008
- 4835 Glenbrook Road Arsenic grid removal and associated test pits (not under driveway) - February 8 through March 12, 2008
- 4835 Glenbrook Road Test pits under driveway - March 13 through April 8, 2008
- 4835 Glenbrook Road Arsenic removal at driveway - April 21 through May 6, 2008
- 4835 Glenbrook Road Test pits and arsenic removal - November 12 through December 8, 2008.

Figure 2-2
Locations of the Test Pits and Areas of Arsenic-Impacted Soil
4835 Glenbrook Road

Spring Valley
Washington, D.C.



Legend

- Test Pits Containing Possible AUES Related Items
- Test Pit 91 Not Excatated Due to Proximity to Utility
- Excavated Test Pits
- Test Pits Not Excavated Due to >12' Fill Material
- Arsenic Contaminated Soil Excavated in 2008
- Property Boundaries
- Buildings
- 20' Grid
- Gas Line
- Electric Line
- Water Line
- Sanitary Sewer Line
- Storm Sewer Line
- Historic Buildings/Structures

Ground Scars

- 1927
- 1918

Trees & Vegetation

- Surveyed Location
- Estimated Location
- Vegetation Trimmed to Allow Access

0 12.5 25 50 Feet

1 inch = 25 feet

Scale:	1:300
Created By:	Parsons
File:	20101216 4835 Glenbrook-Driveway Arsenic Extent.mxd
Date:	12/16/2010
Figure Number:	2-2
Page Number:	2-5

PARSONS

2.4.1.4 Excavation was performed using mechanical equipment (e.g., backhoe or equivalent-sized equipment) operated by a heavy equipment operator. Material was removed from the excavation in 6- to 12-in. lifts. An unexploded ordnance (UXO) Technician II or higher monitored the excavation process at all times. The excavated material was stockpiled temporarily on top of geotextile fabric near the excavation. Each lift of excavated material was inspected by a UXO Technician II or higher for items of interest (e.g., potential AUES items, munitions debris, etc.) before the next lift was excavated. The UXO Technician screened the bottom and sidewalls of the TP with downhole geophysical instrumentation (e.g., Mark [Mk] 26) after each lift. The USAESCH Safety Specialist monitoring the work also used downhole geophysical instrumentation as a quality assurance (QA) check.

2.4.1.5 A number of the proposed TPs were located in arsenic-contaminated grids. Because additional personnel and equipment were utilized for containerizing, transporting, and disposing the arsenic-contaminated soil, arsenic-contaminated grids and the co-located test pits were planned for excavation as a group to maximize efficiency. Confirmation samples were collected at the beginning of the intrusive effort to delineate the extent of arsenic contamination. With the exception of arsenic-contaminated grids under the driveway at 4835 Glenbrook Road, the arsenic-contaminated soil was removed completely from the grid (including any lateral or vertical extensions based on confirmation sampling) prior to any deeper excavation in the test pit. Excavation of arsenic-contaminated soil is discussed further in the following section.

2.4.2 HTW Soil Removal

2.4.2.1 Soil Excavation from Grids

2.4.2.1.1 Previous soil sampling identified arsenic-contaminated soil in 8 full or partial grids at 4835 Glenbrook Road (see Figure 1-3 of the SSWP, USACE 2007b). To allow for more efficient excavation and backfill operations, grid floor and sidewall delineation samples were collected prior to excavation in the arsenic-contaminated grids so the extent of required excavation could be known prior to digging. The initial grid floor confirmation samples for the grids at 4835 Glenbrook Road were collected from 2 ft bgs since this is the minimum excavation depth for arsenic grids. Additional grid floor confirmation samples were collected at these locations in minimum 1-ft intervals, as necessary, to define the vertical extent of excavation required to remove arsenic concentrations greater than Spring Valley remedial action level of 20 mg/kg.

2.4.2.1.2 Sample locations deeper than 6 in. were screened by a UXO Technician using a magnetometer at every 6-in. interval; the sample locations were adjusted, if necessary, based on this screening. When sampling deeper than 6 in. bgs, the auger was advanced in 6-in. increments and the removed soil was inspected by a UXO Technician II or higher for items of interest (e.g., suspect items, munitions debris, etc.) before the sample was collected or the auger was advanced another 6 in. (similar to the procedure used for excavation of the test pits).

2.4.2.1.3 Arsenic contaminated soil in grids (-190, 90), (-250,70), (-150, 50) and (-190,10) was excavated prior to excavation of the co-located test pits. Arsenic-contaminated soil was excavated and loaded into hoppers or directly into the loader bucket to facilitate loadout of the soil into dump trucks staged in the driveway or on Glenbrook Road at the end of the driveway. UXO technicians monitored excavation and loading of the soil for the presence of suspect AUES-related material. Loading of arsenic contaminated soil was conducted over geocloth to

minimize the spread of contamination. Air monitoring during excavation of these arsenic-contaminated grids included CWM (MINICAMS), arsine, and VOC monitoring at each TP excavation; CWM (DAAMS) perimeter monitoring; dust monitoring; and air sampling for arsenic and total particulates.

2.4.1.2.4 During excavation of the arsenic grids, arsenic-contaminated soil was loaded into trucks that transported the soil to the selected off-site disposal facility. Equipment that came into contact with the arsenic-contaminated soil (e.g., bucket of the excavator) was decontaminated in accordance with Subchapter 14.2 of the SWWP (USACE 2007a) once the handling of arsenic-contaminated soil was complete and prior to any deeper excavation in the associated TP.

2.4.2.2 HTW Soil Removal from 4835 Glenbrook Road Driveway

2.4.2.2.1 The grid sampling conducted during the OU-3 EE/CA did not include sampling in areas covered by hardscape (e.g., driveways) – grids (-130,-30) and (-170, 10). As a result of discussions with the Spring Valley Partners, including CENAB, USAESCH, USEPA, DDOE, AU, and Parsons, once the driveway was removed during the TP investigation, additional grid sampling was performed in the driveway area. This sampling identified additional arsenic-contaminated grids.

2.4.2.2.2 Based on these results and in accordance with Amendment 1 to the SSWP (USACE 2008b), excavation of TPs located in the driveway at 4835 Glenbrook Road proceeded once the vertical extent (depth) of the arsenic contamination at the associated grid had been defined (i.e., the TP excavation could proceed without having to excavate arsenic-contaminated soil from the entire grid first). The field crew implemented additional procedures to prevent arsenic-contaminated soil at the surface from falling into the deeper test pit excavations. In the arsenic-contaminated interval, the field crew excavated a footprint slightly larger than the 3 x 6 ft test pit to prevent arsenic-contaminated soil at the surface from falling into the deeper TP excavation. This arsenic-contaminated soil was stockpiled separately from the deeper soil and the excavator bucket was decontaminated prior to proceeding into the deeper intervals of the test pit. Once the TP location was resolved, the deeper uncontaminated soil was backfilled and compacted into the excavation and geotextile was placed at the vertical extent of the arsenic contamination. In some cases, the arsenic-contaminated soil was backfilled temporarily into the excavation without measured compaction, since this material would be removed with the rest of the arsenic-contaminated soil at a later time. In some cases, the arsenic-contaminated soil was loaded for disposal off-site and the open excavation was either secured with plywood, etc., or temporarily backfilled with clean soil that was later excavated with the arsenic grid.

2.4.2.2.3 Once the co-located TPs in the 4835 Glenbrook Road driveway were investigated, the remaining arsenic-contaminated soil was removed. Because the arsenic-contaminated areas in the 4835 Glenbrook Road driveway were excavated after the co-located TPs in the driveway area had been investigated, the arsenic excavation in the 4835 Glenbrook Road driveway area was conducted with VOC and dust monitoring only (i.e., no MINICAMS, DAAMS, or arsine air monitoring was completed).

2.4.3 Geotechnical Boring Investigations

2.4.3.1 A geotechnical boring investigation was completed in accordance with the SSWP Addendum 3 (USACE 2009b). Prior to installation of the geotechnical borings, Miss Utility completed a utility clearance.

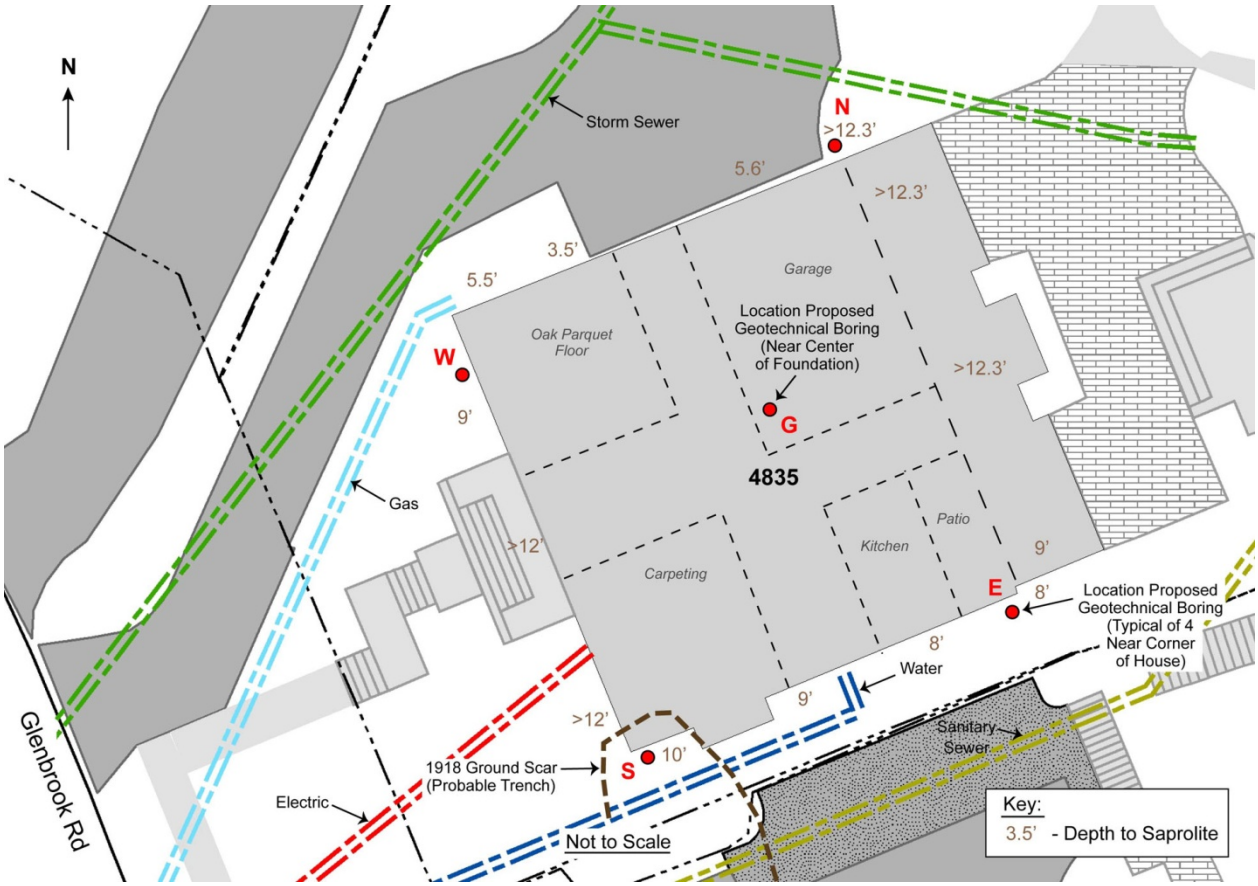
2.4.3.2 On December 10 and 11, 2009, five geotechnical borings were completed at the property to investigate the geological condition beneath the building, determine soil stratigraphy, define depth to the saprolite bedrock, and complete soil sampling. The boring locations are illustrated in Figure 2-4. Four borings were located outside at each corner of the house and one was located inside the garage. All borings were installed using hand augering or a direct push tooling. Hand augering was utilized to excavate the borehole in the garage. Continuous soil samples were collected with a hand auger at 6 in. intervals until saprolite was reached to a point of pure resistance. Direct push sample tooling was used for the four boreholes located outside of the house, one at each corner of the house. A boring was advanced until saprolite was reached and/or probe refusal achieved. The macro-core sampler collected a 2-ft long by 1.75-in. inside diameter soil core within a disposable acetate liner. The sampler would be brought to the surface and the acetate liner containing the soil core was removed by unscrewing the open-end cutting shoe at the bottom of the sampler. Parsons used a Schonstedt locator tool prior to digging to detect and avoid objects below the ground surface. A registered geologist/ geotechnical engineer examined the samples and verified the logs. The boring logs are included in Appendix C.

