SITE-SPECIFIC INVESTIGATION REPORT - AMERICAN UNIVERSITY PUBLIC SAFETY BUILDING (PHASE 1 AND PHASE 2 INVESTIGATIONS)

SPRING VALLEY
OPERABLE UNIT 4
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

Prepared by:

PARSONS

100 M Street, SE
Washington D.C. 20003

AUGUST 27, 2013

PRINCIPAL PREPARERS

This document was prepared and reviewed by the following key project staff:

Primary Author:

Kristine Manglona-Huang

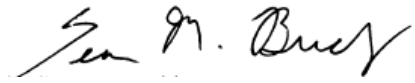
August 27, 2013

Reviewed By:

Janelle Boncal

August 27, 2013

Approved By:



Sean Buckley, Project Manager

August 27, 2013

EXECUTIVE SUMMARY

ES.0.1 Introduction. This report documents the results, conclusions, and recommendations for Phase 1 and 2 investigations at the American University Public Safety Building (AU PSB) (FUDS MEC/CWM Project No. C03DC091801), which were completed between 2006 and 2010. Parsons completed this report for the U.S. Army Engineering and Support Center, Huntsville (USAESCH) and U.S. Army Corps of Engineers (USACE) under Contract No. W912DY-04-D-0005, Task Order 0007. This study was completed at the PSB, located in Spring Valley, Washington, D.C. under the Defense Environmental Restoration Program/Formerly Used Defense Sites (DERP/FUDS) Program.

ES.0.2 Phase 1 and 2 Investigations. Under Phase 1 investigations (August 21 through September 12, 2006), a geotechnical investigation was followed by advancement of boreholes and investigation of three test pits. Sampling for the geologic and geotechnical evaluations was completed in support of this phase. During Phase 2 (June 3, 2008 – June 3, 2010), activities included intrusive investigation of 12 single-item anomalies; intrusive investigation of two anomalous areas (PS-P1 and PS-P2); excavation of debris known or suspected to remain to the south of the AU PSB; and excavation of contaminated soil and associated debris around the utility trench to the east of the AU PSB.

ES.0.3 Phase 1 Results. Activities in this phase commenced on August 21, 2006 and concluded on September 2006. The study results are noted below:

- **Geotechnical Evaluations and Borings.** USACE Baltimore District (CENAB) completed this evaluation and advanced the borings. Sampling performed was used to support CENAB's evaluations.
- **Exploratory Test Pits.** After completion of dewatering activities, three test pits were excavated. In accordance with the work plan for the PSB Phase 1, grab samples were collected based on findings or observations made by the field crew during intrusive work. No such finding at Test Pit (TP) 1 warranted collection of a grab sample at this location. Two grab soil samples were collected at depths of 4.5 ft below ground surface (bgs), one from soil below the building footer at TP-2 at the southwest corner of the building and one from soil below the building footer in TP-3 at the southeast corner of the building. Agent/agent breakdown products (ABPs), explosives, cyanide, and volatile organic compounds were not detected at the practical quantitation limit (PQL) in either sample. Three metals (mercury, thallium, and vanadium) exceeded the Spring Valley comparison values in the TP-2 sample. A stream of water shooting out through the concrete footer of the building in the location of TP-3 at the southeastern corner of the building was observed. The water was clear and appeared to be under pressure since the water streams were continuously shooting out from the concrete. AU was notified and their utility personnel came to the site to evaluate the situation. In an effort to determine the source of this water, USAESCH directed Parsons to collect a sample of the water. Results from a grab water sample from TP-3 did not exceed any Spring Valley comparison values.
- **Recovered Items.** During installation of Sump 3, one munitions debris (MD) item was recovered at approximately 2.5 ft bgs. The item was identified as a 75 mm shell casing. The item was cleared for mustard agent (HD) and lewisite (L). Glassware was found around the

area where the 75 millimeter (mm) shell was recovered. A batch of glassware (approximately 2 lbs) was cleared for HD and L by headspacing. The glassware was disposed at a non-hazardous facility. A piece of suspected American University Experiment Station (AUES)-related ceramic crockery was recovered in TP-3, which was subsequently cleared for HD and L based on headspace analysis.

ES.0.4 Phase 2 Results. Intrusive operations were conducted under the PSB Phase 2 investigations between 3 June 2008 and 3 June 2010. All intrusive operations were conducted under the low probability operations. Excavated soil, aqueous waste, and investigation derived waste was characterized and ultimately disposed of as hazardous or non-hazardous waste in accordance with applicable regulations. The PSB area was restored in July 2010. The key results are noted below:

- **Single-Item Anomalies.** Twelve single-item anomalies were investigated during the PSB investigation on June 25- 27, 2008. All anomalies were investigated successfully by hand-digging in open air. None of the items recovered during the investigation of the anomalies were munitions of explosive concern (MEC), recovered chemical warfare materiel (RCWM), or AUES-related item. Seven of these anomalies investigated had 90 percent signal reduction after intrusive investigation and consisted of items such as nails, wire, scrap metal, metal strapping, and hot rocks. The five anomalies that did not receive a 90 percent reduction were due to underground pipe, root baskets, and wire.
- **Anomalous Areas.** Two anomalous areas (PS-P1 and PS-P2) were investigated by excavating three trenches each within the anomalous areas. Trench PS-P1-3 was the only trench in anomalous area PS-P1 that had 90 percent signal reduction after intrusive investigation. Anomalous area PS-P2 trenches did not achieve a 90 percent signal reduction after investigation. The items recovered from these anomalous area trenches were not MEC, RCWM, or AUES-related. The items recovered from these trenches were nails, metal cables, cast iron pipe, and similar cultural debris.
- **Recovered Items from Debris and Utility area.** Thirteen closed cavity items recovered were assessed as closed cavity rounds and intact containers and did not contain agent/ABPs. These items include three closed cavity 75 mm projectiles, one burster tube for a 75 mm projectile – later classified as MEC due to the presence of residual energetic, one pressurized gas cylinder, two metal pipes with end caps, and six intact containers. Fifty six MD items recovered include open cavity 75 mm shrapnel rounds, open cavity 75 mm projectiles, an open cavity empty 75 mm high explosives (HE) projectile, Mark 2 bomb tail fins and nose cones, a 3-inch open cavity armor piercing round, a 3-inch Stokes mortar, a rotating band, a brass fuse body, point detonating fuses, adapter boosters/open cavity Mark (Mk) IV Adapter boosters, a motor tail boom, a spent fuse, and 4.7-inch projectiles. These open and closed cavity munitions-related items were demilitarized under the T-30 operation and disposed. The intact containers were cleared for the headspace analysis and low levels agent analysis. Intact containers were either disposed at Edgewood Chemical Biological Center (ECBC) or returned to the site and disposed of with the other AUES-related broken lab glassware debris at the King and Queen Landfill in Plymouth, VA.
- **Elemental Mercury.** Elemental mercury was encountered during the Phase 2 debris area investigation. All elemental mercury and associated soil were excavated and disposed off-site at a mercury retort facility at Port Washington, WI. Based on the total mercury and

toxicity characteristic leaching procedure (TCLP) analytical results, 30 drums contained total mercury concentrations higher than 200 milligrams/kilograms (mg/kg) and were disposed in Port Washington. The remaining 54 drums were shipped to a hazardous wastes stabilization facility, Envirite at York, PA.

- **Headwall Tie-in.** During the Phase 2 investigation of these trenches, the field team located the terracotta pipe and connected it to the original headwall in the AU Lot 18 area. An 18-inch high density polyethylene (HDPE) pipe was installed and connected to the end of the terracotta pipe (12-inch diameter) in accordance with HDPE pipe manufacturer specifications. The pipe excavation was started in June 2009 and the pipe tie-in was completed in September 2009. Additional areas of suspected AUES-related debris were encountered in four areas. Debris clearance was performed in these areas. A closed metal pipe with end caps was found at 3 ft bgs. The item was empty based on TE's X-ray review and submitted as a scrap batch sample for headspace analysis. All samples collected from the headwall debris clearance were cleared for the headspace analysis with MINICAMS and DAAMS.
- **Debris Area Soil Sampling.** The four grab samples and 23 pit characterization soil sample results were evaluated against the Spring Valley comparison levels. Based on this comparative analysis, 6 metals exceeded the Spring Valley comparison levels. These metals were aluminum, antimony, cobalt, iron, mercury, and vanadium.
- **Hazardous Toxic Waste Over-Excavation.** Arsenic impacted soil (exceeding the SV action level of 20 mg/kg) in the utility area was excavated and disposed off-site.
- **Horizontal Drilling Sampling.** No munitions or suspected AUES-related debris were encountered beneath the building. One broken pipette was encountered near the building footer and cleared for HD and L based on headspace analysis.

ES.0.5 Conclusions. The results of the Phase 1 and 2 investigations confirm the presence of AUES-related material at the locations investigated at PSB. The investigations removed impacted soil and recovered and safely disposed of 1 MEC, 62 MD, 6 intact containers and approximately 400 pounds of AUES-related intact and broken lab glassware debris discovered, effectively completing a removal action with little to no residual risk to receptors. A human health risk assessment (HHRA) has been finalized on May 31, 2013 under a separate contract to evaluate the effect on human health of chemicals of potential concern (COPCs) detected in the PSB area (ERT 2013).

ES.0.6 Recommendations. Based on the results of the Phase 1 and 2 investigations, Parsons recommends:

1. No additional investigations of the PSB are warranted. Operations completed under the Phase 1 and Phase 2 investigations and previously have effectively characterized the site, removed impacted soil, MEC/MD, and other items associated with AUES historic operations.

2. Evaluate the effects on human health of chemicals of potential concern (COPCs) detected in the PSB area. Note the HHRA has been finalized on May 31, 2013 under a separate contract to evaluate the effects on human health at PSB (ERT 2013). The HHRA indicated that no further investigation is required.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

(Electronic Copy Only)

ACRONYMS AND ABBREVIATIONS

3-D	Three Dimensional
AASHTO	American Association of State Highway and Transportation Officials
ABPs	Agent/Agent Breakdown Products
ADR	Automated Data Review
ALSI	Analytical Laboratory Services, Inc.
ARB	Anomaly Review Board
AU	American University
AUES	American University Experiment Station
AWS	AWS Remediation Inc.
bgs	Below Ground Surface
CARA	CBRNE Analytical Remediation Activity
CBRNE	Chemical Biological Radiological and Explosives
CENAB	USACE Baltimore District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COPC	Chemical of Potential Concern
CSS	Chemical Safety Submission
CVAA	Chlorovinylarsenous Acid
CVAO	Chlorovinylarsenous Oxide
CWM	Chemical Warfare Materiel
DCRA	Department of Consumer and Regulatory Affairs
DCWASA	District of Columbia Water and Sewer Authority
DDOE	District of Columbia Department of Environment
DDOT	District Department of Transportation
DERP/FUDS	Defense Environmental Restoration Program/Formerly Used Defense Sites
DTI	Directional Technology Inc.
DVR	Data Validation Report
ECBC	Edgewood Chemical Biological Center
ECS	Engineering Control Structure
EM	Electro-Magnetic
ERG	Emergency Removal Guideline
GPL	GPL Laboratories, LLLP
HD	Mustard Agent
HE	High Explosives
HDPE	High Density Polyethylene
HHRA	Human Health Risk Assessment
HTW	Hazardous and Toxic Waste
IDW	Investigative Derived Waste
IHF	Interim Holding Facility

L	Lewisite
LAWP	Local Approved Work Plan
MAG	Magnetic
MARB	Materiel Assessment Review Board
MCL	Maximum Contaminant Level
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
Mk	Mark
mg/kg	Milligrams/Kilograms
mg/m^3	Milligrams Per Cubic Meter
mm	Millimeters
MVA	Mercury Vapor Analyzer
NPDWRs	National Primary Drinking Water Regulations
NSDWRs	National Secondary Drinking Water Regulations
OU	Operable Unit
PAHs	Polynuclear Aromatic Hydrocarbons
PDT	Project Delivery Team
PHR&A	Patton Harris Rust & Associates
PID	Photoionization Detector
PINS	Portable Isotopic Neutron Spectroscopy
PPE	Personal Protective Equipment
ppb	Parts Per Billion
ppm	Parts Per Million
PSB	Public Safety Building
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RCWM	Recovered Chemical Warfare Materiel
RI/FS	Remedial Investigation/Feasibility Study
SAP	Sampling and Analysis Plan
SDA	Small Disposal Area
SE	South East
SEDD	Staged Electronic Data Deliverable
SSWP	Site Specific Work Plan
SV	Spring Valley
SVFUDS	Spring Valley Formerly Used Defense Site
SVOCs	Semi-Volatile Organic Compounds
SWWP	Site-Wide Work Plan
TAL	Target Analyte List

TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time Critical Removal Action
TDA	Temporary Discharge Authorization
TE	Technical Escort
TES	Traffic Engineering Services
TICs	Tentatively Identified Compounds
TP	Test Pit
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compounds
ZES	Zimmer Environmental Services

CHAPTER 1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

1.1.0.1 The activities performed under this Scope of Work were completed under the Defense Environmental Restoration Program/Formerly Used Defense Sites (DERP/FUDS) Program. The work was conducted in compliance with the applicable federal, state, and local guidance, including the District of Columbia Hazardous Waste Management Act §6-701 *et seq*., and the Munitions Rule 20 DCMR 4512, and as applicable or relevant and appropriate requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. All activities involving work in areas potentially contaminated with Munitions and Explosives of Concern (MEC) or items related to Recovered Chemical Warfare Materiel (RCWM) were conducted in compliance with the U.S. Army Engineering and Support Center, Huntsville (USAESCH), U.S. Army Corps of Engineers Baltimore District (CENAB), Department of the Army, and Department of Defense requirements regarding personnel, equipment, and procedures.

1.1.0.2 This project was conducted by Parsons under contract W912DY-04-D-0005, Task Order 0007 with USAESCH. CENAB provided the overall operations support and performed the geotechnical borings and analysis during Phase 1 of the investigation. Other organizations that provided technical input for this project included the U.S. Environmental Protection Agency (USEPA), the District of Columbia Department of Environment (DDOE), and Edgewood Chemical Biological Center (ECBC). ECBC was on call during the field effort to provide services were for headspacing glassware, MEC, munitions debris (MD) and soil samples. Parsons subcontracted with AWS Remediation Inc. (AWS) and Zimmer Environmental Services (ZES) for site support activities including disposal. Bloch Consulting Inc. performed landscape evaluation services. Technical Escort (TE) provided X-ray and analytical support when closed cavity items were recovered during investigation. ECS Corporate Services, LLC (ECS) provided geotechnical services; including building monitoring and compaction testing. Compaction testing was also provided by Patton Harris Rust & Associates (PHR&A). GPL Laboratories, LLLP (GPL) and ALSI Analytical Services, Inc. (ALSI) performed laboratory analysis. Traffic Engineering Services (TES) performed traffic control and permit expediting services. Directional Technologies, Inc. (DTI) performed horizontal drilling. Just Locating provided private utility locating services. Parsons subcontracted Bunker Hill Construction Inc. to provide support during site restoration. Table 1.1 identifies these organizations and their associated responsibilities.

1.2 SCOPE AND OBJECTIVE

1.2.0.1 The objective of the Phase 1 investigation was to assess the foundation of the American University (AU) Public Safety Building (PSB) prior to a planned intrusive investigation (Phase 2) that included excavation and sample collection in areas adjacent to the structure. This work was performed under the *Final Site-Wide Local Approved Work Plan* (LAWP) (USACE 2005b), and the *Final Site-Specific Work Plan* (SSWP) (USACE 2006d). The objective of the site-wide LAWP was to address all relevant investigation scenarios in a manner that protected the public, protected the personnel performing the investigations, and minimized

impacts to the normal activities of the public. The SSWP described the plans for the Phase 1 investigation at the AU PSB.

TABLE 1.1: RESPONSIBLE SITE PARTIES

RESPONSIBILITY	ORGANIZATION
Geographic Military District (Project Manager, Site Operations Officer)	CENAB
Implementing Agency (Technical Manager for RCWM, Safety Specialist)	USAESCH
Contractor (Site Manager, Project Safety and Health Officer, and Site Safety Health Officer)	Parsons
Site Support and Hazardous and Toxic Waste (HTW) Waste Disposal.	AWS (Phase 1) and ZES (Phase 2)
Landscape Estimator	Bloch Consulting Group
RCWM Support	ECBC
Geotechnical Subcontractor	ECS Corporate Services
Compaction Services	PHR&A and ECS Corporate Services LLC
Traffic Control and Permit Expediting Services	Traffic Engineering Services
TE for Close Cavity Item Assessment and Transportation	CARA
Laboratory Analytical Services	GPL and ALSI
Horizontal Drilling	DTI Inc.
Private Utility Locator	Just Locating Inc.
Restoration	Bunker Hill Construction Inc.

1.2.0.2 The overall scope of Phase 1 investigations were:

a) To assess the foundation of the AU PSB (performed by CENAB Geotechnical Branch)

b) Install temporary sumps prior to the excavations of the test pits to dewater the area and facilitate the follow-on test pitting and boring activities which assessed the foundation of PSB

c) Perform temporary site restoration, mobilization, and demobilization efforts for these tasks.

1.2.0.3 After the completion of the Phase 1 activities, the Phase 2 activities were planned based on the information gathered during the Phase 1 investigation. Phase 2 investigations were

conducted under the Site-Wide Work Plan (SWWP) (USACE 2007) and the SSWP for PSB Phase 2 investigation (USACE 2008a).

1.2.0.4 The specific scope addressed during the Phase 2 activities was to:

a) Intrusively investigate 12 single-item anomalies in the vicinity of the AU PSB based on the recommendations of the Anomaly Review Board (ARB). The ARB is composed of selected members from USAESCH, CENAB, USEPA, and the DDOE;

b) Intrusively investigate the two large anomalous areas (PS-P1 and PS-P2) in the vicinity of the AU PSB that were recommended for further investigation by the ARB;

c) Excavate and remove buried debris to the south of the AU PSB that was known or suspected to remain subsequent to the AU Bamboo Area investigation and operations at AU Lot 18; and

d) Sample and remove contaminated soil and associated debris around the utility trench to the east of the AU PSB.

e) Excavate and remove elemental mercury (Additional scope)

f) Perform horizontal drilling beneath the PSB (Additional scope)

The additional tasks noted above were required to be performed and scoped to Parsons based on the findings during the Phase 2 investigation.