East corner of house: Continuous soil sampling was completed over 2.5-ft intervals to a total depth of 10 ft where refusal was encountered. Silty lean clay was encountered throughout the entire borehole, generally with a brown-reddish hue. Texture of the borehole progressed from soft to firm. Saprolite parent rock was observed with quartz and saprolite rock fragments directly above the bedrock. A 0.25-in. thick saprolite rock plug was found at end of the plastic drilling tube. Soil samples were collected between 2.5 and 5.0 ft bgs.

West corner of house: Continuous soil sampling was completed over 2.5-ft intervals to a total depth of 14 ft 6 in. where probe refusal was encountered. Silty lean clay was encountered throughout the entire borehole. Red and green traces resulting from weathering were present. The hue changed between brown, yellow, red, and green. All samples taken within the borehole were moist. Mica/pyrite was prevalent. In the area above the probe refusal point, saturated soil was found at 12 and 24-in. Twelve inches (12 in.) directly above the probe refusal point freshly weathered, white, firm saprolite was observed. The 3-in. directly above the probe refusal point was consistent, moist, white-green, firm silty lean clay. Soil samples were collected between 11.0 and13.0 ft bgs.

South corner of house: Continuous soil sampling was complete over 2.5-ft intervals to a depth of 15 ft where probe refusal was encountered. Silty lean clay was encountered throughout the entire borehole. Highly weathered saprolite was encountered in the boring. Coloration of the entire borehole ranged from red-brown-gray-white. Flaky red-white saprolite striations were observed half way down the borehole and were encountered up to the point of probe refusal. The texture of the borehole ranged from soft to firm. Soil samples were collected between 12.0 and 14.0 ft bgs.

Figure 2-3 Geotechnical Boring Locations Map



Garage: Continuous soil sampling was completed over 2.5-ft intervals to a depth of 7 ft 5.5 in. where probe refusal was encountered. Eight inches (8 in.) of artificially placed stones (a French drain) were found directly underneath the garage floor. All the stones were removed with a hand shovel. The soil progressed with depth from silty lean clay to silty fat clay. There was a general trend of increasing soil moisture with an increase in depth. Highly weathered saprolite was encountered in the fourth auger trial. The borehole texture started very soft, then progressed to firm, and returned back to a soft texture. Soil samples were collected between 3.0 and 5.0 ft bgs.

North corner of house: The 8 in. of artificially placed stones encountered for the boring inside of the garage were encountered at approximately 13 ft depth. The depth of 13 ft was achieved due to the starting elevation of the sample location, located directly next to the highly elevated backyard patio. Thus, the stones were inaccessible due to their depth and could not be removed. The push sample tooling could not penetrate through the stones; therefore, work ceased. For the first 13 ft., the characteristics of the soil were primarily soft-firm, moist, red-yellow-brown hue, contained some organic material, and was composed primarily of silty lean clay with some gravel fragments present in the first 4 ft.

2.4.3.3 The results indicate that no AUES related materials were found in any of the samples collected. Laboratory data results are located in Appendix G, Geotechnical Borings.

2.4.4 Sampling

Sampling was conducted in accordance with the SAP (Appendix E) of the Site Wide work plan (USACE 2007a) and the SSWP (USACE 2007 b,c and 2008 a,b) which is located in Appendix L – Site-Specific Work Plans of this report.

2.4.4.1 Confirmation Samples

Soil confirmation samples were collected in a given arsenic grid to define the extent of arsenic affected soil. These confirmation soil samples were submitted to GPL for total arsenic analysis. After the delineation, additional analytes were completed for 12 metals (aluminum, antimony, barium, cadmium, copper, lead, manganese, mercury, nickel, thallium, vanadium, and zinc) in accordance with the request of AU.

2.4.4.2 Grab Samples

2.4.4.2.1 Seventeen grab soil samples were collected during the TP investigation. These grab samples were collected based on the field observations of discolored soil or strange odors associated with AUES-related debris or munitions. After clearance for headspace analysis, six grab soil samples (SW-4835 GB-01, SW-4835GB-02, SW-4835GB-04, SW-4835GB-TP56-001, SW-4835GB-TP49-001, and SW-4835GB-16) were collected and submitted to ECBC for HD and L; HD ABPs 1,4-dithiane and 1,4 oxathiane; and ricin analysis. SW-4835 GB-01 was associated with TP 17. SW-4835GB-02 and SW-4835GB-04 were associated with TP 40. SW-4835GB-TP56-001 was associated with TP 56. SW-4835GB-TP49-001 and SW-4835GB-16 were associated with TP 49. Suspected AUES-related debris was found in TPs 40, 49, and 56. The soil samples were collected from soil near the suspected AUES-related debris in these TPs. A bottom half of a 30-gallon metal drum containing soil and glass fragments was uncovered in an area north of TP-17. The grab soil sample was collected from the soil within the drum (SW-4835GB-01).

2.4.4.2.2 Following ECBC clearance, two samples (SW-4835GB-01 and SW-4835GB-04) were sent to the laboratory (GPL) for analysis of the SVFUDS comprehensive list of chemicals including VOCs (Method CLP OLM04.3), SVOCs (Method CLP OLM04.3), explosives (Method SW 846 8330), target analyte list (TAL) metals (Method CLP ILM05.3), and total cyanide (Method EPA 335.2). In addition, SW-4835GB-04 was analyzed for iodine (Method E314.0 Mod), fluoride (Method E300.0), and Perchlorate (Method IC 314). No additional analysis was performed for the other samples based on the PDT's decisions. The analytical results are summarized in Appendix E. The data validation reports are included in Appendix F. The lab reports are included in Appendix G.

2.4.5 Geotechnical Boring Sampling

Four soil samples were collected from the geotechnical borings advanced at the property. The samples from these borings were submitted to ECBC for headspace and agent/ABP analysis. After the clearance for the headspace and agent/ABPs, the samples were submitted to ASLI to be analyzed for the Spring Valley grab sample analytical suites, including VOCs, SVOCs, explosives, TAL metals, total cyanide, iodine, fluoride, and perchlorate. The analytical results are summarized in Appendix E. The data validation reports are included in Appendix F. The lab reports including ECBC reports are included in Appendix G.

2.4.6 Soil Disposal

One composite waste profile soil sample was collected to represent arsenic-impacted soil excavated from the property. After the clearance for headspace and agent/ABPs, the soil sample was submitted to GPL for Toxicity Characteristic Leaching Procedure (TCLP) analysis. The laboratory reports are included in Appendix G, in the disposal data folder.

2.4.7 Aqueous Investigation Derived Waste

Three composite aqueous investigation derived waste (IDW) samples were collected from drums containing decontamination water generated from the investigation activities. After clearance for headspace and agent/ABPs analysis, the sample was submitted for ALSI for TCLP analysis. The laboratory reports are included in Appendix G, in the disposal data folder.

2.5 DISPOSAL

2.5.0.1 Disposal characterization sampling (waste profile TCLP sample) identified the arsenic-contaminated soil at 4835 Glenbrook Road as non-RCRA hazardous waste. The arsenic-contaminated soil was placed in dump trucks or roll-off boxes and shipped to the King and Queen County Landfill in Virginia for disposal. In addition, personal protective equipment (PPE) and geocloth used during the arsenic removal operation were bagged and placed in the dump trucks/roll-off boxes along with the soil and debris cleared for headspace analysis. The laboratory reports are included in Appendix G, in the disposal data folder.

2.5.0.2 A Livens projectile was found in TP 49 during the intrusive operation. The item contained liquid and there was a pinhole in the item. However, X-ray results showed that the item was "inert and/or free of explosives." The item was stored in the assessment holding facility (AHF) at the federal property. After ECBC analysis confirmed the liquid to be water with traces of benzene, the item was classified as MD and stored in a drum (Appendix G, ECBC data, CA & ABP, sample TE-4835GB-TP49-001W).. This Livens projectile was not included in

the T-30 items for destruction because of its large diameter. T-30 is a transportable controlled detonation chamber (Model T30), operated to demilitarize munitions and explosives of concern (MEC) and closed-cavity MD items. Instead, it was inspected and certified as scrap and was disposed with other munitions scrap at a metal smelter (Demil Metal) in Illinois.

2.5.0.3 Aqueous IDW (such as decontamination water) was collected in 55-gallon drums. A TCLP water sample was collected in accordance with SSWP (USACE 2008b) to characterize the water for disposal. Based on the TCLP analytical results (all detected concentrations were below the RCRA D-list hazardous waste regulatory limits), the water drum from the pressure washing was disposed as non-hazardous waste at DuPont Chambers Works, Deepwater, New Jersey. The laboratory reports are included in Appendix G, in the disposal data folder.

2.6 SITE RESTORATION

2.6.0.1 Following USAESCH and CENAB concurrence on completion of each test pit, soil was backfilled into the hole and compacted. With the exception of arsenic-contaminated grids, the test pits were backfilled with the excavated material. For arsenic-contaminated grids, clean fill was used to backfill the arsenic-contaminated portion. The clean fill was obtained from the approved stockpile at the federal property, which was sampled and approved in accordance with Subchapters 3.8.1.8.3 through 3.8.1.8.5 of the SWWP (USACE 2007a) as a separate activity.

2.6.0.2 The TP excavations were backfilled in compacted lifts (maximum compacted lift thickness of 8 in.). In vegetated areas, the backfill was compacted to a minimum 85 percent of maximum dry density (ASTM 698). In constructed/hardscaped areas (e.g., under the patios, sidewalks, or driveways), the backfill was compacted to a minimum 95 percent of maximum dry density (ASTM 698). While the compactor was lowered to the full depth of the test pit to compact the backfill, compaction tests could not be completed to the full depth. This was because the narrowness and depth of the TP excavations made it unsafe for the operator to enter the excavation to perform the compaction test. Therefore, as described in the SSWP (USACE 2008b), the field team established a compaction procedure for meeting the appropriate density in each area of the site (i.e., how many passes with the compactor). A similar approach was used during the previous TP excavation in the backyard of 4825 Glenbrook Road. All test pits in a particular area were then compacted using the established procedure for that area. No further compaction testing was performed in the test pits once the acceptable procedure was established.

2.6.0.3 For backfill in arsenic-contaminated grids, which were larger in area but shallower than the TP excavations, compaction testing was performed for each lift between 0 and 4 ft bgs in each grid (or each lift in any contiguous area less than 10,000 square ft).

2.6.0.4 Field in-place dry density was determined in accordance with ASTM D 2922. A minimum of one in ten tests was checked using ASTM D 1556.