1.2.0.5 During Phase 2 investigation, additional findings warranted changes to the SSWP to accomplish the listed objectives as noted below:

- *Final Site Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Spring Valley, SVFUDS, Washington DC. (USACE 2008a)*

- *Amendment 1* – Appendix O, Building Monitoring Contingency Plan (USACE 2008b)

- *Amendment 2* – A supplement to the PSB SSWP to address the excavation, sorting and sampling of mercury contaminated soil and water (USACE 2009a)

- *Amendment 3* – A supplement to the PSB SSWP to address sampling activities associated with the horizontal drilling (USACE 2009b)

- *Amendment 4* – An alternative compaction standard for Areas A and B added to paragraph 3.8.5.4.10 (USACE 2009c)

- *Amendment 5* – A supplement to the PSB SSWP to address the procedure of backfilling the excavation in the front of the PSB due to excavation above the footer (USACE 2010).

1.3 BACKGROUND

1.3.1 Site Location

1.3.1.0 The AU PSB is located within the Spring Valley Formerly Used Defense Site (SVFUDS) in the northwest section of Washington, D.C. Figure 1-1 shows the entire SVFUDS including five different Operable Units (OUs). The AU PSB lies within OU-4.

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 testing, production, and effects of noxious gases, antidotes, and protective masks. The AUES was located on the grounds of the current American University and used additional property in the vicinity to conduct this research and development on RCWM, including mustard (HD) and lewisite (L) agents, adamsite, irritants, and smokes. After the war, these activities were transferred to other locations and the site was returned to the owners. Additional information on the history of the AUES operations is provided in the Remedial Investigation Report (USACE 1995) and the website of CENAB at http://www.nab.usace.army.mil/

1.3.2.2 The AU PSB is located in SVFUDS OU-4 and lies adjacent to the AU Lot 18 disposal area and the Small Disposal Area (SDA). This property is located at the base of the slopes of the southern edge of AU. Excavations to date in the AU Lot 18 disposal area have recovered three glass bottles containing RCWM along with assorted MD (USACE 2008c).

1.3.2.3 In January 2001, debris including old used oil filters, glass and lab ware, and other miscellaneous debris was removed from the SDA. No RCWM items or items related to munitions and explosives of concern (MEC) were recovered from the SDA during this investigation. Soil contaminated with elevated levels of arsenic, lead, and mercury was encountered. The area was over-excavated to undisturbed rock; characterization samples indicated that no Hazardous and Toxic Waste (HTW) parameters were present above the comparison standards following the over-excavation effort. The area was backfilled and closed following the 2001 removal (USACE, 2004b).

1.3.3 Previous Investigations

1.3.3.1 Previous investigations across the entire SVFUDS are described in detail in Subchapter 1.8 of the Site-Wide WP (USACE 2007). The following subchapters summarize the previous investigations that have been carried out at or in the immediate vicinity of the AU Public Safety Building. See Appendix P for a complete timeline of these investigations. The appendix also includes a time series of maps related to these activities.

1.3.4 AU Lot 18 Low Probability Anomaly Investigation – 2002-2003

1.3.4.1 In November 2002, the low probability anomaly investigation at the AU Lot 18 area began with the intrusive investigation of 14 low-probability anomalies. During this intrusive operation, a potential disposal area containing glass, ceramic, metal, stone, and concrete was identified. Following the discovery of this potential disposal area, and at the request of AU,

anomalies in AU Lot 18 were excavated until all the debris associated with the anomalies investigated was removed.

1.3.4.2 The OU 4 Remedial Investigation/Feasibility Study (RI/FS) grid sampling identified seven grids in AU Lot 18 with elevated levels (>20 milligrams/kilograms (mg/kg)) of arsenic that were to be removed as part of a Time Critical Removal Action (TCRA). During the low probability anomaly investigation, pit characterization sampling indicated that three additional grids contained elevated arsenic concentrations, thus bringing the total of arsenic-contaminated grids identified at AU Lot 18 to ten grids.

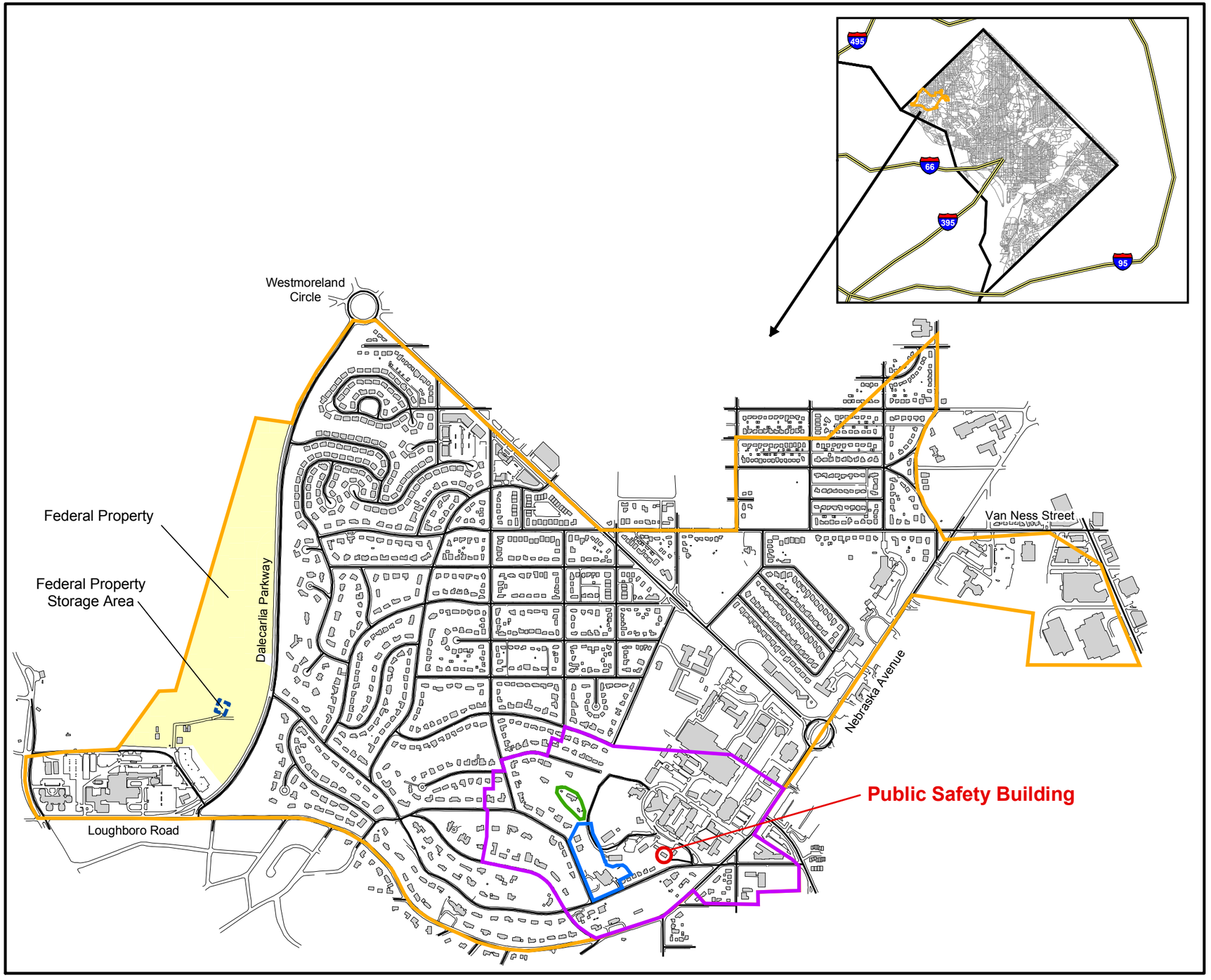


Figure 1-1
Public Safety Building Site Location

Spring Valley
Washington, D.C.

Legend

- Buildings
- Federal Property
- Federal Property Storage Area
- Road

Operable Units

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

Notes:

1. OU-1 encompasses all of the areas depicted as OU-2, 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

1 inch equals 1,000 feet

Scale:	1:12,000
Created By:	Parsons
File:	20080116 Public_Safety_Building_Site_Location.mxd
Date:	2/5/2008
Figure Number:	1-1
Page Number:	1-6

PARSONS

N
W E
S

1.3.4.3 TCRA related arsenic-contaminated soil removal activities occurred concurrently with anomaly resolution in the grids in AU Lot 18. The investigation area was overlaid by a 20 ft by 20 ft grid pattern (X and Y axis with 20 ft interval) and the location of investigation was identified by the southwest corner of the grid. Arsenic-contaminated soil and glassware were removed completely from two of the arsenic-contaminated grids identified during the anomaly investigation (-20,440 and -20,460), and arsenic-contaminated soil was removed completely from one of the TCRA grids (40,400). These soil removal activities left a total of seven grids at AU Lot 18 that were identified as containing arsenic at a concentration above 20 mg/kg. This number included six of the original TCRA grids [(60,320), (40,280), (40,300), (40,320), (40,340), and (40,420)] and one of the additional grids [(0,460)] identified during the anomaly investigation. These grids were later excavated during the AU Lot 18 High Probability Investigation.

1.3.4.4 Items found during the low probability investigation of AU Lot 18 included carboy fragments, and chemical bottles such as stoneware containers, Baker's Analyzed Chemicals bottles, Bausch and Lomb bottles, stoppers, tubes and stirrers. Domestic wares also were identified at AU Lot 18, including dairy bottles and fruit jars. According to an archaeological analysis of the debris performed by Parsons, most of the items uncovered in AU Lot 18 have manufacture dates prior to 1920. The remaining items were manufactured post 1920 and consisted mostly of fruit jars and ceramic plate fragments. The archaeologist concluded that this represented more than one dumping episode since 1848 (2008c).

1.3.4.5 MD uncovered during the low probability investigation of the AU Lot 18 area consisted of scrap related to 75mm and Stokes mortar rounds, a Livens projectile, and 4.7-inch projectiles. All MD items were unfuzed, unfired, and empty and were classified as scrap by Parsons UXO personnel with final concurrence from the USAESCH Safety Specialist. Disposal of these items is discussed in the Waste Disposal Summary Report (USACE 2003). USACE suspended AU Lot 18 low probability operations in March 2003.

1.3.4.6 In preparation for returning to the site, USAESCH prepared a position paper (USAESCH 2003) to determine whether AU Lot 18 should be considered as a potential CWM site. This position paper recommended that the intrusive investigation at AU Lot 18 be conducted under an approved Chemical Safety Submission (CSS) as a potential RCWM site. Subsequent analysis of an intact container recovered at AU Lot 18 in April 2003 indicated it contained approximately 6 milliliters of 0.3 percent lewisite solution (3,000,000 parts per billion [ppb] lewisite), supporting the recommendation of the USAESCH position paper.

1.3.5 AU Lot 18 High Probability Investigation – 2004-2006

1.3.5.1 In June 2004, the high probability investigation commenced at AU Lot 18. This investigation was performed under Annex F to the CSS (USACE 2004) and was conducted between June 24, 2004 and January 21, 2005. During this period, two complete grids (0,500; and 0,520) and the western half of grid (0,540) were excavated and cleared of debris. Six MD items were recovered from the excavation area related to 75 millimeters (mm) and 3-inch Stokes mortar rounds, and a 4.7-inch projectile. Also, a threaded pipe was recovered from the debris determined not to be MD. All MD items recovered were unfuzed, unfired, and empty. In addition, approximately 1,002 pounds of other metal debris was recovered from the excavation

area that was not MEC/RCWM-related items. Pit characterization samples collected from completed grids (0,520) and (0,540) did not have any constituents detected above the Spring Valley (SV) comparison values. The investigation was extending into surrounding grids when work was suspended on January 21, 2005, awaiting the revision of the investigation approach.

1.3.5.2 In June 2005, the higher probability intrusive investigation resumed operating under Annex G to the CSS (USACE 2005a). Intrusive investigation continued through January 26, 2006. The primary goal of the intrusive investigation was to remove all potentially AUES-related material from the suspect disposal area at AU Lot 18, such as ordnance items, ordnance-related scrap items, and intact containers. The objective of the investigation also was to remove all glassware and debris from the suspected disposal area at AU Lot 18; investigate and resolve the anomaly at 4629 Rockwood Parkway (4629-HNC1) due to its proximity to the suspected disposal area; and remove Hazardous Toxic Waste (HTW)-contaminated soil identified in the immediate vicinity of the suspect disposal area at AU Lot 18. For clearance purposes, each grid was excavated to a depth where either the excavation was clear for glassware and debris or when the excavation had reached bedrock, saprolite, or native soil. Once the soil was deemed clear for glassware and debris (i.e., a six-inch lift with no glass containers, debris or identifiable fragments thereof), the excavation was taken 12 inches deeper for confirmation. The sidewalls of each grid were cleared in a similar fashion.

1.3.5.3 During the Annex G investigation, 65 MD items and 16 intact containers were recovered. The MD included empty 8-inch Livens projectiles, empty 4.7-inch rounds, empty 75 mm projectiles, fragment from 75 mm projectiles, 3-inch stokes mortars, bomb fragments, a piece of a burster tube, and one empty incendiary item. Four of the items recovered during the Annex G operation were closed cavity items and included two 75 mm projectiles, one incendiary item, and one 4.7-inch round. The MD was shipped off-site for disposal, while the closed cavity items were placed in a drum stored at the Federal property, demilitarized under the T-30[1] operation, and disposed.. The remaining intact containers consisted of sealed glass bottles. No agent was detected in any of the intact glass containers; agent breakdown products (ABPs) were detected in two intact containers. Approximately 5,115 cubic yards of soil was excavated and disposed off-site. Approximately 203,565 gallons of water pumped from the excavations was sampled and discharged to the sanitary sewer under a District of Columbia Water and Sewer Authority (DCWASA) permit. A report for the Annex F and Annex G high probability investigations at AU Lot 18 (USACE 2008c) documents these investigations.

1.3.5.4 Pit characterization samples were collected from the sidewalls and floors of the excavated grids once cleared for glassware and debris. The results of the Annex F and Annex G pit characterization samples were evaluated to identify which locations should be included in the HTW over-excavation effort to reduce the residual risk at AU Lot 18 (USACE 2006b) until a Human Health Risk Assessment (HHRA) (USACE 2008d) was completed. This evaluation identified arsenic, lead, and/or mercury at 21 sample locations at AU Lot 18 at concentrations exceeding the USEPA Region III Emergency Removal Guidelines (ERGs) (USEPA 1997). With the exception of three sidewall exceedances closest to the AU PSB (where additional debris

[1] T-30 is a transportable controlled detonation chamber (Model T30), which is operated to demilitarize MEC and closed-cavity MD items.

clearance was required), these locations were selected for excavation as part of an interim measure. The three sidewall samples closest to the AU PSB were removed during the excavation of the debris area south of the PSB. This evaluation also identified vanadium as a significant contributor to the residual risk. Based on this evaluation, additional samples were collected between May 31 and June 9, 2006 to delineate the extent of the HTW over-excavation (USACE 2006b). This sampling identified 30 locations for over-excavation. Soil was excavated at these locations between July 10 and August 18, 2006 (2008c). Approximately 27 pounds of glassware was found during the over-excavation effort; one MD (an empty 75 mm projectile) was recovered from grid (20,520). Approximately 870 cubic yards of non-hazardous soil was excavated during the over-excavation effort and disposed off-site.

1.3.6 American University Bamboo Area Investigation (2006)

1.3.6.1 Low probability anomaly investigations were conducted at the AU Bamboo Area in accordance with the LAWP (USACE 2006g) and the SSWP (USACE 2006a). Five anomalous areas, a 10 ft by 10 ft grid, 74 single-item anomalies, and a utility trench east of the AU Public Safety Building were investigated between February and April 2006.

1.3.6.2 The results of the AU Bamboo Area investigation are summarized below (USACE 2006f). A total of eight MD and two intact containers were recovered during the AU Bamboo Area investigation. All MD recovered were headspaced clear, while the intact containers were sent to ECBC at Edgewood, Maryland for analysis and cleared for agent/ABPs. A large amount of debris recovered contained broken glassware that appeared to be AUES-related. The glass fragments were also headspaced in batches at the end of each day; no agent was detected in these batches. The remaining items recovered were identified as cultural debris. Grab soil samples, and water and soil disposal characterization samples, were collected at various locations during the course of investigation. One anomaly, BA-512, had an elevated arsenic concentration of 872 mg/kg; additional arsenic soil excavation was conducted at the BA-512 as part of the TCRA to meet the SV arsenic remedial goal of 20mg/kg.

1.3.6.3 The investigation of four trenches in the BA-P6 anomalous area recovered large volumes of glass and metal scrap. Based on the findings for the trenches in BA-P6, the Project Delivery Team (PDT); consisting of CENAB, USAESCH, and Parsons, decided to excavate the entire BA-P6 polygon for glass and debris. The minimum excavation area was considered to be the anomalous area boundary. A large volume of glass fragments were recovered from within the BA-P6 polygon. These glass fragments were double-bagged and headspaced for HD and L in batches; no agent was detected in these batches. Towards the southeast end of the polygon, closer to the AU PSB, a closed pipe was recovered. Excavation of glass and debris in the anomalous area AU BA-P6 extended under the concrete patio located at the rear (southern side) of the AU PSB. The area under the patio (approximately 15 by 20 by 4 ft deep) was partially excavated for glass and debris. The two intact containers and six of the MD items mentioned above were found under the patio. Four pit characterization soil samples were collected from the patio area, and approximately 15,700 gallons of excavation water was sampled and discharged to the sanitary sewer under a DCWASA permit. Approximately 200 tons of non-hazardous soil and 62 tons of hazardous soil were also disposed off-site.

1.3.6.4 While the investigation at the AU Bamboo Area was in the planning stages, AU contractors working on a utility line between the PSB and Rockwood Building uncovered some suspect debris in their trench excavation. At the request of AU, USACE directed that further excavation of this utility trench be conducted under the SSWP for the AU Bamboo Area. Subsequently, this utility trench area was cleared for debris and backfilled. One MD item (a piece of 75 mm fragment) was recovered and headspaced cleared. Once debris clearance was complete on March 1, 2006, three post-excavation soil samples were collected from the excavated area. Two of these samples were collected from the northern and southern sidewalls of the excavated area at a depth of 2 ft below ground surface (bgs) [SW-AUBA-PSBA-04(2) and SW-AUBA-PSBA-05(2), respectively] and the third sample was collected from the floor of the excavated area at a depth of 4 ft bgs [SW-AUBA-PSBA-06(4)]. No HD or L ABPs, explosives, sulfur, or cyanide was detected in these three samples. Metals and semi-volatile organic compounds (SVOCs) were detected in all three samples, as well as volatile organic compounds (VOCs), although the VOC detections consisted of common laboratory contaminants at low concentrations. The lead concentration in the northern sidewall sample (418 mg/kg) exceeded the EPA ERG of 400 mg/kg and the arsenic concentration (31.1 mg/kg) exceeded the SVFUDS remediation endpoint of 20 mg/kg.

1.3.7 Geophysical Study

1.3.7.1 A geophysical investigation was conducted in the vicinity of the AU PSB in July 2006 to locate and map electromagnetic and magnetic anomalies (USACE 2006e). The SVFUDS ARB subsequently determined that two anomalous areas (denoted PS-P1 and PS-P2), and 12 single item anomalies require intrusive investigation. Based on previous investigations in the vicinity of the AU PSB, these anomalies are not expected to be related to MEC/CWM and are referred to as “low probability” anomalies. Figure 1-2 shows the areas that were identified for investigation at the vicinity of the AU PSB.

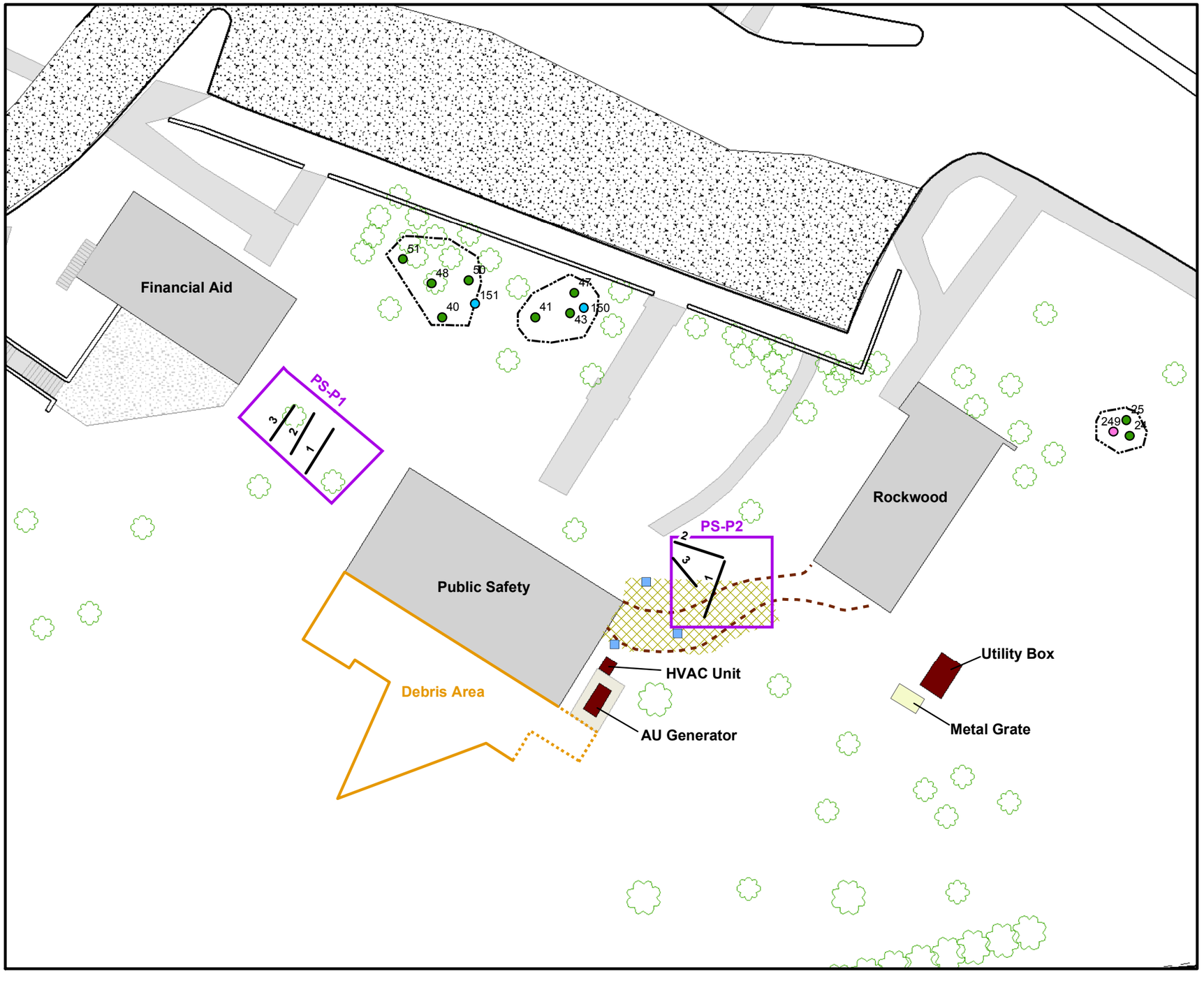


Figure 1-2
Site Map
Public Safety Building

Spring Valley Site Wide Investigation
Washington, DC

Legend

12 Single Item Anomalies in 3 Clusters

- Anomaly Cluster
- Selected MAG Anomalies
- Selected EM Anomalies
- Selected Lot 18/19 Anomaly

2 Anomalous Areas

- PS-P1 and PS-P2
- Trench Locations

Debris Area behind PSB

- Debris Area

Utility Trench Area

- 2006 Post-Excavation Sample Point
- Utility Work Completed by AU (2006)
- Utility Area Excavation Performed by Parsons (2006)
- Trees
- Buildings
- Driveway
- Deck/Porch
- Sidewalk
- Concrete Pad

25 12.5 0 25 Feet

1 inch = 25 feet

Scale:	1:300
Created By:	Parsons
File:	20080111 Site Map Public Safety Building.mxd
Date:	2/5/2008
Figure Number:	1-2
Page Number:	-

PARSONS

CHAPTER 2. DESCRIPTION OF INVESTIGATION ACTIVITIES

2.1 INTRODUCTION

This section describes the investigation activities performed at the AU PSB (Phase 1 and Phase 2), including pre-mobilization; mobilization; structural evaluation; geologic and geotechnical studies; intrusive investigations of 12 single-item anomalies; two large anomalous areas; a debris area; utilities trenches; and completion of horizontal drilling activities. This section also includes documentation of disposal activities; site restoration and demobilization activities associated with these investigation. These activities are also described in the Site-Specific Log Book Entries and are included in Appendix A of this report.

2.2 PHASE 1 INVESTIGATION

2.2.0.1 The Phase 1 investigation was conducted at the PSB Area from August 21 through September 12, 2006. A landscape evaluation was conducted to assess the existing landscape conditions prior to the investigation activities. The pre and post-investigation landscape pictures are included in Appendix B of this report. Excavation of the sumps and test pits was conducted using hand digging tools and a mini-excavator. A qualified unexploded ordnance (UXO) technician and the USAESCH Safety Specialist monitored this work. The sumps were installed at depths below the anticipated depth of the test pits. Sumps were dewatered for two weeks before the intrusive team performed the investigations of the test pits. The test pits were excavated and the footer of the PSB was inspected. Figure 2-1a shows the location of the test pits and the sumps installed during Phase 1 PSB investigation. In accordance with the LAWP, a photoionization detector (PID) was used to monitor VOCs in the breathing zone during all excavation activities. Dust monitors were also used at the site during excavation activities and air samples were collected for analysis of arsenic and total particulates.

2.2.0.2 The water pumped from the sump locations was sampled before discharging to the sanitary sewer. Two discharge samples (SW-AUBA-DIRDIS-082206 and SW-AUBA-DIRDIS-090806) were analyzed for metals (arsenic, cadmium, copper, lead, nickel and zinc), total suspended solids (TSS), perchlorate and pH in accordance with the DCWASA temporary discharge authorization permit (TDA # 0406-683) dated April 20, 2006.

2.2.0.3 The exploratory test pits were excavated after dewatering activities. The CENAB structural engineer inspected the footer of the building at each location and advanced boreholes at the floor of the test pits. CENAB completed sampling for the geologic and geotechnical evaluations. The geotechnical analysis report (CENAB 2006) is included in Appendix C of this report. A photographic log documenting the events on the site is included in Appendix D.

2.2.0.4 Based on the presence of debris, USAESCH requested collection of two grab soil samples during the Phase 1 investigation, one from soil below the building footer at Test Pit 2 (TP-2) at the southwest corner of the building and one from soil below the building footer in Test Pit 3 (TP-3) at the southeast corner of the building. The purpose of these samples was to characterize the soil under the footer. Both samples were collected at a depth of 4.5 ft bgs (6 inches below the bottom of the footer). These samples were designated SW-PSBA-TP2-01(4.5) and SW-PSBA-TP3-01(4.5), respectively. The samples were analyzed for mustard ABPs: 1, 4-dithiane and 1, 4 oxathiane, and thiodiglycol; lewisite ABPs: chlorovinylarsenous acid (CVAA)

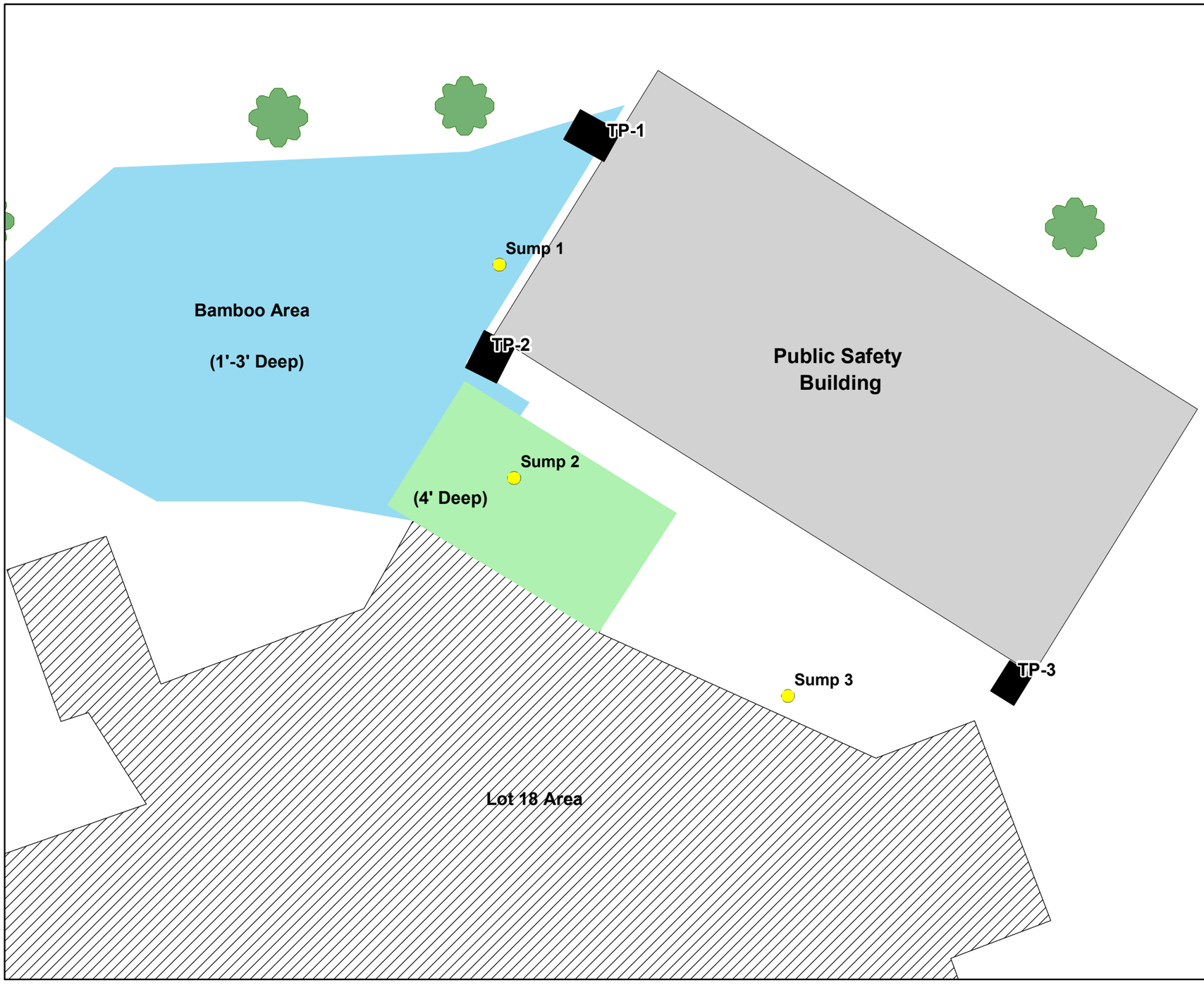


Figure 2-1a
Public Safety Building - Phase 1
Test Pits and Sumps

Spring Valley Site Wide Investigation
Washington, DC

Legend

- Sump Locations
- Test Pit Locations
- Trees
- Buildings
- Lot 18 Area
- Low Probability Excavation at BA-P6 (Cleared for debris)
- Low Probability Excavation at BA-P6 (Not Cleared for debris)

10 5 0 10 Feet

1 inch = 10 feet

Scale:	1:120
Created By:	Parsons
File:	20060719 Public Safety Pumps and Pits.mxd
Date:	11/07/2006
Figure Number:	2-1a
Page Number:	-

PARSONS

and chlorovinylarsenous oxide (CVAO); Target Compound List (TCL) VOCs; TCL SVOCs; Target Analyte List (TAL) metals plus strontium, tin and titanium; explosives (nitrobenzene, nitroglycerin, trinitrotoluene, tetryl, 2,4-dinitrotoluene, and 2,6-dinitrotoluene); and total cyanide.

2.2.0.5 In addition, a grab water sample (SW-PSBA-092106) was collected from streams of water shooting out through the concrete footer of the building in the location of TP-3 at the southeastern corner of the building. The streams of water were observed in the footer at approximately one ft bgs. The water was clear and appeared to be under pressure since the water streams were continuously shooting out from the concrete. AU was notified and their utility personnel came to the site to evaluate the situation. AU collected a sample of this water; the results of the sample have not been shared with Parsons, however AU has stated that based on their evaluation they do not believe the water is coming from one of their water lines. In an effort to determine the source of this water, USAESCH directed Parsons to collect sample of the water. The sample was analyzed for VOCs, total residual chlorine with chloramines; nutrient metals; nitrate; nitrite; chloride and fluoride. These parameters were selected upon discussion with Washington Aqueduct. The validated results are included in Appendix E.

2.2.0.6 After the completion of the Phase 1 investigation at the test pits and boreholes, the excavations were backfilled and re-graded. TP-1 and TP-2 were backfilled with the excavated soil. When streams of water were observed coming through the building footer at TP-3, AU requested that TP-3 be backfilled with gravel. Therefore, the soil excavated from TP-3 was disposed off-site as non-hazardous.

2.2.0.7 Soil excavated during the installation of the sumps was disposed off-site; as discussed above, soil excavated from TP-3 was also disposed off-site as non-hazardous. HTW disposal sample (SW-PSBA1-TCLP-082306) was collected to characterize the soil before disposal; the results of this sample identified it as non-hazardous. The lab results of this analysis are included in Appendix F.

2.3 PHASE 2 INVESTIGATION

2.3.0.1 The Phase 2 investigation conducted in the vicinity of the AU PSB included these major tasks, which were accomplished between June 3, 2008 and June 3, 2010:

- Intrusive investigation of 12 single-item anomalies and 2 anomalous areas (PS-P1 and PS-P2);
- Excavate and remove buried debris to the south of the AU PSB that was known or suspected to remain after the AU Bamboo Area investigation and operations at AU Lot 18 (i.e.: debris area); Additionally, excavate elemental mercury impacted soil encountered while investigating (Area B); perform headwall tie-in to existing terracotta pipe that was previously observed near PSB;
- Sample and remove contaminated soil and associated debris around the utility trench to the east of the AU PSB (i.e. utility area); and

- Subsequent to the finding at the debris and utility area, the Spring Valley Partners decided to perform sampling underneath the PSB. The sampling under PSB was performed by horizontal drilling.

2.3.0.2 All required permits for the Phase 2 investigation activities were obtained in June 2008. A TDA permit dated June 4, 2008 was obtained from DCWASA. A building permit dated June 13, 2008 was obtained from the D.C. Department of Consumer and Regulatory Affairs (DCRA), Building and Land Regulation Administration. A public space permit dated June 19, 2008 was obtained from the District Department of Transportation (DDOT) Public Space Management Branch. These permits were renewed as needed throughout the investigation.

2.3.0.3 Pre-mobilization activities for the PSB Phase 2 operation included placement of road mats, installation of chain link fence along the work perimeter and PSB area to restrict and control site access during the course of investigation; establishing utilities including the required electrical supply, and set-up of temporary tanks to hold water pumped from the excavation.

2.3.0.4 Four 6,500 gallon capacity temporary holding tanks (26,000 gallon total capacity) were situated in the support zone for storage of water encountered during excavation. Excavation water was pumped to the storage tanks prior to sampling and discharge to the sanitary sewer.

2.3.0.5 Surveyors marked the locations of the anomalies, anomalous areas, and the extent of the debris and utility area. A pre-investigation elevation survey was also performed on June 17-18, 2008. The pre-investigation elevation survey helped to document pre-existing conditions. A post-investigation elevation survey was also performed on July 27, 2010. The survey report is included in Appendix G.

2.3.0.6 Three crack monitors (CM-1 through CM-3) and 3-Dimensional (3-D) reflectors were installed on June 12, 2008. All three monitors were placed centered on an existing crack, were located on the southwest façade of the PSB. Geotechnical building monitoring was started on June 17, 2008 and continued throughout the course of the investigation. A replacement crack monitor (CM-1R) was installed below CM-1 on September 3, 2008 when the epoxy bond on CM-1 failed. Crack monitor CM-4, was installed on October 2, 2009 after an additional crack was observed on the western portion of the building, adjacent to CM-3. Final crack and 3-D monitoring was performed on June 17, 2010 (two weeks after the all intrusive operations ceased). The geotechnical building monitoring report is included in Appendix H.

2.3.1 Mobilization

Site mobilization for the PSB Phase 2 investigations began on June 16, 2008. Intrusive team mobilized daily to AU PSB from the Federal Property at 5201 Little Falls Road N.W., Washington D.C. The Federal Property was used as the field office throughout the intrusive investigation.