2.6.0.5 With the exception of areas where arsenic-contaminated soil was excavated from a vegetated area, compacted backfill (either the excavated soil, or the clean fill if in an arsenic-contaminated area) was placed to the original grade. Where arsenic-contaminated soil was excavated in a vegetated area, clean fill was placed and compacted to within 6 in. of final grade. The sub-grade soil was then pulverized to a depth of 50 millimeter (mm) or 2 in. to facilitate

bonding of the final 6-in. layer of topsoil, which was brought from an approved source and spread, graded, and compacted to the original grade, and left free of surface irregularities.

2.6.0.6 Areas previously mulched (e.g., the sloped area in the backyard, the sideyard, planting beds, etc.) were re-mulched on July 2, 2008. Erosion control matting also was used for the steepest areas.

2.6.0.7 American Association of State Highway and Transportation Officials (AASHTO) #3 stone was used to backfill some intervals excavated in the driveway area of 4835 Glenbrook Road because water infiltrating into the excavation from the bottom and sides did not permit placement and compaction of soil fill. The excavation was lined with geotech fabric, the stone placed up to a depth where water was not infiltrating from the sidewalls, and then the geotech was wrapped around on top of the stone. Soil was then backfilled and compacted on top of the stone. For areas previously paved, crushed stone was used on the top 6-in.

2.6.0.8 The broken storm drain located along the street of the 4835 Glenbrook Road property was repaired in March 2010. New dual manhole storm drain inlets were installed on March 6, 2010. Furthermore, the street curb adjacent to the storm drain inlets was restored on March 9, 2010. Photos from the storm drain repair activities are included in Appendix D.

2.7 DEMOBILIZATION

The site was secured and equipment demobilization was complete as of December 16, 2008.

3. RESULTS

3.1 INTRODUCTION

3.1.0.1 This section presents results of the TP investigation activities performed at 4835 Glenbrook Road between October 2007 and December 2008. Site-specific logbook entries are provided in Appendix C.

3.1.0.2 The SSWP (USACE 2008b) included plans for 77 test pits to be investigated at 4835 Glenbrook Road. Seventy-six of the 77 test pits were investigated under the low probability condition:

- Seventy-one TPs were excavated and backfilled at 4835 Glenbrook Road as of June 2008 (62 TPs yielded either no debris or cultural debris only, and 14 TPs included suspect AUES-related items);
- One test pit (TP 4835-91) was not excavated as agreed by the Project Delivery Team (PDT)[1] due to space constraints between the driveways of 4835 and 4845 (Glenbrook Road and the presence of active utility lines in this location; and
- Five test pits (TPs 54, 62, 67, 72 and 75) located along the south side of the property, between the 4835 Glenbrook Road house and the 4825 Glenbrook Road driveway, were excavated in November and December 2008 after the equipment staged in the 4825 Glenbrook Road driveway for the separate Burial Pit 3 investigation was removed. One test pit (TP 67) yielded suspect AUES-related debris.

3.1.0.3 The SSWP (USACE 2008b) also included plans for excavation of arsenic-contaminated soil at 4825 and 4835 Glenbrook Road. As of June 2008, arsenic-contaminated soil on the northern portion of 4835 Glenbrook Road has been excavated and disposed off-site, and the excavations have been backfilled with clean fill. Two arsenic-contaminated grids on the south side of the 4835 Glenbrook Road property were removed in November and December 2008 following completion of the Burial Pit 3 investigation at 4825 Glenbrook Road.

3.1.0.4 Figure 2-2 illustrates the location of the test pits and arsenic-contaminated soil removal completed at 4835 Glenbrook Road. As shown in the figure, locations of some test pits were adjusted in the field with approval of the PDT for reasons that included the presence of footers for the retaining walls and access issues for the excavation equipment. The following sections discuss the investigation activities and findings.

[1] PDT is CENAB, USAESCH, and Parsons.

3.2 LOW PROBABILITY INVESTIGATION RESULTS

3.2.1 Test Pits with No AUES-Related Items

Sixty-two test pit excavations yielded either no suspected AUES-related debris or cultural debris only. These excavations were cleared, backfilled, and the debris disposed as outlined in previous sections. Table 3.1 summarizes the investigation activities for these test pits. Digsheets for these excavations are included in Appendix C.

3.2.2 Test Pits with Suspect AUES-Related Items Recovered

3.2.2.0.1 Fourteen test pit excavations recovered suspect AUES-related items. Of these 14 test pits, 13 test pits included suspect AUES-related lab ware component fragments (glass tubing, stoppers, glass fragments, etc.) and one test pit included a Livens projectile. Table 3.2 summarizes the investigation activities for these test pits. Potential AUES-related material also was found during site preparation activities north of TP 4835-17. Digsheets for these excavations are included in Appendix C. Photographs of the AUES-related items are included in Appendix D.

3.2.2.0.2 As shown in Table 3.2, soil samples and the potential AUES-related material were collected in each of these excavations. The soil samples (SW-4835GB-01 through 17) and potential AUES-related material (PI-4835GB-Batch01 though 019) were headspaced and were found to be negative for agents of concern. Six of the soil samples (SW-4835GB-01, SW-4835GB-02, SW-4835GB-04, SW-4835BG-TP56-001, SW-4835GB-TP49-001, and SW-4835GB-16) were submitted to ECBC for agent/ABPs analyses and two soil samples (SW-4835GB-01 and SW-4835GB-04) also were analyzed by GPL for selected parameters. Appendix F includes the validated results for the soil samples.

3.2.2.0.3 Six test pits (4835 – 27, 37, 38, 46, 47, and 51) did not require further sampling analyses per PDT direction from the November 27, 2007 Partnering meeting. The reasoning was in each case, a minimum of one glassware sample and one soil sample was collected for headspace analysis. The results indicated that the batch glassware and soil samples were all headspace cleared for mustard agent and lewisite.

3.2.2.1 Area North of Test Pit 4835-17

3.2.2.1.1 On October 22, 2007 the field crew was benching the steep slope in the rear yard in preparation for excavating TP 4835-17. After the first 6-in. lift of soil was removed, the Schonstedt gave a reading and the team began hand digging. At approximately 18 in. bgs the team uncovered the bottom half of a 30-gallon metal drum (PI-4835-GB-1) containing soil and glass fragments. The glass fragments could not be positively identified as unrelated to AUES by the field team. The metal drum piece (PI-4835GB-1) and the glass fragment sample (PI-4835GB-BATCH-001) were cleared for headspace analysis.

3.2.2.1.2 A grab soil sample was collected from the soil within the drum (SW-4835GB-01) and submitted for headspace. The MINICAMS detected HD in the headspace but the DAAMS confirmation was negative for agent. The soil sample was sent to ECBC for low-level agent analysis (non-detect) and ricin analysis (non-detect). In accordance with the PDT's direction, the sample was forwarded to GPL for analysis of metals, explosives, and total cyanide. Explosives and total cyanide were not detected. All Spring Valley-specific metals were below the comparison standards.

Table 3.1 SUMMARY OF TEST PITS WITH NO AUES-RELATED ITEMS
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID	EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic Contamin	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite (feet	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-4	1285665.08	462158.4451	N	10/16/2007	10/17/2007	10/17/2007	NA	11	N	N	Cultural debris (piece of rusty metal, beer bottle pieces, scrap wire and a piece of tile).	N	NA	Excavated to max reach of equipment.
4835-10	1285652.52	462168.5917	N	10/16/2007	10/16/2007	10/16/2007	7.5	8.5	N	False alarm Lewisite 0.58 STEL, cleared next cycle	Cultural debris (old baseball covering and chrome lock).	N	NA	
4835-11	1285664.45	462140.5509	N	10/18/2007	10/18/2007	10/18/2007	NA	11.3	N	N	Cultural debris (wire root baskets, pieces of terracotta pipe, plastic bottle cap).	N	NA	Excavated to max reach of equipment.
4835-16	1285651.32	462152.7201	N	10/11/2007	10/11/2007	10/11/2007	10	11	N	False alarm Lewisite 0.78 STEL when no intrusive	Cultural debris (landscape staples, items related to sprinkler system, part of coke bottle).	N	NA	
4835-17	1285663.83	462122.6591	N	11/20/2007	11/20/2007	11/20/2007	NA	11.5	N	N	Cultural debris (china and porcelain fragments, piece of metal container, and soda bottle fragments).	N	NA	Excavated to max reach of equipment.
4835-22	1285639.49	462161.657	N	10/15/2007	10/15/2007	10/15/2007	8	9	N	False alarms Lewisite (1.22, 0.43	Cultural debris (two eyeglass lenses and a plastic tent stake).	N	NA	
4835-23	1285655.17	462136.5945	N	10/17/2007	10/17/2007	10/17/2007	11.5	11.5	N	N	Cultural debris (metal hinge, beer can and beer bottle pieces, and nails).	N	NA	Excavated to max reach of equipment; just started getting into saprolite.
4835-24	1285663.21	462104.7649	Y	3/4/2008	3/4/2008	3/4/2008	NA	12.5	N	N	Cultural debris recovered included a wire, pottery, and beverage bottle	N	NA	Excavated to max reach of equipment.
4835-28	1285637.57	462146.995	N	10/12/2007	10/12/2007	10/12/2007	8.5	9.5	N	N	Cultural debris (rebar, beer bottle fragment, brick, beer can).	N	NA	
4835-29	1285650.08	462116.9341	N	1/8/2008	1/8/2008	1/8/2008	NA	10.5	N	N	Nothing recovered, no cultural debris.	N	NA	Moved off sidewalk to avoid footer of retaining wall. Excavated to max reach of equipment.
4835-30	1285661.1	462093.3187	Y	3/3/2008	3/3/2008	3/3/2008	NA	13	N	N	Cultural debris recovered included pieces of metal, wire, PVC and plastic.	N	NA	Excavated to max reach of equipment.
4835-31	1285675.1	462056.8168	N	11/26/2007	11/26/2007	11/26/2007	NA	10	N	N	Cultural debris (metal pipe, soda and beer bottle fragments, beer cans, wiring conduit, metal, bricks, and asphalt.	N	NA	Excavated to max reach of equipment.
4835-32	1285692.36	462024.1517	N	11/16/2007	11/16/2007	11/16/2007	NA	12	N	N	Cultural debris (construction debris with metal scrap, soda/beer bottle fragments, piece of epoxy).	N	NA	Test pit was rotated to be parallel to straight retaining wall to west and at least 3.5 feet from walls.
4835-33	1285700.12	461996.6956	N	11/6/2007	11/6/2007	11/6/2007	NA	12.3	N	N	Cultural debris (bricks, fragments of glass not AUES related, metal wire).	N	NA	Excavated to max reach of equipment.
4835-34	1285636.94	462129.1007	Y	2/29/2008	2/29/2008	2/29/2008	8	9	N	N	Cultural debris recovered included a piece of rebar.	N	NA	
4835-35	1285647.78	462102.5772	N	1/7/2008	1/7/2008	1/7/2008	NA	12.5	N	N	Cultural debris (rebar, plastic, porcelain, and a metal pipe).	N	NA	Moved off sidewalk to avoid footer of retaining wall. Excavated to max reach of equipment.
4835-36	1285658.52	462067.6752	N	12/6/2007	12/6/2007 & 12/10/07	12/10/2007	NA	12	N	N	Cultural debris (porcelain, china, plastic, metal, and soda bottle fragments).	N	NA	Test pit location adjusted approx 2 feet westward to avoid footer of retaining wall.
4835-39	1285626.51	462134.0425	Y	3/3/2008	3/3/2008	3/3/2008	7.5	8.5	N	N	Cultural debris recovered included an aluminum can.	N	NA	Rotated to be parallel to property line (perpendicular to slope); moved centerpoint approx 3' towards property boundary to get away from retaining wall footer.
4835-41	1285648.83	462081.1485	N	1/4/2008	1/4/2008	1/4/2008	NA	12.5	N	N	Cultural debris (soda cans, golf ball, PVC pipes, reflectors, roots and pieces of terracotta pipe).	N	NA	Moved off sidewalk to avoid footer of retaining wall. Excavated to max reach of equipment.