2.4 SINGLE-ITEM ANOMALY AND ANOMALOUS AREAS INVESTIGATION

2.4.0.1 Twelve single-item anomalies were investigated in accordance with Subchapter 3.8.5.2 of the SWWP (USACE 2007). For the anomaly investigation, hand digging tools were used. After the single item anomalies were intrusively investigated and identified or

removed, Parsons conducted excavation quality control (QC) in accordance with Subchapter 3.6.13 of the SWWP. USAESCH conducted an independent quality assurance (QA) review of the data to confirm that all the selected anomalies were identified or removed. Figure 1-2 shows twelve selected anomalies that were investigated.

2.4.0.2 The two anomalous areas (PS-P1 and PS-P2) were also investigated in accordance with Subchapter 3.8.5.2 of the SWWP (USACE 2007). For the anomalous area investigation, a combination of hand digging and mechanical excavation were used. The initial step of the investigation involved the excavation of three exploratory trenches in each anomalous area to characterize the nature of the anomalies. These trenches were oriented through areas of peak signal response within each anomalous area. The location of these trenches was marked by the geophysicist in the field. Figure 1-2 shows the location of the anomalous areas (PS-P1 and PS-P2) and the selected exploratory trench locations within the anomalous area.

2.4.0.3 Once the anomalies were identified or removed, Parsons conducted geophysical QC in accordance with Subchapter 3.6.13 of the SWWP (USACE 2007) of the open excavation to determine whether the signal response has been reduced by at least 90 percent. If the geophysical signal reduction following anomaly removal was 90 percent or greater, the anomaly was considered to have been resolved, and the excavation(s) was backfilled with the excavated soil. USAESCH also conducted an independent QA review of the data to confirm that all the selected anomalies were identified or removed.

2.5 DEBRIS AREA

2.5.0.1 The excavation of the debris to the south of the AU PSB was performed in accordance with Subchapter 3.8.5.3 of the SWWP (USACE 2007) (except as specified otherwise in the SSWP (USACE 2008a)). However, because of the proximity to the building foundation and the expected presence of water, several additional monitoring and control measures were implemented. All excavation was conducted in accordance with the Excavation Plan of the SSWP to ensure that shoring, benching, and/or sloping is implemented appropriately and that excavation sizes remain within allowable limits. Building monitoring was conducted during the operation to assess any impacts to the building resulting from excavation activities. Air monitoring was also performed for worker and public safety as specified in the work plan.

2.5.0.2 The excavation of this debris area was conducted in several stages: (a) excavation of interceptor trench to facilitate water control, (b) excavation of debris from the remaining areas using twenty trenches perpendicular to the south wall of the building (Areas C, D, E and F), generally working from west to east, and (c) excavation of debris from the two half grids remaining from the investigation at AU Lot 18 [Grid (20,520) and Grid (20,500)] (Area A and B). The locations of these areas are shown as Areas A through E in Figure 2-1b.

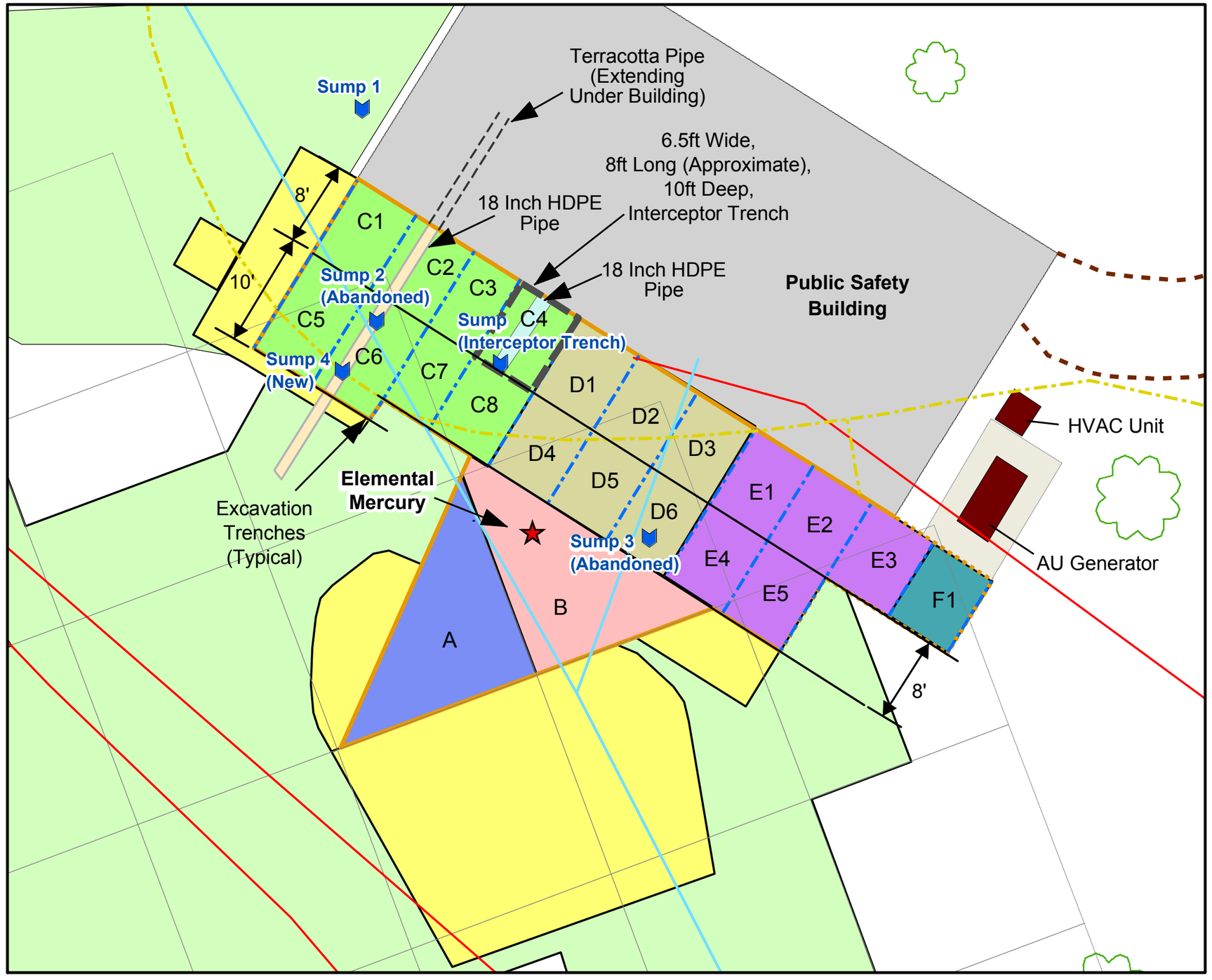


Figure 2-1b
PSB Debris Area - Phase 2
Public Safety Building

Spring Valley Site Wide Investigation
Washington, DC

Legend

- Debris Area Behind PSB
- Trench Locations
- Utility Work Completed by AU (2006)
- Trench Boundaries in PSB Debris Area
- Interceptor Trench
- Areas Cleared During Previous Investigation
- Grids

Debris Excavation Areas

- Area A: Previously Cleared to 5ft Depth
- Area B: Previously Cleared to 4ft Depth
- Area C
- Area D
- Area E
- Area F
- Extension

Cleared of Debris

- Trees
- Buildings
- Concrete Pad

Utilities

- Electric Line
- Water Line
- Gas Line

C1 Trench ID Numbering

10 5 0 10 Feet

1 inch = 10 feet

Scale:	1:120
Created By:	Parsons
File:	20080723 Public Safety Bld Working Map.mxd
Date:	10/14/2009
Figure Number:	2-1b
Page Number:	-

PARSONS

2.5.1 Interceptor Trench

2.5.1.1 A 6.5 ft wide, 8 ft long and 10 ft deep interceptor trench ("French drain") was excavated at trench location C4 to facilitate water control in the vicinity of PSB. This interceptor trench was used in combination with three pre-existing sumps to lower the water level in the vicinity of the excavation, which was required to stabilize the soil during the excavation. This interceptor trench was excavated, shored, and constructed in accordance with the Excavation Plan (USACE 2008a) in order to maintain soil stability in the vicinity of the AU PSB. The interceptor drain consisted of an 18-inch diameter perforated pipe with end cap and tee along with an 18-inch diameter inline drain with cover. The perforated pipe was surrounded by American Association of State Highway and Transportation Officials (AASHTO) #3 stone which was wrapped in geotextile.

2.5.1.2 The interceptor trench was backfilled temporarily for the duration of the excavation operation. Water pumped from excavations or sumps was stored temporarily in holding tanks. The tanks were sampled in accordance with the DCWASA Permit. The samples collected were analyzed for metals (arsenic, cadmium, copper, lead, nickel and zinc), TSS, perchlorate and pH and discharged to a sanitary sewer as permitted by DCWASA. The analytical results of the samples are included in Appendix E.6. The location of the intercept trench is illustrated in Figure 2-1b. Photographs of the installation of the intercept trench are included in Appendix D. Intercept trench and the three sumps installed during Phase 1 of the investigation were removed and backfilled with the approved PSB backfill soil in January 2010 after the completion of all debris clearance work.

2.5.2 Debris Area Trenches (Areas C, D, E, F)

2.5.2.1 Twenty trenches were investigated in the Debris Areas C, D, E and F (see Figure 2-1b) adjacent to the PSB between July 2008 and February 2009. All trenches were excavated as specified by the geotechnical report (CENAB 2006b). The excavation dimensions of the trenches were 6 ft wide, 8 ft long with depths from 8 ft-10 ft. The excavation was performed in six-inch lifts and was considered to be "cleared for debris" when the excavated soil from a six-inch lift contains no debris, as determined by the intrusive team. Once the soil was considered to be "cleared for debris," the excavation was taken six-inches deeper for confirmation. Subsequently, the floor of the trench was screened with a magnetometer as a QA check. Additional excavation was performed in accordance with the SSWP (USACE 2008a) in trench C5 (8.5 ft), C6 and C7 (9 ft). Trenches C3 and C4 were excavated up to a maximum depth of 10 ft for debris clearance.

2.5.2.2 Trench E6 was not required to be excavated because debris was cleared on either side on the south wall of Trench E3 and the east wall of Trench E5. Trench E6 is not shown in Figures 2-1b of this since this trench was not excavated. Suspect AUES-related debris was observed on the east wall of Trench E3; therefore, Trench F1 (6 ft wide, 8 ft long and 8 ft deep) located adjacent to Trench E3 to the east was excavated. AUES-related debris was also observed on the south wall of Trench E5, therefore, an extension of Trench E5 was excavated (5 ft wide, 7 ft long and 6 ft deep) and connected to Area B. The completion date and excavated depth for each trench is summarized in Table 2.1.

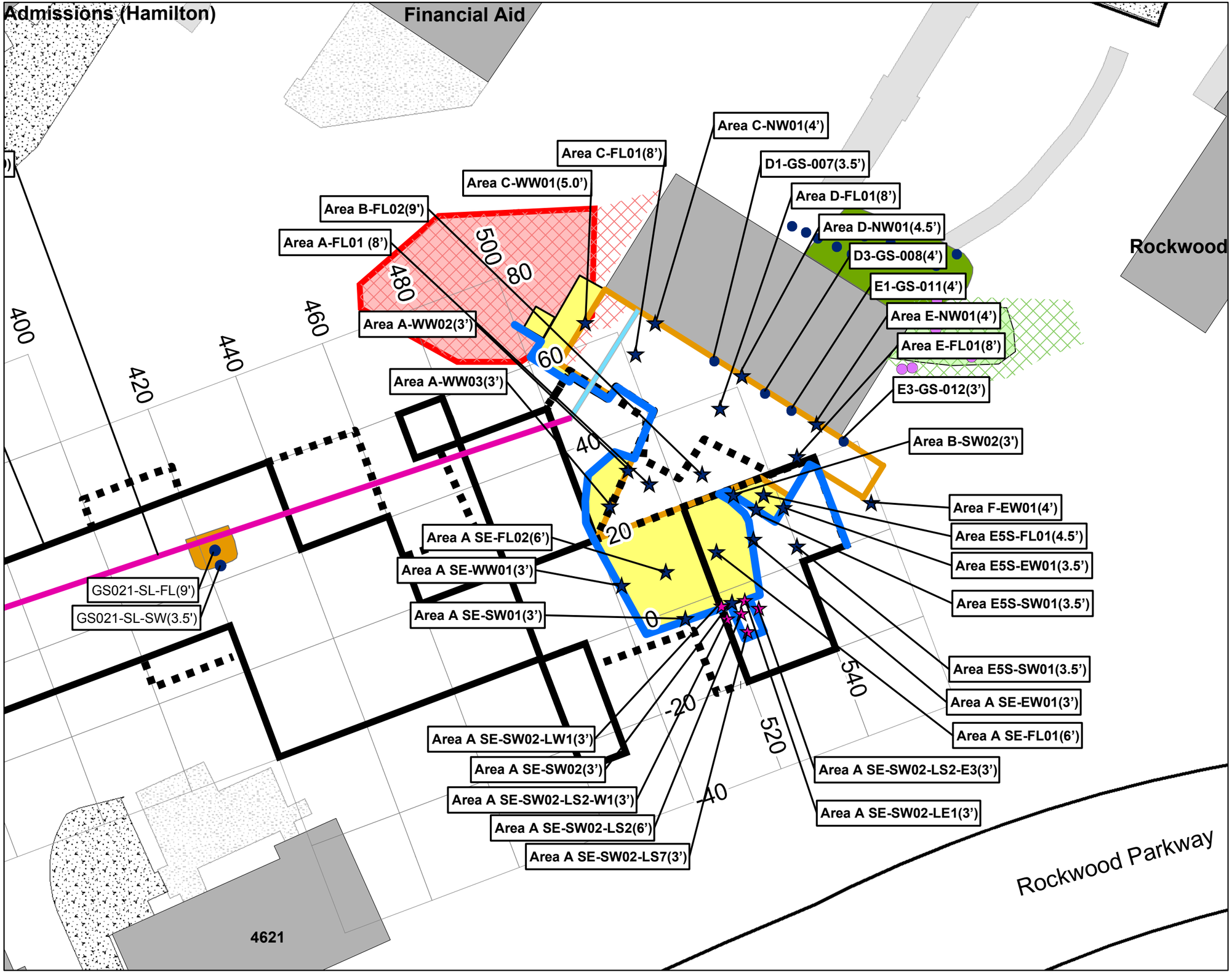
2.5.2.3 Presence of debris to south of Trench E5, west of Trenches C1 and C5, and south of Trenches C5 and C6 required extension of the excavation dimensions. The west extension of Trenches C1 and C5 was excavated to connect to the AU Bamboo Area investigation. The excavation dimensions of the extensions to trench C1 and C5 was 6 ft wide, 20 ft long and 3 ft deep. The south extension of Trenches C5 and C6 was excavated to connect to the Lot 18 investigation area. The excavation dimensions of trenches C5 and C6 was 2 ft wide, 8 ft long, 8 ft deep. The excavations extensions are shown in Figure 2.1b. The soil profile and items recovered from each trench are summarized in the dig sheets included Appendix G.

2.5.2.4 Based on the presence of munitions debris or stained soil, thirteen grab soil samples were collected in trench areas C, D and E. Most of the grab samples were excavated and disposed off-site during the debris clearance except for four remaining along the building footer. The locations of the remaining grab samples are illustrated in Figure 2-2. The purpose of these samples was to characterize the soil associated with the munitions and stained soil. All samples cleared headspaced analysis before they were sent to ECBC in Edgewood, Maryland for low level analysis including mustard agent and ABPs; 1, 4-dithiane and 1, 4 oxathiane, and thiodiglycol. Once the samples were cleared for low level analysis, they were sent to a HTW analytical laboratory for additional analysis. Parsons shipped the samples to GPL Laboratories, LLLP[2] in Frederick, MD between June 2008 and August 2009; and then to ALSI in Middletown, PA. The samples were analyzed for TCL VOCs; TCL SVOCs; TAL metals plus strontium, tin and titanium; explosives (nitrobenzene, nitroglycerin, trinitrotoluene, tetryl, 2,4-dinitrotoluene, and 2,6-dinitrotoluene); total cyanide, and perchlorate. The validated samples results are included in Appendix E. The laboratory data validated sample results, laboratory analytical reports, data validation reports (DVR) and Staged Electronic Data Deliverable (SEDD)/ Automated Data Review (ADR) files for these samples are included in Appendices E, F, I and J respectively.

[2] GPL Laboratories, LLLP was bought over by Centuari Labs in January 2010.

Figure 2-2
Sample Location Map for
Back Yard of Public Safety Building

Spring Valley Site Wide Investigation
Washington, DC



Legend

- Buildings
- Driveway
- Sidewalk
- Deck/Porch
- Grids
- Roads

PSB (Phase 2)

- Front Porch Excavation Area
- Silver Substance
- Extensions of Cleared Debris Areas A, B, C and E
- Pit Characterization Samples
- Mercury Delineation Samples
- Grab Samples
- New Pipe Connection/Headwall
- Debris Excavation Area Behind PSB

PSB (Phase 1)

- Public Safety Excavation Extent
- Public Safety Minimum Excavation Area

Lot 18

- AU Lot 18 Minimum Limit of Excavation
- AU Lot 18 Excavation Extension
- No excavation was performed beyond this line during the Lot 18 Investigation.

Bamboo

- BA-P6 Excavation Extent
- BA-P6 Minimun Excavation Area
- Soil Sample Locations

20 10 0 20 Feet

1 inch = 20 feet

Scale:	1:240
Created By:	Parsons
File:	20100804 PSB Sample Sorting Back.mxd
Date:	8/04/2010
Figure Number:	2-2
Page Number:	

PARSONS

TABLE 2.1: EXCAVATED TRENCH INFORMATION

Trench ID	Excavation Completion Day	Depth (feet)
C1	8/4/08	9
C2	9/5/08	8
C3	9/12/08	10
C4	7/24/08	10
C5	9/24/08	8.5
C6	9/5/08	9
C7	10/3/08	9
C8	10/27/08	8
D1	9/17/08	8
D2	10/16/08	8
D3	10/22/08	8
D4	11/7/08	8
D5	11/18/08	8
D6	1/14/09	8
E1	11/21/08	8
E2	12/2/08	8
E3	1/9/09	8
E4	1/30/09	8
E5	2/6/09	8
F1	2/11/09	8
E5S	2/13/09	4.5
C1W,C5W, C5S, C6S	7/30/09	3
Additional C5W	9/30/09	4

2.5.2.4 During the excavation of trenches in Areas C, D & E, sidewall and floor soil samples were collected at the proposed locations according to the SSWP (USACE 2008a). Five sidewall and three floor samples were collected in Areas C, D & E, and one floor and three sidewall samples were collected at the trench E5 extension. The purpose of these samples was to characterize the soil remaining in the debris area after the excavation. The locations of all the pit characterization samples in the debris area are illustrated in Figure 2-2. The samples cleared headspace and low level analysis and were further submitted to GPL in Frederick, Maryland to be analyzed for TCL VOCs; TCL SVOCs; TAL metals plus strontium, tin and titanium; explosives (nitrobenzene, nitroglycerin, trinitrotoluene, tetryl, 2,4-dinitrotoluene, and 2,6-dinitrotoluene); total cyanide, and perchlorate.