Table 3.1 SUMMARY OF TEST PITS WITH NO AUES-RELATED ITEMS
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID	EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic Contamin	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite (feet	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-42	1285661.34	462051.0905	N	10/25/2007	10/25/2007 & 10/29/2007	10/29/2007	NA	12.3	N	N	Cultural debris (Pepsi cans, bricks, liquor bottle bottom, light bulb, old balls, pieces of metal, PVC and a plate).	N	NA	PVC pipe and electrical lines encountered near top of excavation; temporarily stopped work to verify with AU that these electrical lines were deenergized since they looked different from other electrical lines we expected. Encountered footer for retaining wall (approximaely 4 ft 8 in out from the base of the wall) at approximately 26 inches bgs. Test pit moved westward 2' to avoid the footer (other test pits along the wall will also be adjusted westward based on this information in order to avoid the footer).
4835-44	1285686.36	461990.9694	N	11/7/2007	11/7/2007	11/7/2007	NA	10.5	N	N	Cultural debris (root basket and strap, construction debris with styrofoam,	N	NA	
4835-45	1285623.19	462123.3757	Y	2/29/2008	2/29/2008	2/29/2008	8	9	N	N	Cultural debris recovered included pieces of PVC and plastic.	N	NA	Rotated on centerpoint to be parallel to sidewalk.
4835-48	1285660.81	462037.5848	N	1/3/2008	1/3/2008	1/3/2008	NA	11	N	N	Cultural debris (coke bottle fragments, soda cans, golf ball, metal wire, copper fixture, china, and terracotta pipe).	N		Excavated to max reach of equipment.
4835-50	1285620.8	462104.8323	N	1/14/2008	1/14/2008	1/14/2008	8.5	9.5	N	N	Cultural debris (non-AUES glass and pottery fragments).	N	NA	Moved off sidewalk to avoid footer of retaining wall.
4835-52	1285647.58	462045.3634	Y	2/28/2008	2/28/2008	2/28/2008	NA	11.5	N	N	Cultural debris (two soda cans and rebar pieces).	N	NA	Excavated to max reach of equipment.
4835-53	1285660.09	462015.3028	N	1/10/2008 & 1/11/2008	1/11/2008	1/11/2008	NA	12.5	N	N	Nothing recovered, no cultural debris.	N	NA	Excavated to max reach of equipment.
4835-54	1285672.6	461985.2422	Y	11/20/2008	11/20/2008	11/20/2008	NA	13	N	N	Nothing recovered, no cultural debris.	N	NA	Excavated to max reach of equipment.
4835-55	1285621.94	462087.5897	N	1/15/2008	1/16/2008	1/16/2008	8	9	N	N	Nothing found; no cultural debris	N	NA	Moved off sidewalk to avoid footer of retaining wall.
4835-58	1285659.47	461997.4072	N	12/12/2007	12/13/2007	12/13/2007	9	10	N	False alarm CK (1.04 STEL) during setup (crew was not performing any intrusive activity at the time of the alarm); subsequent cycles clear	Cultural features (pvc piping and electrical conduit).	N	NA	
4835-59	1285609.66	462097.2155	N	1/15/2008	1/15/2008	1/15/2008	8	9	N	N	Nothing found; no cultural debris	N	NA	
4835-60	1285619.92	462072.8623	Y	1/15/2008	1/15/2008	1/15/2008	6.5	7.5	N	N	Cultural debris included PVC piping from drainage systems and landscaping debris.	N	NA	Pit location was adjusted 1' North and rotated 45 degrees to ensure clearance of storm drain.
4835-61	1285639.17	462041.6421	Y	2/27/2008	2/27/2008	2/27/2008	NA	11.3	N	N	Cultural debris (PVC, plastic, metal cans, snack bag).	N	NA	
4835-62	1285658.85	461979.516	Y	11/21/2008	11/21/2008	11/21/2008	NA	9	N	N	Cultural Debris (1/2" rebar at 2')	N	NA	
4835-63	1285608.18	462081.8646	N	1/16/2008	1/16/2008	1/16/2008	7.5	8.5	N	N	Nothing found; no cultural debris	N	NA	
4835-64	1285620.69	462051.8033	Y	3/26/2008	3/26/2008	3/26/2008	5	6	N	N	No cultural debris recovered.	N	NA	4 to 6' compacted with bucket only due to groundwater entering excavation.
4835-65	1285607.56	462063.9721	Y	3/27/2008	3/27/2008	3/27/2008	6.5	7.5	N	N	No cultural debris recovered.	N	NA	groundwater encountered approx 5' bgs.
4835-66	1285620.07	462033.9117	Y	4/3/2008	4/3/2008	4/3/2008	5-6	7	N	N	No cultural debris recovered.	N	NA	

Table 3.1 SUMMARY OF TEST PITS WITH NO AUES-RELATED ITEMS
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID	EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic Contamin	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite (feet	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-68	1285597.56	462068.1463	Y	3/12/2008	3/12/2008	3/12/2008	9	10	N	N	No cultural debris recovered. Extended pit approximately 1' south to resolve mag detection; nothing recovered but no further signal to chase.	N	NA	
4835-69	1285608.73	462039.4688	Y	4/1/2008	4/1/2008	4/1/2008	4.5	5.5	N	N	No cultural debris recovered.	N	NA	Rotated pit on centerpoint approx 30 degrees to be parallel with stormwater pipe
4835-70	1285593.8	462058.2471	Y	3/12/2008	3/12/2008	3/12/2008	7.5	8.5	N	N	Cultural debris recovered included soda bottle glass fragments.	N	NA	Rotated pit on center point approximately 90 degrees clockwise to facilitate excavation.
4835-71	1285606.31	462028.1854	Y	4/3/08 & 4/7/08	4/7/2008	4/7/2008	3-3.5	4.5	N	N	No cultural debris recovered.	N	NA	Moved pit approx 2'east into arsenic extension.
4835-72	1285631.33	461968.0643	Y	12/2/2008	12/2/2008	12/2/2008	NA	10	N	N	No cultural debris recovered.	N	NA	
4835-73	1285593.18	462040.3532	Y	4/2/2008	4/2/2008	4/2/2008	6	7	N	N	No cultural debris recovered.	N	NA	Moved pit south to clear the curb, rotated pit approx 60 degrees counterclockwise to allow clearance for excavator to dig.
4835-74	1285592.75	462022.4281	Y	3/21/2008	3/21/2008	3/21/2008	5.5	6.5	N	N	Cultural debris included PVC piping from drainage systems and landscaping debris.	N	NA	Pit location was adjusted 1' North and 2.5' East to ensure clearance of arsenic grids. Pit was rotated to be parallel to East West grid lines.
4835-75	1285617.58	461962.3392	N	12/2/2008	12/2/2008	12/2/2008	NA	11	N	N	No cultural debris recovered	N	NA	
4835-76	1285584	462030.0003	Y	3/31/2008	3/31/2008	3/31/2008	6.5	7.5	N	N	No cultural debris recovered	N	NA	Pit rotated on centerpoint so excavator could sit in grid -170,10 to dig.
4835-77	1285586.41	462003.1351	N	2/4/2008	2/5/2008	2/5/2008	9.5	10.5	N	N	Cultural debris (root basket, non-AUES glass fragments, metal, plastic, and PVC).	N	NA	Test pit location adjusted approx 1 foot south to avoid gas line.
4835-78	1285604.96	461970.4138	N	1/24/2008	1/24/2008 &	1/25/2008	NA	12	N	N	Cultural debris recovered included misc glass bottle fragments.	N	NA	Excavated to max reach of equipment.
4835-79	1285578.8	462016.7353	Y	3/20/2008	3/20/2008	3/20/2008	7	8	N	N	Cultural debris included metal and wire conduit.	N	NA	
4835-80	1285590.41	461986.3364	N	1/30/2008	1/30/2008	1/30/2008	12	12	N	N	Cultural debris (construction debris, piece of metal).	N	NA	Excavated to max reach of equipment; just started getting into saprolite.
4835-81	1285603.82	461956.6141	N	1/25/2008	1/25/2008 & 1/28/2008	1/28/2008	NA	12	N	N	Cultural debris recovered included pieces of plastic sheeting & yellow caution tape from approximately 1.5 to 2' bgs and misc non-AUES glass fragments (2-8'bgs).	N	NA	Test pit reoriented east-west and moved centerpoint approximately 3 feet north to avoid re-marked water line that runs through original centerpoint. Excavated to max reach of equipment.
4835-82	1285575.86	461999.7517	Y	3/25/2008	3/25/2008	3/25/2008	3	4	N	N	No cultural debris recovered	N	NA	
4835-83	1285594.6	461972.2262	N	1/18/2008	1/23/2008	1/23/2008	NA	12.5	N	N	Cultural debris(plastic and beverage bottle fragments).	N	NA	Excavated to max reach of equipment.
4835-84	1285569.03	462010.7578	Y	4/8/2008	4/8/2008	4/8/2008	3-4	5	N	N	No cultural debris recovered	N	NA	Encountered concrete for retaining wall and curb. Moved test pit south into driveway and then northeast to avoid electric line.
4835-85	1285577.55	461980.9496	N	1/31/2008	1/31/2008	1/31/2008	5.5	6.5	N	N	Cultural debris (soda bottles, metal can, rubber, and PVC).	N	NA	
4835-86	1285588.1	461955.7226	N	1/23/2008	1/23/2008	1/23/2008	2	3	N	N	No cultural debris recovered	N	NA	
4835-87	1285569.03	461990.9077	Y	3/19/2008	3/19/2008	3/19/2008	5	5	N	N	No cultural debris recovered (PVC drain line at >3'bgs).	N	NA	
4835-88	1285576.93	461963.0568	N	1/18/2008	1/18/2008	1/18/2008	3	4	N	N	Cultural debris(plastic, PVC, and beverage bottle fragment).	N	NA	
4835-89	1285563.8	461975.2246	Y	3/14/2008	3/14/2008	3/14/2008	1	1.5	N	N	Cultural debris recovered included a glass container fragment.	N	NA	Could only penetrate saprolite layer 0.5 feet.
4835-90	1285574.14	461944.6717	N	1/28/2008	1/28/2008	1/28/2008	2.5	3.5	N	N	No cultural debris recovered.			Test pit oriented north-south, same center point so that can dig without moving the guard shack (electric line that was shown on as-builts is not in this location).
4835-91	1285552.4	461983.273	N	Unable to investigate due to presence of utilities.										
4835-93	1285551.79	461966.5063	N	3/14/2008	3/14/2008	3/14/2008	1	1.5	N	N	Cultural debris recovered included a metal bolt and pvc.	N	NA	Pit was moved 1' east to ensure clearance with electrical lines.