2.5.3 Areas A& B Including Elemental Mercury Impacted Area

2.5.3.1 Areas A and B were investigated from February 2009 to September 2009. During the excavation of the debris area trenches extending into Area B at the PSB, visible mercury beads were encountered at 3.5 ft bgs in the excavation south of trench D-5. Work was temporarily

suspended in February 2009 to include appropriate safety measure and work plan revisions. Figure 2-1b illustrates the area where visible mercury was encountered. Elemental mercury impacted soil was excavated in accordance with Work Plan (USACE 2009a).

2.5.3.2 Prior to the excavation of mercury impacted soil in the excavation area south of Trench D-5, the following activities were performed:

- Water samples were collected from the Baker tanks containing potentially mercury impacted water and analyzed for the DCWASA parameters (Level D personal protective equipment (PPE) operation). The analytical results did not exceed the DCWASA discharge regulatory levels. DCWASA review the submitted analytical results and approved the discharge of the water stored in Baker Tanks was discharged to the sanitary sewer.

- Soil left on the sorting table, excavation bucket, and loader when elemental mercury was encountered was manually placed in 55-gallon drums (Level C PPE operation). Prior to drumming the soil, a composite soil sample was collected from the table, excavation bucket, and the loader and analyzed for TCLP parameters (TCLP VOCs, TCLP SVOCs, TCLP metals, corrosivity, ignitability, and reactivity) for disposal characterization.

- A TCLP soil disposal sample was collected from the roll-off box which was in use when elemental mercury was first encountered (Level C PPE operation).

2.5.3.3 Excavation of all visible mercury and associated soil were conducted in Level C PPE with the Mercury Vapor Analyzer (MVA) until there was no visible mercury and the mercury level in breathing zone was below 0.025 mg/m^3 and below 0.012 mg/m^3 at the established excavation perimeter. Excavated soil was placed on a sorting table to perform visual inspection for items of interest and loaded into drums. Composite disposal characterization samples were collected for every 5 drums and submitted for total mercury and TCLP analysis.

2.5.3.4 All visible mercury associated soil was excavated and the excavation was extended one ft along the excavation boundary in all directions for confirmation. Four grab samples were collected, which included three sidewalls and one floor sample. These samples were cleared for headspace and low levels analysis, and further sent to GPL for analysis for grab sample parameters including TCL VOCs; TCL SVOCs; TAL metals plus strontium, tin and titanium; explosives (nitrobenzene, nitroglycerin, trinitrotoluene, tetryl, 2,4-dinitrotoluene, and 2,6-dinitrotoluene); total cyanide, and perchlorate. The validated samples results are included in Appendices E.3 and E.5. The laboratory analytical reports for these samples are included in Appendix F; the DVRs are included in Appendix I; and the SEDD/ ADR files for these samples are also included in Appendix J.

2.5.3.5 Eighty four drums of soils were removed during the mercury excavation operation including the mercury impacted soil and 1 ft extension along the excavation boundary. The excavated soil stored in drums was sampled for total mercury and TCLP for disposal. Water from the excavation area was pumped into Baker tanks during the course of the investigation. A tank discharge water sample was collected whenever a tank was full. The sample was analyzed by GPL for DCWASA parameters (metals including arsenic, cadmium, copper, lead, nickel and

zinc; TSS, perchlorate and pH) and Resource Conservation and Recovery Act (RCRA) disposal parameter (TCLP VOCs, TCLP SVOCs, TCLP metals, corrosivity, ignitability, and reactivity). The validated sample results are included in Appendix E.6. As required by the TDA permit, the analytical results were submitted to DCWASA for approval to discharge to the sanitary sewer. When DCWASA criteria were exceeded for the tank samples, associated water in these five tanks (approximately 11,250 gallons) was disposed at DuPont hazardous water treatment facility in New Jersey.

2.5.3.6 After the mercury excavation operation were completed in April 2009, Areas A and B were investigated in accordance with Amendment 1 of the SSWP (USACE 2008b). Once the soil was considered to be "cleared for debris," the excavation was taken six-inches deeper for confirmation. To achieve debris clearance, the original boundary of Area A was excavated to 8' bgs and extended to the northwest area. The original boundary of Area B was excavated to 9' bgs and extended to the southeast area. Then, the floor of the trench was screened with a magnetometer as a QA check. The final boundaries of Areas A and B and their extensions are illustrated in Figure 2-3. The soil profile and items recovered from Areas A and B (including extensions) are summarized in the dig sheets included in Appendix G.

2.5.3.7 During the course of investigation pit characterization samples were collected. One floor sample (SW-PSB2-AREA A-FL01-(8.0)) and three sidewall samples (SW-PSB2-AREA A-NW01-(3.0), SW-PSB2-AREA A-WW02-(3.0), and SW-PSB2-AREA A-WW03-(3.0)) were collected from Area A. Two floor samples (SW-PSB2-AREAA-SE-FL01(6) and SW-PSB2-AREAA-SE-FL02(6)) and four sidewall samples (SW-PSB2-AREAA-SE-SW01(3), SW-PSB2-AREAA-SE-EW01(3), SW-PSB2-AREAA-SE-SW02(3), and SW-PSB2-AREAA-SE-WW01(3)) were collected from the southeast extension of Area A. One floor sample (SW-PSB2-AREA B-FLO2(9)) and one sidewall sample (SW-PSB2-AREA B-SW02(3)) was collected from Area B and Area B northeast extension. The pit characterization sampling results showed that mercury concentration of 26 mg/kg detected in a sidewall sample (SW-PSB2-AREAA-SE-SW02(3)) from the south wall of Area A southeast extension exceeded the mercury screening level of 0.56 mg/kg. Therefore, mercury delineation sampling was performed between October and December 2009 to determine the vertical and horizontal extent of the contamination in the east sidewall sample of Area A southeast extension. Sixteen soil delineation samples were collected in 1' increments in the lateral east, south and west directions and analyzed for total mercury. Based on the sampling results, the excavation dimension was determined to be 4' wide, 7' long and 6'deep. The area was then excavated, and a composite soil sample was collected and analyzed for RCRA disposal parameters (TCLP VOCs, TCLP SVOC, TCLP metals, corrosivity, ignitibility, and reactivity) for disposal.

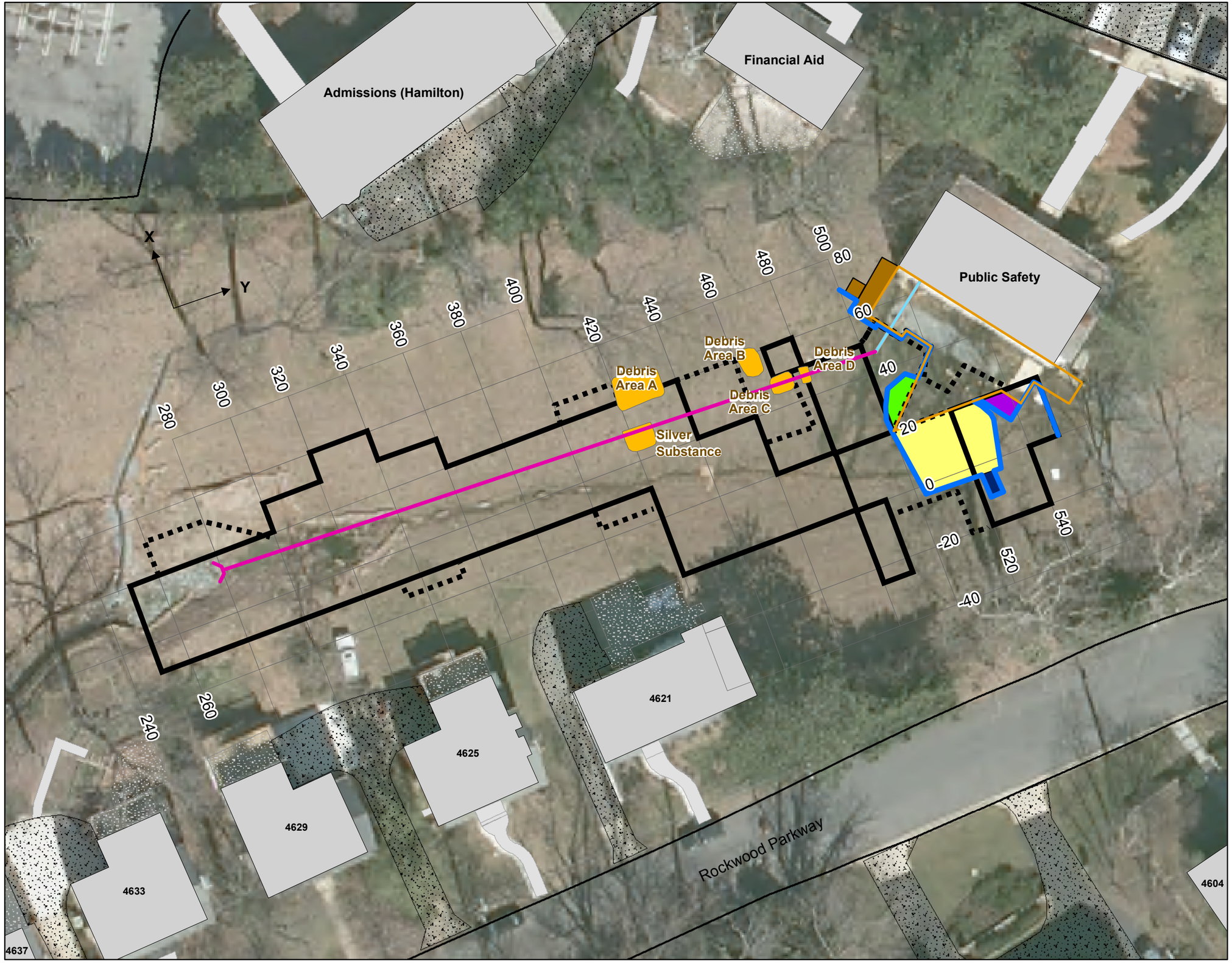


Figure 2-3
Public Safety Building
Phase 2 Investigation Activities

Spring Valley Site Wide Investigation
Washington, DC

Legend

- AU Lot 18 Minimum Limit of Excavation (2006)
- AU Lot 18 Excavation Extension (2006)
- Area east of this line was addressed as part of the Public Safety Building Area Phase 2 Investigation
- Pre-existing Terracotta Pipe
- PSB Pipe and Headwall
- Buildings
- Driveway
- Deck/Porch
- Roads
- Sidewalk
- Grids
- PSB Phase II Debris Area
- Trench C1/C5 Extension
- Debris Area Encountered During Headwall Tie-in Activities
- Area A North-West Extension
- Area A South-East Extension
- Trench E5 Extension
- Mercury Delineation Area

30 15 0 30 Feet

1 inch = 30 feet

Scale:	1:360
Created By:	Parsons
File:	20100916 Lot18 Over-Excavation Limits.mxd
Date:	9/16/2010
Figure Number:	2-3
Page Number:	-

PARSONS

2.5.3.8 An 18-inch terracotta pipe was uncovered during the AU Lot 18 investigation, and this pipe was originally going to be connected to a headwall in the Upper Rockwood Stream area as part of the AU Lot 18 restoration. However, the other end of the pipe was not located during the AU Lot 18 investigation. During the previous PSB Area Phase 1 investigation (2006), the field team had observed a part of the 18-inch diameter terracotta pipe at the southwest corner of the building (near Sump 2), but again the other end of the pipe could not be further located. During the Phase 2 investigation of these trenches, the field team located the terracotta pipe and connected it to the original headwall in the AU Lot 18 area. The location of the headwall pipe and the headwall are illustrated in Figure 2-3. The headwall was installed based on the original design of the stream topography documented in the final restoration of Lot 18 investigation report (USACE 2008c). The terracotta pipe diameter was confirmed to be 12-inches at the point where it exits from underneath the building. An 18-inch high density polyethylene (HDPE) pipe was installed and connected to the end of the terracotta pipe (12-inch diameter) in accordance with HDPE pipe manufacturer specifications. The pipe excavation was started in June 2009 and the pipe tie-in was completed in September 2009. The excavation dimensions for the HDPE pipe was 20 ft wide and ranged between 4ft to 8ft in depth depending on the ground elevations. The pipe bedding was laid by #57 stones (1-inch to 1½-inch diameter). The length of the pipe laid to connect the headwall to the terracotta pipe was 238 ft. A clean-out was installed approximately 18 ft from the building.

2.5.3.9 During the headwall tie-in effort, silver powder substance was encountered at approximately 4’ bgs located approximately 100 ft from the building in August 2009. A grab sample of the silver substance (SW-PSB2-Headwall-GS021) was collected and submitted to ALSI for analysis after headspace and low level clearance. The silver powder substance was excavated in Level B PPE operation and placed the excavated substance and impacted soil in drums. Once all visible silver powder was removed, the excavation was taken 6 inches further for confirmation. One floor and one sidewall grab soil samples were collected and analyzed for SV grab sample parameters. Figure 2-3 shows the location where the silver powder was encountered and the location of the grab samples.

2.5.3.10 Additional areas of suspected AUES-related debris were encountered in four areas. Figure 2-3 illustrates these areas: headwall debris Area A, headwall debris Area B, headwall debris Area C, and headwall debris Area D. Debris clearance was performed in these areas in six-inch lifts. Once the soil was considered to be “cleared for debris,” the excavation was taken six inches deeper for confirmation. Headwall debris area A was encountered on August 6, 2009. Approximately 9 lbs of AUES-related broken lab glasses were found at depths between 2 to 4 ft bgs through August 21, 2009 during the headwall tie-in activity. The area was surveyed and additional debris clearance was performed between November 18 and November 20, 2009. The excavation dimension was 12 ft long x 12 ft wide x 4 ft deep. Approximately 4 lbs of suspected AUES broken glass debris were uncovered. Headwall Debris Areas B, C, and D were encountered and cleared on September 16, 2009. Approximately 2 lbs of AUES-related broken labware glass were found at depths between 2 to 3 ft bgs. A closed metal pipe (6 ft long x 3 ft wide) with end caps was found at 3 ft bgs. The item was evaluated to be empty based on TE’s X-ray review and was submitted as a scrap batch sample for headspace analysis. All samples collected from the headwall debris clearance were cleared for the headspace analysis with MINICAMS and DAAMS.

2.5.4 Utility Area (Including Front Stoop)

2.5.4.1 Utility area was investigated to excavate the arsenic and lead exceedance in the northern sidewall samples that were collected during the AU Bamboo Area investigations performed in 2006. In October and December 2008 soil delineation samples were collected to determine the extent of the impacted soil. Five samples were collected (one floor and four sidewall). The soil delineation sample results showed that arsenic concentrations were below the Spring Valley comparison level of 20 mg/kg except at one sidewall sample location (SW-PSB2-UT-WW01(2')). Therefore, arsenic extent was confirmed to be defined to the north, east and south. The extent to the west of the walk path was not defined.

2.5.4.2 Part of the delineated area east of the front stoop and walk path were investigated by excavating two trenches (6' wide and 8' long each). The trenches were excavated to a depth of 4.8 ft based on previously collected floor sample delineated results from December 2008. Construction debris and a large concrete pipe were encountered at 4.5 ft adjacent to the walk path during the utility area investigation. Therefore, excavation around the concrete pipe could not be conducted to the predetermined depth of 4.8 ft. An additional soil sample was collected at the concrete pipe area at a depth of 4.5ft to confirm the arsenic concentration was below the SV comparison level of 20 mg/kg. The first trench excavated was backfilled with the approved backfill soil. However, high moisture content in the backfill soil prevented compaction. Therefore, flowable fill was used to backfill the second trench closer to the building. The remaining area east of the front stoop and walk path near the building was not investigated in December 2008 due to the presence of an existing gas line. This area was revisited for excavation in December 2009 taking necessary safety measurements with the full delineation for the excavation area.

2.5.4.3 Additional delineation to the west of the front stoop and walk path was performed in January 2009. The soil analytical results show that the sidewall sample (SW-PSB2-UT-WW-W01(2')) on the other side of the walk path also exceeded the arsenic comparison level. The exceedance of two sidewall samples (SW-PSB2-UT-WW01(2') and SW-PSB2-UT-WW-W01(2')) on each side of the front stoop and walk path indicated that soil beneath the front stoop concrete walk path was impacted with elevated arsenic. Consequently, the front stoop and the concrete walk path were removed in late November and early December 2009. The final delineation was completed in December 2009.

2.5.4.4 The area west of the front stoop concrete and walk path, the area beneath the concrete walk path, and the area east of the walk path near the building were excavated in five sections to depths ranging between 4ft bgs (area west of the walk path based on the delineation floor sampling results) and 8ft bgs (near the gas line for debris clearance) in December 2009 and January 2010. The excavated soil was placed in roll-off boxes for off-site disposal. A composite soil sample was collected and analyzed for TCLP parameters.

2.5.4.5 During excavation in the utility trench area, AUES-related encountered debris was cleared in accordance with Subchapter 3.8.5.3 of the SWWP (USACE 2007) and the PSB Phase 2 SSWP (USACE 2008a). The excavation was performed in six-inch lifts and when the excavated soil from a six-inch lift contained no suspect AUES-related debris, as determined by the intrusive team, the excavations were taken six-inches deeper for confirmation and the floor

was cleared with a magnetometer. The utility trench area investigation was backfilled using temporary backfill in February 2010.

2.5.5 Horizontal Drilling

2.5.5.1 Horizontal Drilling was performed between May 17, 2010 and May 21, 2010 to collect representative soil samples beneath the PSB. Prior to starting drilling activities, all site utilities were located and verified by reviewing AU utility maps and building layouts using a private utility locator (Just Locating, Inc). Just Locating, Inc verified and marked utilities in the vicinity of the building. A terracotta pipe underneath the building was located after reviewing previously taken photographs (i.e., trench C2 investigation in August 2008). The location of the pipe was marked and precautions were made to avoid any damage to the pipe.

2.5.5.2 Directional Technology Inc. (DTI) was subcontracted by Parsons to perform horizontal drilling beneath the PSB in accordance with the SSWP Amendment 3 (USACE, 2009). Sixteen (16) discrete samples were collected from eight soil sampling locations (four rows at 2 foot depth intervals) as shown in Figure 2-4.

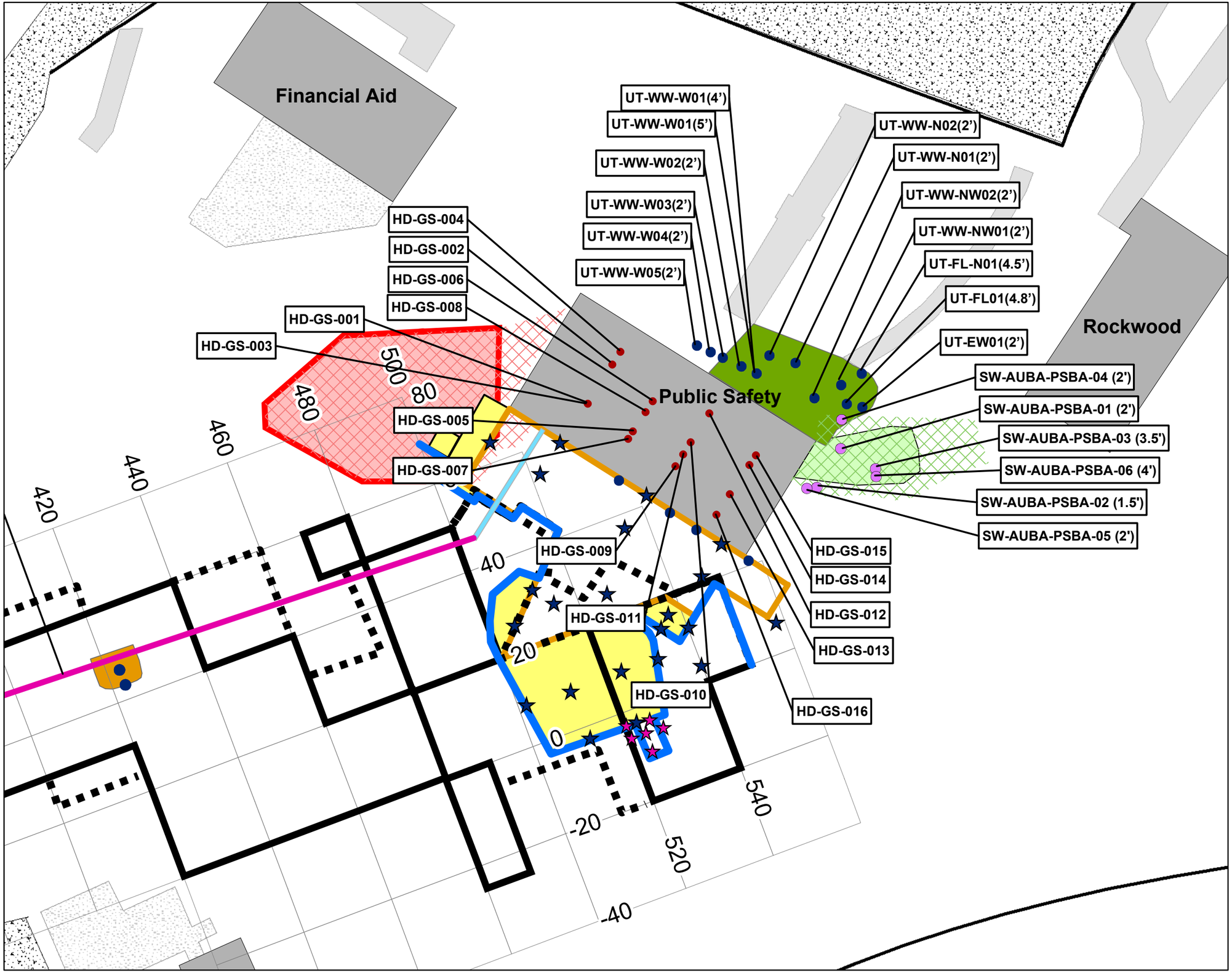


Figure 2-4
Sample Location Map for
Front Yard of Public Safety Building

Spring Valley Site Wide Investigation
Washington, DC

Legend

- Buildings
- Driveway
- Sidewalk
- Deck/Porch
- Grids
- Roads

PSB (Phase 2)

- Front Porch Excavation Area
- Silver Substance
- Extensions of Cleared Debris Areas A, B, C and E
- Pit Characterization Samples
- Mercury Delineation Samples
- Grab Samples
- Horizontal Drilling Samples
- New Pipe Connection/Headwall
- Debris Excavation Area Behind PSB

PSB (Phase 1)

- Public Safety Excavation Extent
- Public Safety Minimum Excavation Area

Lot 18

- AU Lot 18 Minimum Limit of Excavation
- AU Lot 18 Excavation Extension
- No excavation was performed beyond this line during the Lot 18 Investigation.
- Small Disposal Area

Bamboo

- BA-P6 Excavation Extent
- BA-P6 Minimun Excavation Area
- Soil Sample Locations

20 10 0 20 Feet

1 inch = 20 feet

Scale:	1:240
Created By:	Parsons
File:	20100804 PSB Sample Sorting Front.mxd
Date:	8/04/2010
Figure Number:	2-4
Page Number:	

PARSONS

The sampling locations were altered from the proposed locations based on access, utilities, and field conditions. Samples were collected from two discrete sample depth intervals at each location. The final sampling depth interval was determined based on the thickness of the footer and the locations of the 3' stones placed beneath the backfill soil and flowable fill placed in trenches E3 and F1.

2.5.5.3 The movement of the building foundation was monitored daily by Parsons via crack monitors and every other day via crack monitors and 3-D monitors monitored by ECS. ECS preformed pre-drilling crack monitoring on May 14, 2010, on May 18 and 20, 2010 during the drilling operation, and post-drilling monitoring on May 24, 2010. A Parsons geotechnical/civil engineer observed the drilling operation. A building monitoring log was prepared by the geotechnical/civil engineer and included in Appendix H.

2.5.5.4 Two separate boreholes were drilled from the same drill location to collect the multiple depth samples. The drill rig was moved four times to collect samples from four drilling locations. Samples were collected from each borehole at two points along the length of each borehole. After the collected samples were cleared for the headspace and low level analysis by ECBC, the samples were submitted to ALSI in Middletown, Pennsylvania for analysis of the full Spring Valley list of parameters including VOCs, SVOCs, TAL metals, explosives, total cyanide, iodine, fluoride, and perchlorate. The required QC samples such as field duplicated samples and rinsate samples were also collected in accordance with the Spring Valley sampling analysis plan.

2.6 DISPOSAL

2.6.0.1 Suspected AUES-related debris and culture debris uncovered during the low-probability PSB Phase 2 investigation were placed in roll-off boxes. Batch samples of AUES-related debris were collected daily and submitted to ECBC for headspace analysis. After the batch samples cleared headspace, the sample and the remaining associated debris were placed in drums. All suspected AUES-related debris was disposed at a non-hazardous landfill (King and Queen County Landfill in Plymouth, VA). Ordnance related items that were certified as MD were placed in two MD demilitarization drums and MD scrap were place in two MD scrap drums. The drums were transferred to the Federal property and stored in the drum storage area. One closed cavity MEC item was stored in the HE Bunker at the Federal property. These munitions-related items were later demilitarized and disposed.

2.6.0.2 Soil removed from debris clearance and excavation of metal impacted soil was placed into roll-off boxes. Waste profile and representative TCLP samples were collected for disposal. PPE associated with the non-RCRA hazardous operations was taken to a non-hazardous landfill for disposal along with the excavated soil or debris. The TCLP data has been included in Appendix F – Laboratory Analytical Reports.

2.6.0.3 Aqueous investigation derived waste (IDW), including decontamination water, was collected in 55-gallon drums. TCLP water samples were collected in accordance with SSWP 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 of at a DuPont facility (DuPont Chambers Works) in Deepwater, New Jersey as non-hazardous waste.

2.7 RESTORATION AND DEMOBILIZATION

2.7.0.1 Restoration activities were completed in phases. The utility trench area was permanently compacted in April 2010 and the front stoop and the concrete walk path were restored to the original status in May 2010. The utility area including the front and side area of PSB was graded, contoured, and seeded in June 2010.

2.7.0.2 The PSB site restoration was performed following the debris clearance, HTW over-excavation and horizontal drilling sampling in June and July 2010. After the scope for Phase 2 investigation was completed, pressure washing activities were performed at PSB. The wall facing the debris area was pressure washed to remove any potential residual mercury particulate on the structure. Water from the pressure washing was collected and placed in a drum. A TCLP sample was collected for disposal characterization. The site was graded to accommodate the drainage away from the existing building. Topsoil was uniformly spread, graded, and compacted to the desired grade, and left free of surface irregularities. Topsoil was compacted by one pass of heavy equipment, followed by hydroseeding. CPJ surveyor preformed post-excavation survey in July 2010 (See Appendix B).

2.7.0.3 As part of the demobilization, Baker tanks were returned, road mats were power washed, all stones for the access road were placed in roll-offs and shipped to the King and Queen Landfill. Miscellaneous items such as hoses, flammable material storage locker, tent, and pumps were removed from the site, and the perimeter fence around the site was removed in June and July 2010.

2.7.0.4 Topsoil used during the PSB Phase 2 restoration was obtained from AggTrans in Hanover, MD as directed by USACE. This topsoil source had been approved for use as part of soil removal activities being conducted by another contractor (Sevenson Environmental) at residential properties in the SVFUDS.

2.7.0.5 Per AU requests, a concrete patio was placed between two doors at the back of the PSB. Following placement of backfill and topsoil as described above, the disturbed areas were seeded with grass. In areas with steep slopes, restoration also included placement of erosion control matting.

2.7.0.6 The restoration and demobilization of all equipment from the PSB low probability investigations were completed on July 27, 2010. Photos are included in Appendix D.

CHAPTER 3. RESULTS

3.1 PHASE 1

3.1.0.1 Three sumps were installed on August 22 and 23, 2006 at the locations shown on Figure 2-1a. Sump 1 was installed to a depth of 8.5 ft bgs; Sump 2 was installed to a depth of 7 ft bgs; and Sump 3 was installed to a depth of 7 ft bgs. No water was encountered during installation of Sump 1; over the course of the Phase 1 investigation only minimal water ever accumulated at the bottom of Sump 1. During the excavation of Sump 2, a portion of an 18-inch terracotta pipe was observed at approximately 7 ft bgs. The observed portion of the pipe and the surrounding sidewalls of excavation collapsed into the hole shortly after the pipe as observed. Subsequent excavation in this area during Phase 1 investigation did not encounter this pipe again.

3.1.0.2 During installation of Sump 3, one MD item was recovered at approximately 2.5 ft bgs. The item was identified as a 75 mm shell casing and was headspaced clear. The item was certified as MD on November 6, 2006 and the Form DD-1348 is included in Appendix L. The item was disposed along with other MD items found during Lot 18 investigations. Glassware was also found around the area where the 75mm shell was recovered. A batch of glassware (approximately 2 lbs) was headspaced clear. The glassware was shipped for disposal at King and Queen Landfill in VA.

3.1.0.3 Water was pumped from the sumps for two weeks prior to the excavation of the test pits. Approximately 82,770 gallons of water was pumped from the sumps during the period between August 21 and September 19, 2006. Two discharge samples (SW-AUBA-DIRDIS-082206 and SW-AUBA-DIRDIS-090806) were collected over the course of the investigation and analyzed for metals (arsenic, cadmium, copper, lead, nickel, and zinc), total suspended solids (TSS), perchlorate and pH. The water was then discharged into the sanitary sewer in accordance with the permit (TDA #0406-683). Perchlorate was not detected in these samples. The term not detected used in this report implies that the analyte is not detected at the practical quantitation limit (PQL). TSS was reported at 360 and 14 mg/L, respectively. The pH was reported at 7.0 and 6.6, respectively. All seven metals were detected in both samples, but were below the DCWASA discharge limits. The validated sample results are included in Appendix E of this report. The laboratory analytical reports for these samples are included in Appendix F. The data were forwarded to DCWASA in accordance with permit requirement.

3.1.0.4 A PID was used to monitor VOCs to be below 50 ppm (parts per million) in accordance with the SWWP during excavation work. A dust monitor was used to monitor the dust levels to be below 5 milligrams per cubic meters (mg/m^3) in the breathing zone, in accordance with the SWWP during excavation activities. A limited amount of air samples were collected during excavation activities and were analyzed for arsenic and total particulates; the results were nondetect. The analytical results for the air samples are shown in Appendix K.

3.1.0.5 A composite soil disposal sample was collected on August 23, 2006 from the soil excavated from the sumps and the test pits. The soil was determined to be non-hazardous. The soil excavated from the sump locations and TP-3 was disposed at King and Queen Landfill at

Plymouth, Virginia. The laboratory analytical report for this sample is included in Appendix F (Analytical Summary Report 608140).

3.1.0.6 After two weeks of dewatering activities, the exploratory test pits were excavated. The approximate dimensions of the test pits and the depth of the boreholes are shown in Table 3.1 below.

TABLE 3.1: DIMENSIONS OF TEST PITS AND BOREHOLE DEPTHS (PHASE 1 INVESTIGATIONS AT PSB)

Test Pits	Dimensions (in feet)	Borehole Depth (bgs)
TP-1	3 x 8 x5 (deep)	12.3 feet below the floor slab of the building 10.1 feet below the bottom of the footer
TP-2	4 x 10 x 4 (deep)	14.5 feet below the floor slab of the building 12 feet below the bottom of the footer
TP-3	4 x 5 x 4 (deep)	14.4 feet below the floor slab of the building 10.9 feet below the bottom of the footer

3.1.0.7 During the excavation of TP-3 on September 11, 2006, a piece of suspected AUES-related ceramic crockery was recovered. The item was clear for headspace analysis.

3.1.0.8 Two grab soil samples were collected during the Phase 1 investigation at depths of 4.5 ft bgs, including one from soil six inches below the building footer at TP-2 at the southwest corner of the building and one from soil six inches below the building footer in TP-3 at the southeast corner of the building. These samples were designated SW-PSBA-TP2-01(4.5') and SW-PSBA-TP3-01(4.5'), respectively. ABPs, explosives, VOCs, and cyanide were not detected in either sample. Among the SVOCs, low levels of polynuclear aromatic hydrocarbons (PAHs) were detected in the TP-3 sample. The source or PAHs is unknown, but may not be site-related since PAHs are ambiguous in environment. Three Spring Valley-specific metals (mercury, thallium, and vanadium) and two non-Spring Valley-specific metals (iron and sodium) exceeded comparison values in sample SW-PSBA-TP2-01(4.5'). Sodium is the only metal that exceeded comparison values in sample SW-PSBA-TP3-01(4.5'). The results for these samples are shown in Appendix E. Soil excavated from the TP-3 and sumps were disposed at a non-hazardous landfill.

3.1.0.9 An HHRA was finalized on May 31, 2013 under a separate contract to evaluate the effect on human health of chemicals of potential concern (COPCs) detected in the PSB area (ERT 2013). This HHRA, referred to hereafter as the PSB HHRA, uses current USEPA methods and procedures, and site-specific information, to evaluate and quantify the potential health risks

to on-site workers that might result from exposure to COPCs in soil. The PAHs and metals exceedances described in the previous paragraph are addressed in the PSB HHRA.

3.1.0.10 Streams of water were observed shooting out through the concrete footer of the building in the location of TP-3. In accordance with USAECH direction, a grab water sample (SW-PSBA-092106) was collected from the streams of water to determine the water source. The validated results for this sample are included in Appendix E, E.7. The grab water sample was analyzed for VOCs (Method SW-8260B), total metals (Method EPA-200.7), inorganic anions (Method-EPA300), and total residual chlorine (Method EPA 330.5). For the nutrient metals that were analyzed, calcium, copper, magnesium, potassium, and sodium were detected in this sample. Iron and lead were not detected. Fluoride, chloride, and nitrate were detected in the sample. Residual chlorine and nitrite were not detected in the sample. VOCs that are considered potential disinfection by-products were not detected with the exception of chloroform (which was also detected in the associated blank). These results alone did not support a conclusive identification of the source for this water. The presence of residual chlorine would have indicated that the water was coming from a treated water source. The absence of residual chlorine, however, does not rule out the possibility that the water is from a treated source. Depending on a variety of factors, including where the source is located relative to the sample point, the length of time the water may have been exposed to the atmosphere, the materials that the water may have been exposed to prior to the sample point, etc., it is possible that any residual chlorine could have dissipated or been consumed prior to the sample point. The maximum contaminant level (MCL) per the National Primary Drinking Water Regulations (NPDWRs) for nitrate is 10 mg/L and fluoride is 4 mg/L. Chloride is not a contaminant listed under the NPDWRs. However, the MCL per the National Secondary Drinking Water Regulations (NSDWRs) for chloride is 250 mg/L and fluoride is 2 mg/L. The concentrations for chloride, nitrate, and fluoride did not exceed the MCLs for NPDWRs or NSDWRs. The fluoride concentration of 0.16 mg/L is lower than what would be expected in a treated drinking water source. Based on data provided by the Washington Aqueduct at the Dalecarlia Water Treatment Plant, the fluoride concentration ranged from 0.93 to 1.03 mg/L in the finished water produced by the plant between September 11 and September 27, 2006.

3.1.0.11 The CENAB Geotechnical Branch prepared a report (CENAB 2006) describing the geotechnical analysis for the Phase 1 investigation. The CENAB report is provided as Appendix C. CENAB recommendations from the geotechnical report were used to plan the excavation activities during the Phase 2 investigation at PSB.

3.2 PHASE 2

The Phase 2 PSB investigations were conducted between June 2008 and June 2010. All investigations were completed as low-probability and in open- air. The findings of the phase 2 investigations are summarized in the following sections.

3.2.1 Anomaly and Anomalous Area Investigation

3.2.1.1 Twelve single-item anomalies were investigated during the PSB investigation between June 25 and 27, 2008. All anomalies were investigated successfully by hand-digging in open air. None of the items recovered during the investigation of the anomalies were MEC/RCWM or

AUES-related items. Seven of these anomalies investigated had 90 percent signal reduction after intrusive investigation and consisted of items such as nails, wire, scrap metal, metal strapping, and hot rocks. The five anomalies that did not receive a 90 percent signal reduction were identified as underground pipe, root baskets, and wire. Appendix G includes the geophysical dig sheet for the single-item anomalies. All items recovered from these anomalies were collected in 55-gallon drums. These items were shipped to the King and Queen Landfill in Plymouth, VA for disposal. The disposal records are included in Appendix L.