Table 3.1 SUMMARY OF TEST PITS WITH NO AUES-RELATED ITEMS
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID	EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic Contamin	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite (feet	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-94	1285557.53	461953.0301	N	1/28/2008 & 1/30/08	1/30/2008	1/30/2008	2	3	N	N	Cultural debris consisted of metal.	N	NA	1/28/08 Test pit location adjusted eastward to avoid electric line marked by Miss Utility at 2' from curb, western edge of pit moved to be approximately 3.5 feet from curb. Excavated and uncovered unmarked gas line approx 1-2' bgs. Halted excavation and backfilled pending revisit by utility locator. 1/30/08 Adjusted location northward to avoid the gas line that was uncovered in this pit on 1/28. Overall, the pit has been relocated from it's original position by moving eastward to avoid electric line marked by Miss Utility at 2' from curb (western edge of pit moved to be approximately 3.5 feet from curb) and moving northward approximately 5' to avoid gas line (southern edge of pit approximately 2' north of gas line).

Table 3.2 SUMMARY OF TEST PITS WITH SUSPECTED AUES-RELATED ITEMS RECOVERED
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID		EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-(North)	17	NA	NA	N	10/22/2007	NA	NA	NA	NA	N	N	Contingency Plan was initiated upon discovery of a bottom half of a 30-gallon metal drum containing soil and glass fragments; the glass fragments could not be positively identified as unrelated to AUES by the field team.	Y - a soil sample was collected from soil inside of a metal drum piece. Metal drum, glass fragments, and soil sample cleared for headspace .	PI-4835GB-1 PI-4835GB-BATCH-001 SW-4835GB-GS01	The metal drum piece was found 9'6" north of TP 17 while cutting access road. Depth at approximately 18".
4835-	21	1285713.874	462002.4211	N	11/19/2007	11/19/2007	11/19/2007	NA	8	N	False alarms Phosgene (1.58, 0.94 STEL); subsequent cycles clear	Cultural debris (construction debris with bricks, metal, concrete). Potential AUES glassware (glass tubing fragment) from ~7' bgs and sample of surrounding soil both cleared for headspace.	Y - Glass tubing fragment and surrounding soil sample from ~7' bgs both cleared for headspace.	SW-4835GB-10 PI-4835GB-Batch 008	Excavated to max reach of equipment.
4835-	27	1285703.088	462013.0154	N	11/14/2007 & 11/15/2007	11/15/2007	11/15/2007	NA	12	N	N	Cultural debris (construction debris with bricks, metal, insulation, wire,terracotta, pulley, wire rope, soda bottle fragments,chickenwire and porcelain). Potential AUES glassware also found at 1', 6', and 8' bgs; soil and glassware samples collected and cleared for headspace.	Y - batch glassware and 3 soil samples (1', 6', and 8' bgs) cleared for headspace; per PDT no further analysis of soil samples.	SW-4835GB-07 SW-4835GB-08 SW-4835GB-09 PI-4835GB-Batch007	Test pit was rotated on centerpoint approximately 45 degrees to the east so it could be excavated from downslope. Excavated to max reach of equipment.
4835-	37	1285680.115	462043.925	N	11/26/2007 & 11/27/2007	11/27/2007	11/27/2007	NA	10.3	N	N	Potential AUES glass tubing and fragments collected at 3' bgs; soil and glass headspace clear. Cultural debris (metal, foam, soda and liquor bottle fragments, wiring conduit, china fragments, terracotta pipe and pvc pipe).	y - potential AUES glass tubing and fragments collected at 3' bgs; glass and surrounding soil headspace clear; per PDT no further analysis of soil	SW-4835GB-011 PI-4835GB-Batch009	Excavated to max reach of equipment.
4835-	38	1285691.655	462012.6281	N	11/8/2007	11/8/2007	11/8/2007	NA	11.5	N	N	Cultural debris (construction debris with bricks, terracotta pipe, PVC, geocloth, and soda and beer bottle fragments). Potential AUES glassware and ceramic fragments also found at 6' bgs; cleared for headspace (sample of surrounding soil also cleared).	Y - headspace negative for CA for glass sample and soil sample; per PDT no further analysis of soil sample.	SW-4835GB-6 PI-4835GB-Batch006	Test pit was rotated to be perpendicular to the retaining wall to the north, parallel to the retaining wall to the west in order to dig the pit with excavator sitting to the south.

Table 3.2 SUMMARY OF TEST PITS WITH SUSPECTED AUES-RELATED ITEMS RECOVERED
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID	EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-40	1285636.321	462111.209	N	10/23/2007 & 10/30/2007 & 1/9/2008	1/9/2008	1/9/2008	10	11	N	10/23/07: N 10/30/07: False alarms for L and chloropicrin from MINICAMS after Contingency plan was initiated and MINICAMS was placed under the plastic covering the hole. 1/9/08: N	10/23/07: Glass encountered at approx 18" bgs consisting of bottle neck and bottom as well as other glass pieces. Archaeo eval id'd glass as manufactured between 1901 and 1938. Therefore, this artifact could be related to the AUES activities that occurre between 1917 and 1919. 10/31/07: Collected a soil sample near the root ball excavation. Found glassware consisting of a bottleneck with stopper, bottom of a glass container, and the sides of a glass container and collected a glassware sample. The soil and glassware samples cleared for headspace.	Y -headspace negative for agent by DAAMS for glass sample and soil sample collected 10/23/07;soil sample negative for CA/ABPs/ricin by low level analysis; Partners concur no further analysis of soil sample. Y - headspace negative for agent by DAAMS for glassware and soil samples.	SW-4835GB-2 PI-4835GB-Batch002 SW-4835GB-4 PI-4835GB-Batch004	10/23/07: At approximately 3.5' bgs in the northern end of the test pit concrete was encountered. The test pit was shifted slightly to the south. After shifting the test pit location southward, encountered glassware at approximately 18" bgs. Crew initiated Contingency Plan. 10/30/07: Resume intrusive to appro 7' bgs. Removed a root ball at appro 20" bgs in the southern portion of the excavated area when they witnessed a small visible cloud being emitted from the sidewall, receeded by an audible popping sound. Initiated Contigency Plan. ECBC put DAAMS tubes under the plastic - no agent detections on perimeter DAAMS or DAAMS that were placed in the covered excavation, and entire library of compounds were analyzed on DAAMS tubes. Additional DAAMS tubes were sent to Edgewood. No arsine or PID detections. ECBC results - no detection of HD or L; inconclusive on the library analyses, can only say that chlorinated hydrocarbons were present in the DAAMS tube samples.
4835-43	1285670.964	462023.3572	N	1/10/2008	1/10/2008	1/10/2008	8.5	9.5	N	N	Encountered glassware (broken bottleneck, approx 3" diameter opening) in east sidewall approximately 3.5' bgs and initiated Contingency Plan. PDT approved proceeding in exception mode. Initial glassware clear for headspace; no additional items encountered.	Y - headspace negative for glass bottleneck	PI-4835GB-15	
4835-46	1285635.695	462093.3147	N	1/8/2008	1/9/2008	1/9/2008	NA	12	N	N	Glass bottleneck (clear) recovered from north sidewall at approx 5 feet bgs. Contingency plan implemented. PDT approved proceeding in exception mode. Soil sample and initial glassware clear for headspace.	Y - headspace negative for soil sample and glass bottleneck sample; additional glassware found at 6' bgs also clear	SW-4835GB-17 PI-4835GB-Batch13 PI-4835GB-Batch14	Excavated to max reach of equipment.
4835-47	1285648.204	462063.2534	N	10/29/2007	10/29/2007 & 10/30/2007	10/30/2007	NA	12	N	N	Cultural debris (pliers, rebar, bricks). At max reach of equipment found glass fragment (top of glass bottle). DAAMS negative on headspace for glass and negative for soil.	Y - headspace negative for CA by DAAMS for glass sample and soil sample; per PDT no further analysis of soil sample.	SW-4835GB-3 PI-4835GB-Batch003	Directed by PDT to backfill excavation since at max reach of equipment. No soil discoloration around glass bottle top. No other glassware observed in excavation.

Table 3.2 SUMMARY OF TEST PITS WITH SUSPECTED AUES-RELATED ITEMS RECOVERED
LOW PROBABILITY TEST PIT INVESTIGATIONS, 4835 GLENBROOK ROAD

Test pit ID	EASTING (Center point)	NORTHING (center point)	Located in/adjacent to Arsenic	Date Excavated	Date Backfilled	Date Complete	Depth to Saprolite	Final Depth (feet bgs)	Magnetometer Detections?	Air Monitoring Alarms?	Dig Results	Samples Collected from Test Pit	Sample IDs	Comments
4835-49	1285677.899	462004.9911	N	12/13/2007 & 12/18/07	12/19/2007	12/19/2007	6 to 7	8	Y - in northeast corner, cleared after excavation extended eastward approximately 3 feet	N	During final screen of sidewalls on 12/13 mag indicated reading in northeast corner of the test pit. Upon examination of this area metal items were uncovered, including a Livens projectile. Contingency plan initiated. Dig team identified item as a full Livens Projectile, 59 Lbs, 22" Length, 8 1/8" Diameter, NO detects on Minicams, PID, Arsine, ICAM, all Negative. The projectile was determined to have liquid inside and a small pinhole. Technical Escort X-ray of the projectile concluded there were no explosives present. The soil sample collected cleared for headspace.	Y - headspace negative for soil sample; Edgewood analysis of liquid negative for agent/ABP/ricin, GC/MS scan id'd benzene in chromatogram.	SW-4835GB-16 TE-4835GB-TP49-001W	Test pit extended from northeast corner (extension was approximately 3 feet to east and 4 feet north/south from northeast corner, 5' deep).
4835-51	1285635.073	462075.4223	N	12/10/2007	12/10/2007 & 12/11/2007	12/11/2007	NA	10.5	N	N	Potential AUES glass fragment collected at 4.5' bgs (part of the neck of clear glass container, approx 2" diameter opening) and 9.5'bgs (glass tubing fragment near two rubber stoppers). PDT approved Exception Mode after find at 4.5'bgs. Soil and glassware samples cleared for headspace.	Y - headspace negative for CA for glass samples and soil samples; per PDT no further analysis of soil samples.	SW-4835GB-14 PI-4835GB-Batch011 SW-4835GB-15 PI-4835GB-Batch012	Test pit rotated to be approximately parallel to retaining wall, centerpoint moved approximately 2 feet south away from wall. Encountered footer for concrete wall at 10.5' and could not excavate past the footer (max reach of excavator at this location estimated to be approx 11').
4835-56	1285636.059	462058.1728	N	11/5/2007, 11/28/2007 & 12/3/2007	12/4/2007	12/4/2007	NA	11	N	N	Suspect glass fragments and ceramic fragment found at 2' bgs 11/5/07. After soil and glass headspace cleared, PDT approved returning to excavation. On 11/28/07 restarted excavation and found glass bottle with cap, containing clear liquid. TE packaged the bottle. Headspace of the soil sample collected from around the bottle cleared headspace.	Y - headspace negative for CA by DAAMS for 11/5/07 glass sample and soil sample; per PDT no further analysis of soil sample. Y - TE-4835GB-TP56-001clear glass bottle with screw-on lid, approx 3"tall, approx 1.25" diameter, approx one third full of clear liquid. GC/MS analysis of the liquid indicated the possible presence of toluene.	SW-4835GB-05 PI-4835GB-Batch005 SW-4835GB-012 TE-4835GB-TP56-001	Crew encountered a stump along the East wall of the pit approximately 7 feet deep extending downward. Due to the stump and the concrete West wall, the pit was excavated approximately 4x3' from 7' to the final 11'.
4835-57	1285648.727	462028.3987	Y	2/27/2008	2/27/2008	2/27/2008	NA	12.5	N	N	Recovered a potential AUES-related glass fragment at 4.5'bgs and collected it for headspace; continued in exception mode. No cultural debris recovered.	Y - potential AUES glass, continued under general exception mode, headspaced cleared.	PI-4835GB-17	
4835 67	1285645.09	461973.7905	Y	11/25/2008	12/1/2008	12/1/2008	9	10	N	N	AUES Glass/Labware	Y - Potential AUES glass 3" X 1/4 Glass tube Head Space cleared 11/25/08	PI-4835GB-19	Item encountered at 2'
4835-92	1285563.175	461957.3318	N	1/28/2008	1/28/2008	1/28/2008	2	2	N	N	Excavated 2' bgs and encountered a saprolite layer too hard to excavate into. Cultural debris recovered consisted of PVC, glass fragments, and plastic. Recovered suspect AUES glass bottle neck and continued under exception mode; glassware cleared for headspace.	Y -headspace negative on batch glassware from 1.5 bgs consisting of bottleneck and glass fragments.	PI-4835GB-16	Test pit location moved 2' eastward, western edge 18" from edge of sidewalk to avoid electrical line marked by Miss Utility.

3.2.2.2 Test Pit 4835-21

3.2.2.2.1 Cultural debris consisting primarily of construction-related debris such as bricks, metal, and concrete, were recovered from TP 4835-21 between 0 and 7 ft bgs. At 7 ft bgs, a glass tubing fragment (PI-4835GB-Batch008) was recovered on November 19, 2007 and headspaced negative for agent.

3.2.2.2.2 A grab soil sample was collected from around the item (SW-4835GB-10) and submitted for headspace. The MINICAMS detected Lewisite in the headspace but the DAAMS confirmation was negative for agent. MINICAMS detected phosgene during the first two cycles of air monitoring, but was undetected in the subsequent cycles. The TP excavation was completed at 8 ft bgs, the maximum reach of the excavator at this location.

3.2.2.3 Test Pit 4835-27

3.2.2.3.1 TP 4835-27 was excavated to the maximum extent of the excavator (12 ft bgs) on November 14 and 15, 2007. Cultural debris consisting primarily of construction debris with bricks, metal, insulation, wire, terracotta pipe, pulley, wire rope, soda bottle fragments, chicken wire, and porcelain, was recovered from depths between 4 and 12 ft bgs. Potential AUES glassware was found at 1, 6, and 8 ft bgs.

3.2.2.3.2 A glassware sample (PI-4835GB-Batch007) and three soil samples (SW-4835GB-07, 08, and 09) were collected for headspace analysis. The batch glassware and soil samples (1, 6, and 8 ft bgs) were all cleared for headspace. In accordance with PDT direction, further analyses of the soil samples were not performed.

3.2.2.4 Test Pit 4835-37

3.2.2.4.1 TP 4835-37 was excavated to the maximum extent of the excavator (10.5 ft bgs) on November 26 and 27, 2007. Cultural debris consisting primarily of metal, foam, soda, and liquor bottle fragments, wiring conduit, china fragments, terracotta pipe, and PVC pipe was recovered from depths between 1 and 10 ft bgs. Potential AUES glass tubing and fragments were found at 3 ft bgs.

3.2.2.4.2 A glassware sample (PI-4835GB-Batch009) and a soil sample (SW-4835GB-11) were collected for headspace analysis. The batch glassware and the soil sample (3 ft bgs) were all cleared for headspace. In accordance with PDT direction, further analysis of the soil sample was not performed.

3.2.2.5 Test Pit 4835-38

3.2.2.5.1 TP 4835-38 was excavated to the maximum extent of the excavator (11.5 ft bgs) on November 8, 2007. During the investigation, gravel related to the retaining wall was encountered north of the excavation. Cultural debris consisting primarily of construction debris with bricks, terracotta pipe, PVC, geocloth, and soda and beer bottle fragments was recovered from depths between 1 and 8 ft bgs. Potential AUES glassware and ceramic fragments were found at 6 ft bgs.

3.2.2.5.2 A glassware sample (PI-4835GB-Batch006) and a soil sample (SW-4835GB-06) were collected for headspace analysis. The batch glassware and the soil sample (6 ft bgs) were all cleared for headspace. In accordance with PDT direction, further analysis of the soil sample was not performed.

3.2.2.6 Test Pit 4835-40

3.2.2.6.1 Initial excavation of TP 4835-40 to 2 ft bgs was conducted on October 10, 2007 to perform a compaction test and develop backfill procedures. Cultural debris, including a sprinkler head, flower pot, brick, carpet, and the heel of a shoe was excavated. The excavation was temporarily backfilled. On October 23, 2007 excavation of the test pit proceeded to 3.5 ft bgs where concrete was encountered, apparently related to the lower retaining wall. In accordance with PDT direction, the excavation was shifted southward by 2 ft to avoid the concrete. At approximately 18 in. bgs in the adjusted location a bottle neck and bottom and other glass fragments were encountered. The Low Probability Contingency Plan (USACE 2008b) was initiated due to finding of suspect AUES glass fragments. The glassware (PI-4835GB-Batch002) and a soil sample (SW-4835GB-02) were collected. Headspace analysis of both samples was negative for agent. The soil sample was sent to ECBC for low-level agent analysis (non-detect) and ricin analysis (non-detect). The PDT and Partners concurred that no further analysis of the soil sample was necessary; activities resumed on October 30, 2007. The contingency plan was initiated due to finding of potential AUES glass fragments" was added to Section 3.2.2.6.1

3.2.2.6.2 Archaeological evaluation of the pieces identified the glass as manufactured between 1901 and 1938, indicating that the artifacts could be related to AUES activities that occurred between 1917 and 1919. Therefore, they were considered suspected AUES-related debris.

3.2.2.6.3 While removing a root mass in the southern end of the excavated area, a popping sound was heard followed by a smoke-like cloud at the sidewall. The Low Probability Contingency Plan (USACE 2008b) was initiated, and the excavation was covered with plastic. During air monitoring, MINICAMS detected L and chloropicrin in the covered excavation. Agents were neither detected by DAAMS in the perimeter, nor by the DAAMS that was placed in the covered excavation. Additional DAAMS tubes were submitted to ECBC Edgewood for agent and entire library analysis. The results showed no detection of HD or L. The entire library analyses were inconclusive for chloropicrin; but indicated that chlorinated hydrocarbons were present in the DAAMS tube samples. Per the PDT, the crew returned to the excavation on October 31, 2007 to collect a soil sample (SW-4835GB-04) and also found glassware (PI-4835GB-Batch004) consisting of a bottleneck with stopper, bottom of a glass container, and the sides of a glass container. The bottom piece had markings similar to that recovered at this location on October 25, 2007. Headspace analyses of the glassware and soil sample were negative for agents of concern. Low-level analysis of the soil sample was also negative. The soil sample was sent to GPL for analysis of the SVFUDS Comprehensive List. The non-Spring Valley-specific SVOC benzo(a)pyrene (B(a)P) at 83 parts per billion (ppb) exceeded comparison standard of 15 ppb (current RSL). Total polycyclic aromatic hydrocarbons (PAH) and total B(a)P equivalents are below the 12 parts per million (ppm) and 3 ppm standards, respectively. On January 9, 2008 the TP was excavated to 11 ft bgs (1 ft below saprolite) with no further findings.

3.2.2.7 Test Pit 4835-43

3.2.2.7.1 TP 4835-43 was excavated to 1 ft below saprolite (9.5 ft bgs) on January 10, 2008. Cultural debris consisting primarily of construction debris with metal, plastic, and ceramic plate fragments was recovered from depths between 0 and 6 ft bgs. Potential AUES glassware was found at 3.5 ft bgs.

3.2.2.7.2 A glassware sample (PI-4835GB-Batch015) was collected for headspace analysis. The batch glassware was cleared for headspace.

3.2.2.8 Test Pit 4835-46

3.2.2.8.1 TP 4835-46 was excavated to the maximum extent of the excavator (12 ft bgs) on January 8 and 9, 2008. Cultural debris, consisting primarily of construction debris with polyvinyl chloride (PVC) pipe, wood, metal, beverage bottle glass, and plastic, were recovered from depths between 0 and 4 ft bgs. Potential AUES glassware, including a bottle top, was found between 5 to 9 ft bgs.

3.2.2.8.2 Two glassware samples (PI-4835GB-Batch013 and Batch014) and a soil sample (SW-4835GB-17) were collected for headspace analysis. The batch glassware and soil samples were cleared for headspace. In accordance with PDT direction, further analysis of the soil sample was not performed.

3.2.2.9 Test Pit 4835-47

3.2.2.9.1 TP 4835-47 was excavated to the maximum extent of the excavator (12 ft bgs) on October 29 and 30, 2007. Cultural debris consisting primarily of pliers, rebar, and bricks, were recovered at depths of 3, 6, and 10 ft bgs. A potential AUES glass bottle fragment (top of bottle) was found at maximum reach of equipment (12 ft bgs).

3.2.2.9.2 Although soil discoloration was not encountered, a grab soil sample was collected around the glass fragment. One glassware sample (PI-4835GB-Batch003) and a soil sample (SW-4835GB-03) were submitted for headspace analysis. The batch glassware and the soil sample were cleared for headspace. In accordance with PDT direction, further analysis of the soil sample was not performed.

3.2.2.10 Test Pit 4835-49

3.2.2.10.1 Excavation of TP 4835-49 began on December 13, 2007. The TP location was under the hardscaped patio area, which required jack hammering an opening in the concrete to excavate the test pit. The excavation was approximately 8 ft bgs and the crew was scraping the northeast sidewalls to resolve readings with the Schonstedt. While scraping the sidewalls, metal debris was recovered followed by a Livens projectile, which fell out into the floor of the excavation. The Low Probability Contingency Plan (USACE 2008b) was initiated and TE was contracted to package and transport the projectile to federal property. The projectile was determined to have liquid inside and a small pinhole. Saprolite was encountered at depths between 6 to 7 ft and the final excavation depth of the test pit was 8 ft bgs.

3.2.2.10.2 A soil sample (SW-4835GB-16) was also collected from the sidewall where the projectile was embedded. Low-level analysis of the liquid and the soil sample indicated no agents of concern. Gas chromatography-mass spectroscopy (GC/MS) analysis of the liquid indicated the presence of trace benzene. Technical Escort X-ray of the projectile concluded there were no explosives present. Further excavation was approved on December 18, 2007 and a 5-6 ft long x 12 in. metal tube was recovered. This item was sent for low level agent analysis and the excavation was cleared with the Schonstedt. The excavation was then backfilled. No agents of concern were detected in association with the metal tube. The GC/MS analysis report is included in Appendix G, in the ECBC data folder, and CA&ABP folder.

3.2.2.11 Test Pit 4835-51

3.2.2.11.1 TP 4835-51 was excavated to the maximum extent of the excavator (10.5 ft bgs) where a concrete footer was encountered on December 10 and 11, 2007. Cultural debris, consisting primarily of metal, beer and soda bottle fragments, plastic pipe, and plastic, were recovered at depths between 1 to 3 ft bgs. Suspect AUES glass fragments were found at 4.5 ft bgs (part of the neck of clear glass container, approximately 2-in. diameter opening) and 9.5 ft bgs (glass tubing fragment near two rubber stoppers). PDT approved work under Exception Mode after items were found at 4.5 ft bgs. Exception mode to the contingency plan allows intrusive operation to continue prior to clearance of headspace analysis of items previously found.

3.2.2.11.2 Two glassware samples (PI-4835GB-Batch011 and Batch012) and two soil samples (SW-4835GB-14 and -15) were collected for headspace analysis. The batch glassware and soil samples were cleared for headspace. In accordance with PDT direction, further analysis of the soil sample was not performed.