3.2.1.2 Two anomalous areas were investigated during the PSB investigation. Two anomalous areas (PS-P1 and PS-P2) were investigated by excavating three trenches each within the anomalous areas. Trench PS-P1-3 was the only trench in anomalous area PS-P1 that had 90 percent signal reduction after intrusive investigation. Trench PS-P1-1 and PS-P1-2 did not achieve 90 percent signal reduction due to a 6.5 inch pipe that was left in ground after investigation. Anomalous area PS-P2 trenches did not show a 90 percent signal reduction after investigation. Trenches PS-P2-1 and PS-P2-2 did not achieve 90 percent signal reduction due to its proximity to two pipe junctions in ground. Trench PS-P2-3 did not achieve 90 percent signal reduction due to magnetic rocks encountered at this trench and in the proximity of the trench. Appendix G includes the geophysical dig sheet for these trenches which provides these details. The items recovered from these anomalous area trenches were not MEC/RCWM or AUES-related. The items recovered from these trenches were nails, metal cables, cast iron pipes and similar cultural debris. Appendix G includes the geophysical dig sheet for the anomalous area. All items recovered from these anomalous area trenches were collected in 55-gallon drum. These items were shipped to the King and Queen Landfill in Plymouth, VA for disposal along with other disposal items. The disposal records are included in Appendix L.

3.2.2 Debris Area and Utility Area Results

During the PSB Phase 2 investigation, 1 MEC, 62 MD items, 6 intact containers, and 356 pounds of suspect AUES-related debris were uncovered from the debris area (twenty trenches and Areas A and B), utility trench area and headwall tie-in area. These items were recovered between July 2008 and February 2010. Tables 3.2 and 3.3 lists the closed cavity and MD items found. Items recovered were either assessed by TE or sent for headspacing and low level analysis. The TE assessment reports are included in Appendix M and the headspace and low level analytical reports are included in Appendix E along with other validated sample results.

3.2.2.1 Debris Area

3.2.2.1.1 During the investigations at the PSB debris area, a total of 12 closed cavity items were uncovered. Among the items recovered, eleven closed cavity items were uncovered during the debris area investigation: six from Areas C, D, E, and F, four from Area A, and one from Area B. The twelfth item was uncovered during the headwall tie-in operation.

3.2.2.1.2 Closed cavity item (TE-001) was a clear glass, closed cavity ampoule (1/4 inch diameter x 1.5 inches long) found on the sorting table from Trench C2 at 3 ft bgs. Technical escort (TE) transported TE-001 to ECBC for unknown analysis. ECBC analysis reported the item to be empty. TE-002 through TE-004 was recovered in Trench D1 at depths ranging between 18 inches to 2.5 ft bgs. TE-002 was noted to be 2 inches diameter by 6 inches long steel

pipe with end caps. TE performed X-ray of the item and determined it to be empty; and was re-classified as scrap. TE-003 was identified as a pressurized gas cylinder which made a "sloshing" sound when moved. This item was described as a closed cavity cylinder (3.5 inches diameter x 16 inches long) with a valve on the end. TE-003 was X-rayed and found to be filled with liquid. TE-003 was further assessed using Portable Isotopic Neutron Spectroscopy (PINS) and the Materiel Assessment Review Board (MARB) report on TE-003 (ID number SVM-08-189 on the MARB report) was provided. The MARB report indicated that the item contained water with no energetic. Three 75 mm closed cavity projectiles were found (TE-004, TE-005 and TE-006). TE-004 was X-rayed by TE and found to be empty. TE-005 found in Trench D4 at 2 ft bgs was assessed to be possibly water filled and containing no energetic (MARB report dated 10/31/08). TE-006, found in trench D5 at 1.5 ft bgs was assessed to contain no explosive components or CWM (MARB report dated 11/12/08). The MARB reports are included in Appendix M. Table 3.2 summarizes all closed cavity items recovered during Phase 2 PSB investigation.

3.2.2.1.3 One closed cavity item was uncovered in Area B. The item, TE-007 was identified to be a Burster Tube for a 75mm chemical projectile. The item was examined by TE and found to have residual energetic material inside; therefore, it was classified as MEC. Consequently, TE-007 was stored in the HE Bunker at the Federal Property, demilitarized under the T-30 operation and disposed.

3.2.2.1.4 Four closed cavity items (TE-008 thru TE-012) were uncovered in the southeast extension of Area A. These four items were AUES-related laboratory intact containers and all were uncovered at 4 ft bgs. TE-008 was assessed as a closed cavity, pint size, clear glass, intact bottle with liquid inside and a rubber stopper. TE-009, a closed cavity ampoule with a brown liquid inside and TE-010, a closed cavity ampoule with a clear liquid inside. TE-012 was assessed as closed cavity, pint-sized, intact bottle with cork stopper and filled with liquid. All items were cleared for headspace and low level analysis. TE-008 and TE-012 were further submitted to ALSI for VOCs, SVOCs, explosives, and metals analysis based on the volume of liquid available. The analytical results are summarized in Appendix E.

3.2.2.1.5 As summarized in Table 3.3, 56 MD items were uncovered during the PSB Phase 2 investigation. These included open cavity 75mm shrapnel rounds, open cavity 75mm projectiles, open cavity empty 75mm high explosive projectile, Mark 2 bomb tail fins, and nose cones, 3-inch open cavity armor piercing round, 3-inch Stokes mortar, rotating band, brass fuse body, point detonating fuses, adapter boosters/open cavity Mk IV Adapter boosters, a motor tail boom, spent fuse, and 4.7-inch projectiles. The items were classified as MD by the USAESCH Safety Specialist and were stored in 55-gallon drums. Based on Parsons UXO Site Manager determination, some of the items were demilitarized under the T-30 operation and disposed.

3.2.2.2 Headwall Tie-in

3.2.2.2.1 During the headwall pipe installation operation, one closed cavity item (SW-PSB2-Headwall Ext-TE-011) was uncovered at 6 ft bgs and approximately 96 ft from the PSB. TE-011 was identified as a closed cavity beaker (6 inches long, 2.5 inches wide at the bottom and 1 inch wide at the top) sealed with mud plug and pipette inside. The item was cleared for headspace analysis. TE packed the item and transferred to ECBC for low level analysis. Soil from TE-011

and glassware rinsate sample from the item were collected and analyzed for agent. The samples were clear for HD and L. The ECBC laboratory report is included in Appendix E.

3.2.2.2.2 A total of 58 lbs of debris was uncovered during the headwall tie-in operation from the four debris areas encountered during excavations along the headwall pipe. Figure 2-3 shows these debris areas along the headwall pipe. Twenty to fifty percent of the debris by volume was suspect AUES-related debris (mainly broken laboratory glassware including pipettes, bottle glass, and carboys) were found between 2 ft to 3 ft bgs. The remaining fifty to eighty percent of debris volume was cultural debris.

Table 3.2 SUMMARY OF CLOSED AND OPEN CAVITY ITEMS ASSESSED BY TECH ESCORT
SPRING VALLEY SITE PUBLIC SAFETY BUILDING

Phase 2 PSB TE ITEMS Total: 14

Item #	Sample ID	Trench # where item was found	Depth	Sample Type (solid/ liquid)	Date Recovered	Headspace Clearance Date	Date to Edgewood	Container Description	TE ASSESSMENT REPORT RECEIVED (Y/N) DATE	CWM Clearance Y/N Date Received	Ricin Clearance Y/N Date Received	Final Disposition
1	SW-PSB2-C2-TE-001	C2	3FT	Empty	08/12/08	08/13/08	8/11/2008	One clear glass closed cavity ampule (1/4"D x 1.5" L) found item on sifting table from trench C2 at 3' bgs	TE transported to ECBC. Item underwent unknown analysis at ECBC, and was found to be empty.	Y 8/21/2008	NA	Item went to ECBC. Not received back from ECBC (10-22-08). May be destoryed at ECBC.
2	SW-PSB2-D1-TE-002	D1	18"	empty	09/16/08	9/17/2008	NA	2" diameter by 6" long steel pipe with endcaps. Found on the sifting table in material from trench D1, approximate that it came from 18"depth, 2' from the building.	TE has X-rayed the item and determined it is empty. As such the item will be classified as scrap.	NA	NA	Stored in Drum SW-PSB2-MD-001 at the PSBA.
3	SW-PSB2-D1-TE-003	D1	20"	water	09/16/08	9/24/2008	9/16/2008	Pressurized gas cylinder which "sloshed", closed cavity, 16"long, 3.5" in diameter with a valve on the end. The item was found 5' from building, 20" deep. TE was again notified. At 1650 TE arrives on site and packages the item for transport back to Edge	Item was x-rayed and found to filled with liquid. Item was PINS'd. MARB report on SVM-08-189 (email from Allyn dated 09/24/08) indicated item to contain probable water with no energetics. Item was recommended for local disposition. 092408 Item was returne to the Federal Property.	NA	NA	At Federal Property IHF (10-22-08). Item released by TE and put into Drum SW-PSB2 - MD002 at PSB
4	SW-PSB2-D1-TE-004	D1	2.5'	Empty	10/06/08	10/8/2008	NA	75 mm closed cavity projectile found on sifting table that was collected from 2.5 ft bgs., 6 ft from the building footer in the middle of the trench.	Item was x-rayed and found to be empty. Yes (MARB dated and received 10/28/08) - free of all Hazardous/Explosive materials and are assessed and deemed to be empty	NA	NA	Stored in Drum SW-PSB2-MD-001 at the PSBA.
5	SW-PSB2-D4-TE-005	D4	2.0'	Water fill and no energetics	10/28/08		NA	75 mm closed cavity projectile found 1.5' bgs and 15 feet from building.	Yes (MARB dated and received on 10/31/08) - possible water fill and no energetics	NA	NA	Item released by TE and put into Drum SW-PSB2-MD002 at PSB
6	SW-PSB2-D5-TE-006	D5	1.5'	closed	11/12/08	11/13/2008	NA	75 mm closed cavity projectile found 1.5' bgs and 18 feet from building.	Yes (dated 11/12/08, received on 11/25/08) - no explosive components or chemical warfare material	NA	NA	Stored in Drum SW-PSB2-MD-001 at the PSBA.
7	SW-PSB2-AreaB-TE-007	Area B	3.5'	open	04/07/09	NA (energetic material inside)	NA	Burster Tube for a 75mm Chemical Projectile	Item was examined and found to have residual energetic material inside.	NA	NA	HE Bunker at the Federal Property
8	SW-PSB2-Area A-SE-TE-008	Area A (SE Ext)	4.0'	Closed	07/08/09	NA	7/8/2009	Closed cavity pint size clear glass intack bottle with liquid and rubber stopper	TE packaged and transported to ECBC	Y 07/13/09	Y 07/13/09	
9	SW-PSB2-Area A-SE-TE-009	Area A (SE Ext)	4.0'	Closed	07/14/09	NA	7/14/2009	Closed cavity ampoule with a brown liquid inside.	TE packaged and transported to ECBC	Y 07/20/09	NA	
10	SW-PSB2-Area A-SE-TE-010	Area A (SE Ext)	4.0'	Closed	07/21/09	NA	7/21/2009	Closed cavity ampoule with a clear liquid inside.	TE packaged and transported to ECBC	Y 07/23/09	NA	
11	SW-PSB2-Headwall Ext-TE-011	Heardwall pipe tie-in extension	6.0'	closed	8/28/2009	8/28/2009	8/28/2009	Closed cavity beaker (6"Lx2.5"W-bottom and 1"W-top) sealed with mud plug and pipettes inside (approximately 96 feet from the PSB).	TE packaged and transported to ECBC	9/1/2009	NA	
12	SW-PSB2-Area A SE-TE-012	Area A (SE Ext)	4.0'	closed	9/22/2009	9/22/2009	9/22/2009	Closed pint-sized intact bottle with cork stopper and filled with liquid.	TE packaged and transported to ECBC	9/23/2009	NA	
13	SW-PSB2-FRT Porch-TE-013	UT	1.0'	Empty	12/7/2009	NA	NA	2" diameter and 11" long metal pipe with end caps.	TE assessed the item. Based on the X-ray, it was determined to be empty.	NA	NA	
14	SW-PSB2-FRT Porch-TE-014 (Recategorized as MD056)	UT	4.0'	Closed	1/4/2010	1/5/2010	NA	Closed cavity unfired 75 mm projectile	TE packaged and transported to the federal property for further assessment due to inconclusive of x-ray results.	NA	NA	

NOTES:

NA[1] - No headspace could be conducted on these containers as they were suspect items.

NA[2] - No HTW analysis conducted on the solid due to insufficient amounts.

Item reclassified as MEC and renamed as SVS-09-001. It was demilitarized under the T-30 operation with other SV MEC items

Table 3.3 MUNITIONS DEBRIS SUMMARY

SPRING VALLEY PUBLIC SAFETY BLDG

PHASE 2 PSB MD Items Total: 56

Item Number (if applicable)	ID	Date Recovered	Trench # item found	Depth (feet bgs)	Description	ECBC Onsite Headspace Clearance SItRep Date
001	SW-PSB2-(C2)-MD-001	08/07/08	C2	10"	One 3" Stokes Mortor round that was found 10 inches in depth, 1.5 feet from bldg footer (towards C-3 trench side), grab sample collected from soil around the item	08/13/08
002	SW-PSB2-D1-MD-002	09/16/08	D1	18"	3" diameter by 7" long armor piercing round nose, open cavity, empty. Found on the sifting table. Double bagged and sent to headspace - clear.	09/16/08
003	SW-PSB2-D1-MD-003	09/16/08	D1	1'	Item was uncovered in excavation 9/15, removed by TE on 9/16 for assessment. Partial open scrap sheet metal bomb body with conical tail fins. Item is approximately 2.5' long by 8" in diameter.	09/17/08
004	SW-PSB2-C7-MD-004	09/29/08	C7	4'	Munitions rotating band (1/2" in width and 7" in length). Item found on sifting table from about 4 feet in depth from trench.	09/30/08
005	SW-PSB2-C7-MD-005	10/02/08	C7ex	7'	Munitions debris tail section of a Mark 2 (2" diameter, 2' width and 4" long) was found on the sifting table	10/03/08
006	SW-PSB2-D1-MD-006	10/06/08	D1	2.5'	Mark 2 bomb tail fins	10/07/08
007	SW-PSB2-D1-MD-007	10/07/08	D1	2.5'	Mark 2 bomb tail fins with tail section	10/08/08
008	SW-PSB2-D1-MD-008	10/07/08	D1	2.5'	Mark 2 bomb tail fins	10/08/08
009	SW-PSB2-D1-MD-009	10/07/08	D1	3' to 4"	Mark 2 bomb tail fins(3 separate sets)	10/08/08
010	SW-PSB2-D4-MD-010	10/28/08	D4	1.5'	Mark 2 nose cone	10/29/08
011	SW-PSB2-D4-MD-011	10/28/08	D4	1.5'	Mark 2 nose cone	10/29/08
012	SW-PSB2-D4-MD-012	11/03/08	D4	2'	Incendiary empty cavity item (16"L X 4" D)	11/03/08
013	SW-PSB2-D4-MD-013	11/03/08	D4	2'	3" Open cavity AP round	11/03/08
014	SW-PSB2-D4-MD-014	11/03/08	D4	2'	Mark 2 bomb tail fins (3 separate sets)	11/03/08
015	SW-PSB2-D4-MD-015	11/04/08	D4	3'	Mark 2 bomb tail fins	11/04/08
016	SW-PSB2-D4-MD-016	11/04/08	D4	3.5'	Brass fuse body	11/04/08
017	SW-PSB2-D5-MD-017	11/10/08	D5	8"	Open cavity 75 mm shapnel round	11/12/08
018	SW-PSB2-D5-MD-018	11/10/08	D5	2'	Base of a 75 mm round	11/12/08

Table 3.3 MUNITIONS DEBRIS SUMMARY

SPRING VALLEY PUBLIC SAFETY BLDG

PHASE 2 PSB MD Items Total: 56

Item Number (if applicable)	ID	Date Recovered	Trench # item found	Depth (feet bgs)	Description	ECBC Onsite Headspace Clearance SItRep Date
019	SW-PSB2-D5-MD-019	11/10/08	D5	2'	Mark 2 bomb tail fins	11/12/08
020	SW-PSB2-D5-MD020	11/12/08	D5	3'	Bottom half of a 75 mm round .(empty).	11/13/08
021	SW-PSB2-D5-MD021	11/12/08	D5	2.5-3	Pieces of Mark 2 bomb	11/13/08
022	SW-PSB2-D5-MD022	11/13/08	D5	1.5'	Botttom of a Mark 2 bomb	11/13/08
023	SW-PSB2-D5-MD023	11/13/08	D5	1.5'	Nose cone	11/13/08
024	SW-PSB2-E1-MD024	11/19/08	E1	2'	Open cavity empty 75 mm shapnel round	11/19/08
025	SW-PSB2-E5-MD025	02/02/09	E5	2'	Mark 2 bomb tail fins	02/03/09
026	SW-PSB2-Area B-MD026	04/07/09	Area B	3.5'	Nose cone of a Mark 2 bomb	04/08/09
027	SW-PSB2-Area B-MD027	04/07/09	Area B	3.5'	Bottom of a Mark 2 bomb	04/08/09
028	SW-PSB2-Area B-MD028	04/07/09	Area B	3.5'	Point Detonating Fuse	04/08/09
029	SW-PSB2-Area B-MD029	04/07/09	Area B	3.5'	Motor tail boom	04/08/09
030	SW-PSB2-Area B-MD030	04/08/09	Area B	3.5'	Point Detonating Fuse	4/9/2009
031	SW-PSB2-Area B-MD031	04/08/09	Area B	3.5'	Bomb tail pieces	4/9/2009
032	SW-PSB2-Area B-MD032	04/08/09	Area B	3.5'	Adapter booster	4/9/2009
033	SW-PSB2-Area B-MD033	04/08/09	Area B	3.5'	Adapter booster	4/9/2009
034	SW-PSB2-Area B-MD034	04/09/09	Area B	3.5'	Bomb tail fin assembly	4/10/2009
035	SW-PSB2-Area B-MD035	04/09/09	Area B	3.5'	Bomb nose cone	4/10/2009
036	SW-PSB2-Area B-MD036	04/14/09	Area B	4.5'	Tail boom	4/15/2009
037	SW-PSB2-Area B-MD037	04/14/09	Area B	4.5'	spent fuse	4/15/2009
038	SW-PSB2-Area B-MD038	04/22/09	Area B	2.5'	Open cavity empty 75 mm projectile	4/23/2009
039	SW-PSB2-Area B-MD039	04/28/09	Area B	4.5'	Open cavity empty 75 mm projectile	4/29/2009
040	SW-PSB2-Area A-MD040	05/19/09	Area A	2.5'	Closed cavity Pipe with end caps (8.5"L x 1.5" W)	5/20/2009
041	SW-PSB2-Area A-MD041	05/19/09	Area A	2.5'	Open cavity Mk IV Adapter booster	5/20/2009
042	SW-PSB2-Area A-MD042	05/20/09	Area A	2.5'	Open cavity Mk IV Adapter booster	5/21/2009
043	SW-PSB2-Area A-MD043	05/28/09	Area A	4.0'	Open cavity Mk IV Adapter booster	5/29/2009
044	SW-PSB2-AreaA-MD044	05/28/09	Area A	4.0'	Bomb tail fins	5/29/2009
045	SW-PSB2-Area A-MD045	05/28/09	Area A	4.0'	Open cavity Mk IV Adapter booster	5/29/2009
046	SW-PSB2-Area A-MD046	07/08/09	Area A	4.0'	4.7" Projectlie Fragment	7/9/2009
047	SW-PSB2-Area A-SE-MD047	07/14/09	Area A-SE	4.0'	Mark 2 bomb fragment	7/14/2009
048	SW-PSB2-Area A-SE-MD048	07/14/09	Area A-SE	4.0'	Open cavity empty 4.7" Projectile	7/14/2009
049	SW-PSB2-Area A-SE -MD049	07/14/09	Area A-SE	4.0'	Open cavity empty 4.7" Projectile	7/14/2009