3.2.2.12 Test Pit 4835-56

3.2.2.12.1 Excavation of TP 4835-56 began on November 5, 2007. Approximately 2 ft bgs, glass fragments and a piece of crockery were recovered. The fragments and a soil sample were collected for headspace analysis (PI-4835GB-Batch005). Results of the headspace analysis showed no agents of concern and excavation resumed on November 28, 2007. During excavation, a small glass bottle approximately ¼ - ½ full was recovered. Figure 1-2 shows the location where the glass bottle was recovered.

3.2.2.12.2 The Low-Level Contingency Plan (USACE 2008b) was initiated and TE was contacted to package the bottle (TE-4835GB-TP56-001). Headspace of the soil sample collected from around the bottle revealed no agents of concern. GC/MS analysis of the liquid indicated the possible presence of toluene. Excavation resumed in the exception mode as defined in Section 16.13.8.2 through 16.13.8.4, Appendix D of SSWP (USACE 2008b) on December 3, 2007. The exception mode is a modification to the low probability contingency procedure, which allows the field team to continue with excavation activities as long as the initial potential item found was cleared for headspace analysis and no agent was detected, and the modification was concurred by the USAESCH and CENAB PDTs. A small glass fragment was recovered approximately 9.5 ft bgs and was collected for analysis. The final depth of the excavation was 11 ft bgs. Two grab soil samples (SW-4835GB-05 and SW-4835GB-012) were collected from soil near the location where the glass fragments and the small glass bottle was found. Excavation of the TP was completed December 3, 2007 and the excavation was backfilled. Analysis of the glass fragment and an associated soil sample indicated no agents of concern were present.

3.2.2.13 Test Pit 4835-57

3.2.2.13.1 TP 4835-57 was excavated to the maximum extent of the excavator (12.5 ft bgs) on February 27, 2008. No cultural debris was recovered from this test pit. A potential AUES glass fragment was found at 4.5 ft bgs (18 in. below the arsenic removal depth).

3.2.2.13.2 One glassware sample (PI-4835GB-Batch017) was collected for headspace analysis. The batch glassware sample was cleared for headspace.

3.2.2.14 Test Pit 4835-67

3.2.2.14.1 TP 4835-67 was excavated to 1 ft below the saprolite (10 ft bgs) on November 25 and December 1, 2008. No cultural debris was recovered from this test pit. One potential AUES glass pipette (¼ in. x 3 in.) was uncovered at approximately 6 ft below original ground surface (4 ft previously removed arsenic soil; and the pipette was found at approximately 2 ft below the excavated surface) in TP 67 south wall.

3.2.2.14.2 One glassware sample (PI-4835GB-Batch019) was submitted for headspace analysis. The batch glassware sample was cleared for headspace.

3.2.2.15 Test Pit 4835-92

3.2.2.15.1 TP 4835-92 was excavated to the saprolite layer (2 ft bgs) on January 28, 2008. Additional excavation was not performed because the saprolite layer was too difficult to excavate. The TP location was moved 2 ft eastward with the western edge 18 in. from edge of sidewalk to avoid electrical line marked by Miss Utility. Cultural debris consisting primarily of PVC pipe, glass fragments, and plastic was recovered at depths between 0 to 2 ft bgs. Potential AUES glass fragments, including a glass bottle neck, were found at 1.5 ft bgs.

3.2.2.15.2 One glassware sample (PI-4835GB-Batch016) was collected for headspace analysis. The batch glassware sample was cleared for headspace.

3.2.3 Air Monitoring

3.2.3.1 Air monitoring was performed during investigation of the test pits in accordance with the SSWP and SSHP. During the TP investigation there were six MINICAMS alarms. Copies of the MINICAMS results are included in Appendix I.

3.2.3.2 There were no instances of arsine alarms during the test pits investigation. The monitors were set to log the sample results each minute. Copies of the arsine logs are included in Appendix I.

3.2.3.3 There were no Photo Ionization Detector (PID) alarms for VOCs in the breathing zone during the TP investigation.

3.2.3.4 Particulate monitoring was conducted during TP investigations in arsenic-contaminated grids. Results of particulate monitoring were recorded periodically in the Site Daily Logbooks. No readings above the action level were observed. Copies of the Daily Logbook are included in Appendix C.

3.3 HAZARDOUS AND TOXIC WASTE (HTW) SOIL REMOVAL

3.3.1 Soil Excavation from Grids and 4835 Glenbrook Road Driveway

3.3.1.1 Full or partial arsenic contaminated soil grids were excavated in accordance with procedures outlined in Section 3.5 of the SSWP (USACE 2008b). The grids and associated extensions were excavated to the predetermined depth defined by the confirmation samples.

3.3.1.2 Based on the soil confirmation delineation soil sampling results, soil contaminating arsenic concentrations higher than 20 mg/kg were removed. Approximately 539 cubic yards were removed and disposed in accordance with Section 3.6 of the SSHP (USACE 2008b).

3.3.2 Air Monitoring

3.3.2.1 Air monitoring was performed during the arsenic removal operation in accordance with the SSWP and Site Safety and Health Plan (SSHP) (USACE 2008b). Initially, air monitoring was conducted for agents of concern, arsine, VOCs, total particulates in dust, and arsenic. During the excavation of the arsenic grids there were no alarms for any of the air monitoring equipment. In accordance with Amendment 1 of the SWWP, air monitoring during arsenic removal conducted after completion of the TP investigation was reduced to total particulate monitoring.

3.3.2.2 There were no instances of arsine alarms during the arsenic removal. The monitors were set to log the sample results each minute. Copies of the arsine logs are included as Appendix I.

3.3.2.3 There were no PID alarms for VOCs in the breathing zone during the arsenic removal.

3.3.2.4 Particulate monitoring was conducted during all arsenic removal operations. Results of particulate monitoring were recorded periodically in the Daily Logbooks. No readings above the action level were observed. Copies of the Daily Logbooks are included in Appendix C.

3.3.2.5 Arsenic air samples were taken during initial arsenic removal operations. Arsenic was not found above the action level. Arsenic air sample data is included in Appendix I.

3.4 SAMPLING RESULTS

3.4.1 Confirmation Samples

3.4.1.1 Soil confirmation samples were collected in 2007 and 2008 in the arsenic grids. These samples were collected from floor and sidewalls of the arsenic grids during the arsenic removal activities to ensure that the removal action level of 20 mg/kg was met and to determine the excavation extent. . After clearance of headspace and low level analysis, the samples were submitted to ALSI for total arsenic analysis. After the sampling results showed that arsenic concentrations were below the removal action level, the samples were analyzed for 12 AU-requested metals. One hundred and thirteen (113) confirmation samples were collected of which 21 were floor samples and the remaining 92 were sidewall samples (including QA/QC samples). Figures 3-1 and 3-2 show the results of the 19 Floor and 46 Sidewall arsenic soil confirmation sample locations.

3.4.1.2 The sampling results are summarized in Appendix E. Based on the delineation results, all arsenic-affected soil exceeding the Spring Valley comparison level of 20 mg/kg was excavated and disposed off-site. Appendices F, G and H include the laboratory results and validated data for these samples. Aluminum, copper, nickel, and thallium concentrations detected in one or more samples exceeded the Spring Valley comparison levels. These data were evaluated in the 2009 HHRA for the property. The HHRA evaluation results are summarized in Section 3.5.

3.4.2 Grab Samples

3.4.2.1 The analytical results collected from two grab samples are summarized in Appendix E. Appendix E shows that one non-Spring Valley-specific SVOC (benzo(a)pyrene) and one metal (aluminum) in one sample were detected at concentrations exceeding the Spring Valley

comparison levels. Appendices F, G and H include the laboratory results and validated data for these samples.

3.4.2.2 These data were evaluated in the 2009 HHRA for the property. The HHRA evaluation results are summarized in Section 3.5.

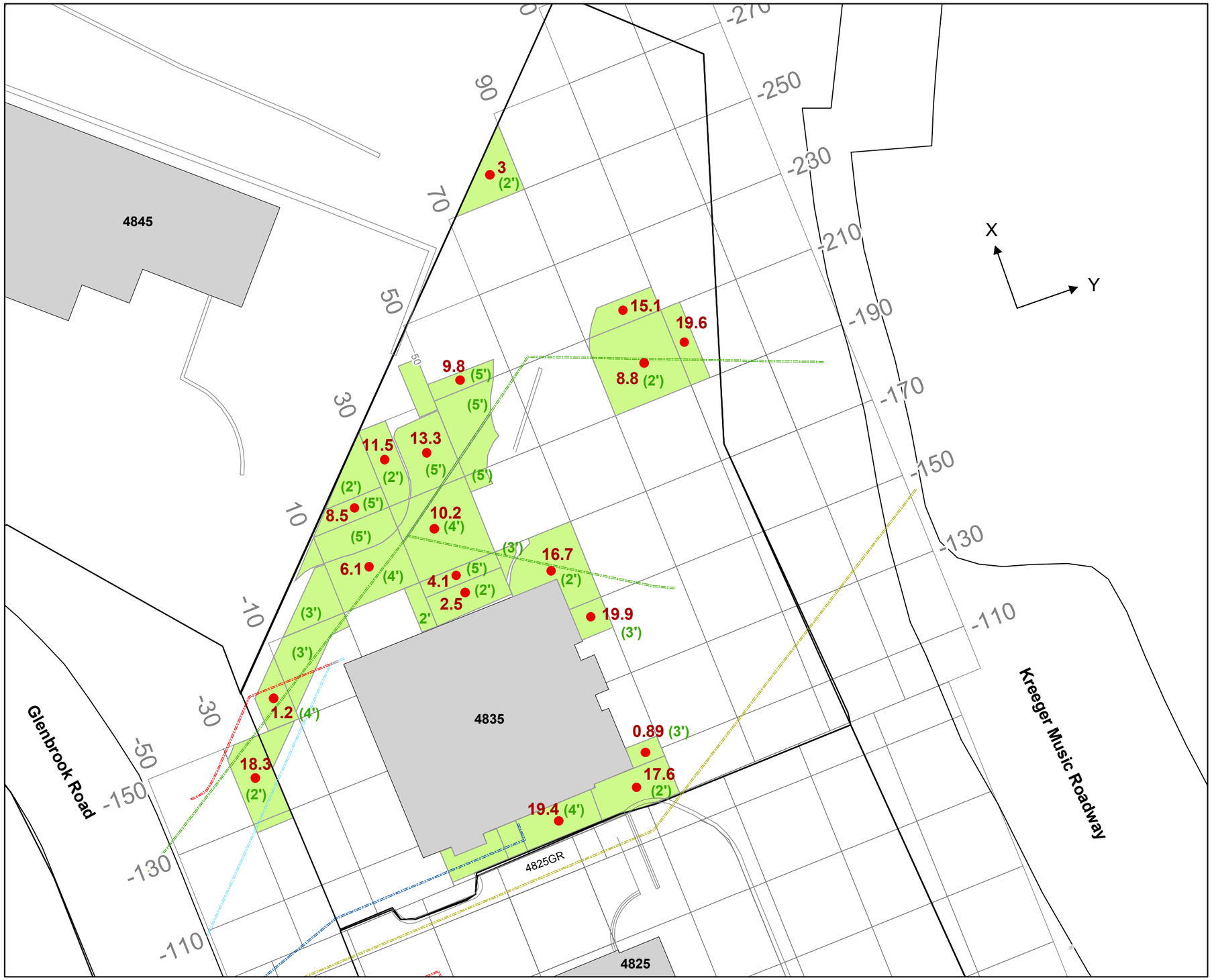


Figure 3-1
Arsenic Grid Floor Sampling Results
4835 Glenbrook Road

Spring Valley
Washington, D.C.

Legend

- Arsenic Sample Location (Concentration in mg/kg)
- Arsenic Contaminated Soil Excavated in 2008
- Property Boundaries
- Buildings
- 20' Grid
- Gas Line
- Electric Line
- Water Line
- Sanitary Sewer Line
- Storm Sewer Line

0 12.5 25 50 Feet

1 inch = 25 feet

Scale:	1:300
Created By:	Parsons
File:	20110308 4835 Glenbrook-Arsenic Grid Sampling.mxd
Date:	3/8/2011
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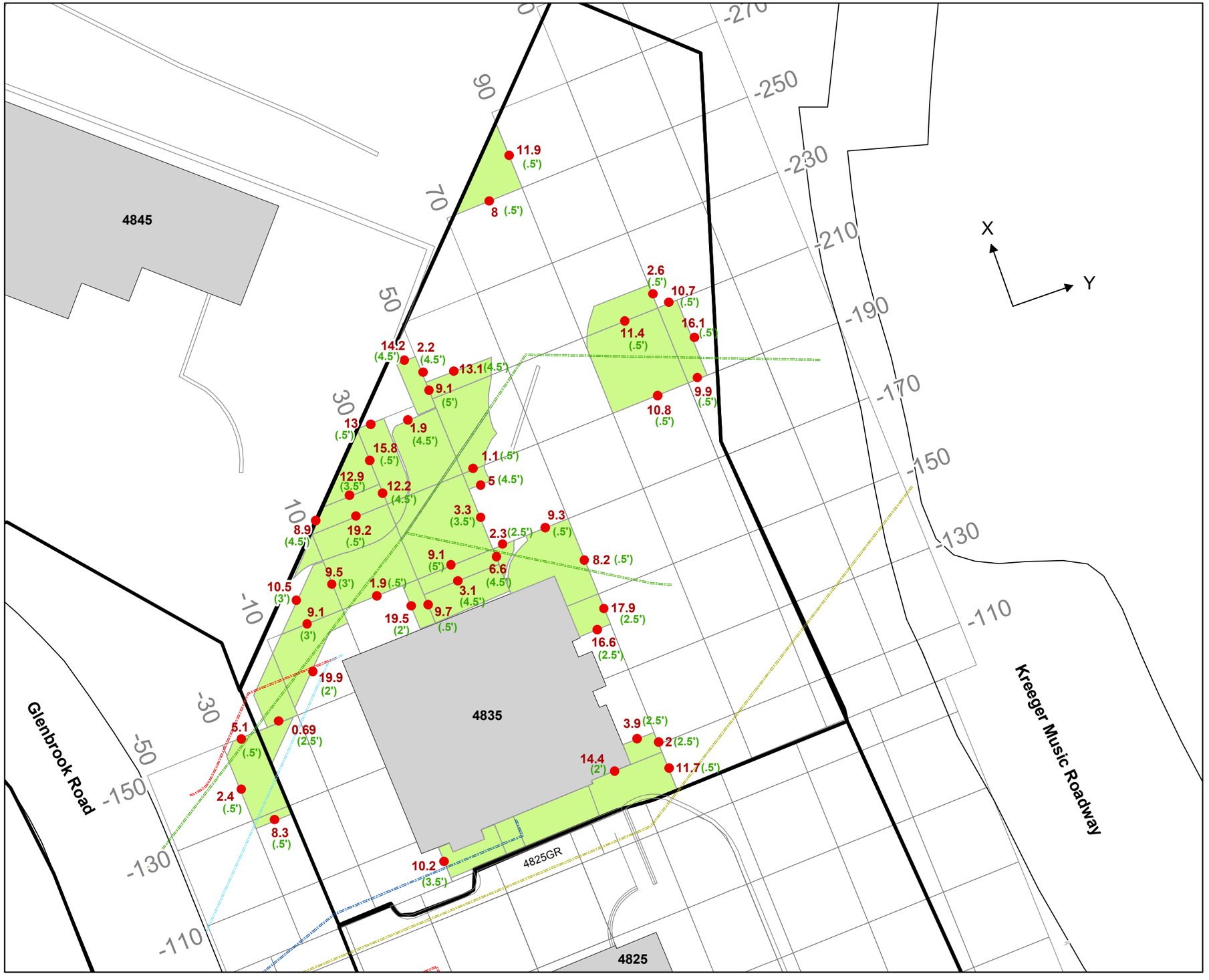
Figure 3-2
Arsenic Grid Sidewall Sampling Results 4835 Glenbrook Road

Spring Valley
Washington, D.C.



Legend

- Arsenic Sample Location (Concentration in mg/kg)
- Arsenic Contaminated Soil Excavated in 2008
- Property Boundaries
- Buildings
- 20' Grid
- Gas Line
- Electric Line
- Water Line
- Sanitary Sewer Line
- Storm Sewer Line

0 12.5 25 50 Feet

1 inch = 25 feet

Scale:	1:300
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3.4.3 Geotechnical Sampling

3.4.3.1 The analytical results collected from four geotechnical borings soil samples are summarized in Table E.3, Appendix E. Data in Table E.3 indicate that four metals (aluminum, cobalt, thallium, and vanadium) were detected at concentrations exceeding the Spring Valley comparison levels. VOCs, SVOCs, explosives, and other analyzed compounds were either not detected or detected at concentrations below the Spring Valley comparison levels. Appendices F, G and H include the laboratory results and validated data for these samples.

3.4.3.2 These data were not evaluated in the 2009 HHRA for the property and are evaluated in Section 3.5.

3.4.4 Soil Disposal

The TCLP waste profile sample analytical results indicate that arsenic-affected soil excavated from 4835 Glenbrook Road are non-RCRA hazardous. A total of approximately 539 cubic yards of excavated soil, debris, and PPEs were shipped to King and Queen County Landfill, VA as non-RCRA hazardous waste. The laboratory reports are included in Appendix G, in the disposal data folder. Disposal manifests are included as Appendix J.

3.4.5 Aqueous IDW

The TCLP sample analytical results show that aqueous IDW was non-RCRA hazardous waste and disposed at DuPont Facility in New Jersey as non-RCRA hazardous waste. The laboratory reports are included in Appendix G, in the disposal data folder. Disposal manifests are included as Appendix J.

3.5 COMPARISON OF INVESTIGATION RESULTS WITH HISTORICAL GROUND SCARS AND BUILDINGS

3.5.0.1 A comparison of test pit locations and the 1918 ground scars indicate that test pits with suspected AUES-related finds are in close proximity to or within the 1918 ground scars at the backyard. These test pits include TP 17, 37, 40, 46, 47, 51, 56, and 57 towards the northern end of the backyard and TP 21 towards the southern end. TPs 27, 38, and 49 are in close proximity to the 1927 ground scar. Figure 2-2 shows the ground scars and the locations of these test pits. The 1918 ground scar in the front yard of the property was not in the vicinity of the test pits with suspect AUES-related finds. However, the ground scar is adjacent to the 1996 debris find at the front yard of the property (Section 1.3.3.3 of this report).

3.5.0.2 Comparison of the historical buildings with the test pit locations also show TP37 and TP57 to be in close proximity to the mustard shed and mustard storage shed respectively. TPs 47, 51 and 57 are within or in close proximity to the historic Ice House #2.

3.6 HUMAN HEALTH RISK ASSESSMENT AND ADDITIONAL RISK EVALUATION FOR THE GEOTECHNICAL SOIL DATA

3.6.0.1 Soil data collected in 2007 and 2008 from the TP investigation and arsenic removal activities along with other data collected from previous investigations in 1992, 1996, 1999, and 2000 were evaluated in a HHRA for the 4835 Glenbrook Road property. The HHRA concluded that the cumulative cancer risk estimates for child residents, adult residents, and outdoor workers are all well below the USEPA point of departure of 1 x 10^{-6} risk level. Thus, unacceptable

cancer risks to the human receptors are not expected from assumed exposures to COPCs (aluminum, cobalt, copper manganese, mercury, nickel, thallium, and vanadium) in soil at the site. Additionally, the hazard indexes (HI) estimated for assumed exposures at the site do not exceed the benchmark level of concern of 1. This indicates that unacceptable non-carcinogenic health effects are not expected from assumed exposures to COPCs in soil at the site.

3.6.0.2 Geotechnical soil samples were collected after performing the HHRA. The aluminum, cobalt, thallium, and vanadium concentrations collected from the geotechnical soil samples were further evaluated by comparing the concentrations to the mixed soil reasonable maximum exposure (RME) exposure point concentrations (aluminum: 25,533 mg/kg, cobalt: 42 mg/kg, thallium: 1.35 mg/kg, and vanadium: 109 mg/kg) used in the HHRA. Among the four subsurface soil samples collected, only two samples are within 0 to 10-ft interval, where the soil direct contact exposure pathways are potentially complete. The comparison results show that the exceeded concentrations (aluminum: 24,100 mg/kg, thallium: 2.7 J mg/kg, and vanadium: 92.4 mg/kg) detected in these two samples are lower than the exposure point concentrations used in the HHRA except for thallium. The 95 percent UCL was recalculated for thallium including the two additional data points. The recalculated 95 percent UCL is 1.36 mg/kg, which is close to the exposure point concentration of 1.35 mg/kg. Therefore, the conclusions of the HHRA are still valid for the site. The 95 percent UCL calculations sheets are included in Appendix K.

3.7 SITE RESTORATION

Following a Quality Control inspection, USAESCH, and CENAB concurrence that each excavation had been completed in accordance with the SSWP (USACE 2008b), and the excavations were backfilled with the excavated soil. Initial grading was completed and erosion controls were placed around the excavated areas. As mentioned previously, backfill of arsenic areas adjacent to the house and on the sloped area were delayed due to arsenic removal operations in the driveway. As a result, final grading of the backyard and the sloped area were completed at a later date. Areas of grass that were temporarily removed were replaced and watered to retain soil moisture. Post-restoration photographs of 4835 Glenbrook Road are included in Appendix D.

4. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

4.0.0.1 A total of 76 test pits were investigated between October 2007 and December 2008. Either no debris or cultural debris was removed from 62 test pit excavations. Suspect AUES-related items (mainly lab ware component fragments such as glass tubing, stoppers, glass fragments, etc.) were recovered in 14 test pits and area north of TP 17. A Livens projectile was found in one test pit (TP 49).

4.0.0.2 A total of approximately 539 cubic yards of arsenic-affected soil at concentrations exceeding the Spring Valley remedial action level of 20 mg/kg were removed from the property and disposed off-site at the King and Queen County Landfill as non-RCRA hazardous waste.

4.0.0.3 The soil data collected from the TP investigation and arsenic removal activities, along with data collected from the previous investigations (1992, 1996, 1999, and 2000), were evaluated in a HHRA for the property. The HHRA revealed that the residual concentrations detected in soil did not pose an unacceptable risk to a residential human receptor. Additional risk evaluations for aluminum, cobalt, thallium and vanadium were also conducted using data from the geotechnical soil borings. The risk evaluation demonstrated that aluminum, cobalt, and vanadium concentrations were below the exposure point concentrations and that the recalculated thallium 95 percent UCL was close to the exposure point concentration for thallium used in the HHRA. Therefore, the conclusions of the HHRA are still valid for the property.

4.0.0.5 Based on the results and conclusions of these investigations and the HHRA, no further investigations at this property are recommended.

5. REFERENCES

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