Table 3.3 MUNITIONS DEBRIS SUMMARY						
SPRING VALLEY PUBLIC SAFETY BLDG						
PHASE 2 PSB MD Items Total:		**56**				
						ECBC
Item Number (if applicable)	**ID**	**Date Recovered**	**Trench # item found**	**Depth (feet bgs)**	**Description**	**Onsite Headspace Clearance SItRep Date**
050	SW-PSB2-Area A-SE-MD050	07/21/09	Area A-SE	4.0'	Open cavity empty 75 mm HE projectile	7/22/2009
051	SW-PSB2-Area A-SE-MD051	07/21/09	Area A-SE	3.5-4'	Open Cavity empty 75 mm HE projectile frag	7/22/2009
052	SW-PSB2-Area A-SE-MD052	09/29/09	Area A-SE	3.5-4'	Open cavity unfired empty 75 mm Projectile	9/29/2009
053	SW-PSB2-Area A-SE-MD053	09/29/09	Area A-SE	3.5-4'	Open cavity empty flash tube primer	9/29/2009
054	SW-PSB2-FRT PORCH-MD054	12/15/09	Front Porch	3'	Mark 2 tail fins and cone	12/15/09
055	SW-PSB2-FRT PORCH-MD055	12/16/09	Front Porch	3.5'	Mark 2 bomb fin	12/16/09
056	SW-PSB2-FRT PORCH-MD056	01/04/10	Front Porch	4'	Open cavity unfired 75 mm projectile	01/05/10

3.2.2.3 Utility Area

3.2.2.3.1 During the utility area investigations, the thirteenth TE item (SW-PSB2-FRT Porch-TE-013) was uncovered. Item TE-013 is a 2 inches diameter and 11 inches long metal pipe with end caps. TE-013 was X-rayed and found to be empty.

3.2.2.3.2 Three MD items were uncovered from the Utility Area. MD-054 is Mark 2 tail fin and cone, MD-055 is Mark 2 bomb fin, and MD-056 was initially identified as a closed cavity TE item. TE-014 was identified as a closed cavity unfired 75 mm projectile in the field and reclassified after determination by TE that the item was an MD.

3.2.3 Sampling

Two intact container samples, sixteen (16) grab samples, twenty three (23) pit characterization samples, sixteen (16) horizontal drilling sample, thirty two (32) pre-excavation samples, and associated QA/QC samples were collected during the Phase 2 investigation.

3.2.3.1 Intact Containers

3.2.3.1.1 Four AUES-related intact containers containing liquid were recovered from the southeast extension of Area A. The intact containers (TE-008, TE-009, TE-010, and TE-012) were sent to ECBC for agent analysis (mustard and lewisite); mustard ABPs:1,4-dithiane and 1,4-oxathiane; and ricin. Agent/ABP and ricin were not detected in any of the intact containers. Two containers contained sufficient volume of liquid for further analysis at GPL or ALSI. These samples were analyzed for VOCs and associated tentatively identified compounds (TICs), SVOCs and associated TICs, metals, bromide, chloride, perchlorate, total cyanide, and explosives. For TE-008, only VOCs and metals were analyzed due to insufficient volume of liquid in the item. The analytical results are summarized in Appendix E. Appendix E shows that antimony, arsenic and mercury were detected at concentrations exceeding the Spring Valley intact container screening levels in TE-008. Appendix E shows that 2-Nitrotoluene, 3-Nitrotoluene, 4-Nitrotoluene, antimony, arsenic, cobalt, lead, manganese, and thallium were detected at concentrations exceeding the SV intact container screening levels for the sample from TE-012. Appendices I and J include descriptions of each sample and the validated data.

3.2.3.2 Grab Samples

3.2.3.2.1 Sixteen (16) grab samples were collected during PSB Phase 2 investigation. Each sample was cleared for the headspace analysis and further cleared for HD and L; HD ABPs 1,4-dithiane and 1,4 oxathiane; and ricin by ECBC. Following ECBC clearance, the samples were sent to the laboratory (GPL or ALSI) for analysis of the SVFUDS Comprehensive List of parameters. The analytical results are summarized in Appendix E. Appendix E shows that 5 SVOCs (acenaphthylene, acetophenone, anthracene, benzo(a)pyrene, and bis(2-Ethylhexyl)phthalate) and 14 metals (aluminum, antimony, arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, tellurium, thallium, vanadium, and zinc) in one or more samples were detected at concentrations exceeding the Spring Valley comparison levels. The soil associated with 12 grab sample locations were excavated and disposed off-site. Among the four sample locations remaining at the site (namely, D1-GS-007, D3-GS-008, E1-GS-011 and E3-GS-

012), only benzo(a)pyrene in sample (SW-PSB2-D1-GS007) and thallium in sample (SW-PSB2-D3-GS-008) was detected at concentration of 60 µg/kg and 2.7 mg/kg, respectively, which exceeds the SV comparison level. As described previously, the PSB HHRA has been finalized on May 31, 2013 under a separate contract to evaluate the effect on human health of COPCs detected in the PSB area (ERT 2013). This HHRA uses current USEPA methods and procedures, and site-specific information, to evaluate and quantify the potential health risks to on-site workers that might result from exposure to COPCs in soil. The benzo(a)pyrene and thallium exceedances described above are addressed in the PSB HHRA. The analytical results are summarized in Appendix E. Appendices I and J include the validation reports prepared by Parsons chemist and SEDD/ADR files provided by the laboratory for validation purposes, respectively.

3.2.3.2.2 Four mercury confirmation sample results (AreaB-NW-01-GS014(3.5), AreaB-WW01-GS015(3.5), AreaB-SW01-GS016(3.5), and AreaB-FL01-GS017(7.5)) showed that the sidewall samples were below the SV comparison level for mercury. However, the mercury concentration of 1.7 mg/kg collected from the floor sample at 7.5 ft bgs was above the SV comparison level of 0.56 mg/kg for mercury. Soil associated with the floor sample location was subsequently removed during excavation activities in Area B. Area B was excavated to 9 ft bgs for debris clearance. A confirmation sample [SW-PSB2-Area B-FL02(9')] was collected at 9 ft bgs to verify that all of the mercury had been removed from the area. See Appendix F, Pit Characterization Samples, file folder 906066 for the laboratory data results.

3.2.3.2.3 During excavation activities associated with the headwall tie-in activities a silver powder substance was encountered at approximately 4 ft bgs and approximately 100 ft southwest of the PSB. A grab sample (SW-PSB2-Headwall-GS021) was collected and submitted to ALSI for analysis after headspace and low level clearance. The analytical results show that aluminum, antimony, arsenic, cobalt, copper, and mercury were detected at concentrations exceeding the SV comparison levels. The silver substance and soil surrounding the area impacted by the silver substance were excavated from 4 ft to 9 ft bgs in a Level B PPE operation. A floor sample (SW-PSB2-Headwall-GS021-SL-FL) and one sidewall sample (SW-PSB2-Headwall-GS021-SL-SW) were collected after completion of excavation in this area. The soil analytical results show that cobalt and vanadium concentrations exceed the SV comparison levels in both samples (Appendix E.4). These cobalt and vanadium exceedances are addressed in the PSB HHRA (ERT 2013), which is referred to above in Paragraph 3.2.3.2.1. The excavated soil was placed in 55-gallon drums. Thirty two drums of soil were disposed at Envirite in York, Pennsylvania as hazardous waste based on the high metal content and TCLP results.

3.2.3.3 Pit Characterization

3.2.3.3.1 Twenty three pit characterization soil samples were collected during the PSB Phase 2 investigation. All samples were cleared for HD and L based on headspace and low-level HD agent and ABP analysis. The soil analytical results are summarized in Appendix E. Appendix E shows that seven VOCs (acetone, acetonitrile, bromoform, carbon disulfide, chlorodibromomethane, methyl ethyl ketone, and methylene chloride), thirteen SVOCs (anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, dimethylphthalate, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthene, and pyrene) and metals were detected in one or more pit

characterization samples. One explosive 2,4,6-trinitrotoluene was detected in one sample (SB-PSB2-AreaD-FL01(8)). However, the detected concentration was below the SV comparison level. Among the detected VOCs and SVOCs, PAHs were mainly detected in SW-PSB2-AreaA-SE-SW01(3) and SW-PSB2-AreaA-SE-SW02(3) and the benzo(a)pyrene concentrations exceed the SV comparison levels. Among the detected metals, aluminum, antimony, cobalt, iron, mercury, and vanadium were detected at concentrations exceeding the SV comparison levels. The benzo(a)pyrene exceedance is addressed in the PSB HHRA (ERT 2013), which is referred to above in Paragraph 3.2.3.2.1. Appendices F and I include the validated data and laboratory results for these samples.

3.2.3.4 HTW Over-excavation Sampling

3.2.3.4.1 Sixteen delineation soil samples were collected between October and December 2009 in the southeast extension of Area A. These samples were collected to delineate the extent of soil mercury exceedance on the south sidewall sample of the Area A southeast extension pit characterization samples (SW-PSB2-AREAA-SE-SW02(3)). After clearance of headspace and low level analysis, the samples were submitted to ALSI for total mercury analysis. The mercury concentrations were delineated vertically to 6 ft bgs and horizontally 1 ft to the west, 3 ft to the east and 7 ft to the south. The samples were collected in 1 ft increments and analyzed to be below SV comparison level of 0.56 mg/kg for mercury. The sampling results are summarized in Appendix E. Based on the delineation results, all mercury impacted soil exceeding the SV comparison level was excavated and disposed off-site. Appendices F and I include the laboratory results and validated data for these samples.

3.2.3.4.2 Additionally, twelve soil samples were collected in the utility area to delineate arsenic impacted soil and three additional soil samples were collected for mercury exceedance detected during the arsenic delineation [SW-PSB2-UT-EW01(2), SW-PSB2-UT-FL-N01(4.5), SW-PSB2-UT-FL01(4.8), SW-PSB2-UT-NW01(2), SW-PSB2-UT-NW02(2), SW-PSB2-UT-WWN01(2), SW-PSB2-UT-WW01(2), SW-PSB2-UT-WWN02(2), SW-PSB2-UT-WW01(2), SW-PSB2-UT-WW-W01(4), SW-PSB2-UT-WW-W01(5) through SW-PSB2-UT-WW-W05(2)]. The SV comparison standard for arsenic of 20mg/kg and mercury of 0.56mg/kg were used for delineation. The sampling results are summarized in Appendix E, E.5. Based on the delineation results, all exceeded arsenic and mercury impacted soil locations were excavated, which included the following samples: SW-PSB2-UT-WW01(2), SW-PSB2-UT-WW-W01(2), SW-PSB2-UT-WW-W02(2) . Based on TCLP sample collected, all excavated soil from the mercury impacted area was disposed off-site at a non-hazardous landfill. Appendices F and I include the validated data for these samples.

3.2.3.5 Horizontal Drilling Soil Sampling

3.2.3.5.1 During horizontal drilling activities, no munitions or suspected AUES-related debris were encountered beneath the building. Suspect AUES broken glassware were found beneath the building footer and cleared for the headspace analysis. Soil samples collected beneath the building show that brown silty clay with traces of sand and gravel material was encountered predominately. The soil descriptions for the horizontal drilling activities are included in Appendix N.

3.2.3.5.2 Sixteen discrete samples (SW-PSB-HD-GS-001 through SW-PSB-HD-GS-016); three field duplicates and a MS/MSD sample was collected from beneath the PSB (As depicted in Figure 2-3). A grab sample (SW-PSB2-HD-023) was collected from soil associated with suspected AUES glassware (SCR-017). All samples were cleared for HD and L based on headspace and low-level HD agent and ABP analysis. The soil analytical results are summarized in Appendix E. Appendix E shows that one or more metals including aluminum, cobalt, thallium, and vanadium were detected at concentrations exceeding the SV comparison levels in samples SW-PSB2-HD-GS-004, SW-PSB2-HD-GS-005, SW-PSB2-HD-GS-008, SW-PSB2-HD-GS-012. Magnesium was detected in SW-PSB2-HD-GS-012 and SW-PSB2-HD-GS-016 at concentrations exceeding the SV background level. The USEPA regional screening level is not applicable for this constituent because magnesium is an essential nutrient. The analytical results for the grab soil sample (SW-PSB2-HD-GS-023) show that benzo(a)pyrene, antimony, arsenic and mercury were detected at concentrations exceeding the SV comparison levels. The soil associated with the grab sample was placed in the roll-off with the other horizontal drilling soil cuttings and disposed off-site. The benzo(a)pyrene and metals exceedance is addressed in the PSB HHRA (ERT 2013), which is referred to above in Paragraph 3.2.3.2.1. Appendices E, F and I include the validated data for these samples.

3.2.3.6 Tank Discharge Sampling

3.2.3.6.1 During the PSB Phase 2 operations, water from open excavations were pumped into the Baker tanks. Tank discharge samples were collected bi-weekly while discharging water into the DCWASA sanitary sewer. Between September 24, 2008 and October 26, 2009, a total of 1,332,360 gallons of water was discharged into the DCWASA sanitary sewer. Zinc exceedance on July 29, 2009 and the mercury exceedance on August 26, 2009 were noted in discharge samples. Remaining tank discharge sampling results show that water discharged to sanitary sewer was within DCWASA permit allowable limits. No additional monitoring or investigation was required for the zinc exceedance as subsequent tank samples met the zinc comparison standard. The mercury exceedance was because the sample was unfiltered unlike the discharge water. As a corrective action the sampling team ensured the water was filtered during sample collection. Appendix F includes the laboratory analytical results.

3.2.4 Crack Monitoring and 3-D Monitoring Results

3.2.4.1 Crack monitoring and 3-D monitoring were performed throughout the Phase 2 debris area investigation and horizontal drilling operation. The crack monitoring results show that movement was observed on all four crack monitors. However, the movements did not impact continuation of investigation activities in accordance with the work plan. The final crack monitoring and 3-D monitoring reports provided by Parsons Subcontractor- ECS are included in Appendix H.

3.2.5 Air Monitoring Results

3.2.5.1 Air monitoring was performed during all investigation activities. A PID was used to monitor for VOCs in the breathing zone during all intrusive investigations. No PID alarms were noted during the investigation. Air monitoring for dust was performed during the excavation of

silver powder and associated soil. Dust levels did not exceed the concentration of 5 mg/m^3during the investigation.

3.2.5.2 Continuous mercury vapor monitoring was performed using Jerome 405 – Mercury Vapor Monitor with data logger; during the excavation of elemental mercury operation. The monitoring results showed that mercury vapor concentrations did not exceed the work plan specified action level of 0.025mg/m^3 in the breathing zone and 0.012 mg/m^3 at the excavation perimeter. The monitoring data was submitted daily to CENAB, USAESCH and AU. The mercury vapor monitoring reports are included in Appendix K.

3.2.6 Backfill and Compaction

3.2.6.1 All excavations were backfilled with either backfilled approved clean soil or flowable fill based on the conditions of the backfill during the operation. All backfill and compaction work accomplished were in compliance with the SSWP (USACE 2008b and USACE 2009c). The compaction tests conducted were documented and are included in Appendix O.

3.2.7 Disposal

3.2.7.1 The closed cavity munitions items and munitions debris uncovered during the low-probability PSB Phase 2 investigation were stored in the HE Bunker or in drums at the Federal property and demilitarized under the T-30 operation and disposed. The closed cavity intact containers were either disposed by ECBC or disposed with the other AUES-related broken lab glassware debris after they are cleared for headspace analysis and low levels.

3.2.7.2 After clearance of the headspace analysis, the AUES-related labware debris uncovered during the PSB Phase 2 investigation was disposed at a non-hazardous landfill (King and Queen County Landfill in Plymouth, VA). Ordnance related items that were certified as MD were placed in drums and stored at the Federal property waiting to be disposed of at a demilitarization metal smelter.

3.2.7.3 Based on a waste profile and a TCLP sample analytical results, a total of approximately 1,600 tons of excavated soil, debris and PPEs were shipped to King and Queen Landfill, VA. Soil cuttings from the horizontal drilling samples were also shipped to King and Queen Landfill.

3.2.7.4 During elemental mercury excavation, total mercury and TCLP samples were collected. Based on the analytical results, thirty 55-gallon drums contained total mercury concentrations higher than 200 mg/kg. These 30 drums were disposed at a mercury retort facility at Port Washington, WI because the hazardous waste stabilization facility, Envirite at York, PA did not accept contaminated soil exceeding 200 mg/kg of total mercury. The remaining 66 drums, with mercury concentrations less than 200 mg/kg and associated PPE were shipped to a hazardous wastes stabilization facility, Envirite at York, PA.

3.2.7.5 A composite TCLP sample was collected from the headwall area where silver powder was encountered. Based on analytical results of the samples, 35 drums containing the silver powder and soil associated with the area and PPE used for the operation were disposed at

Envirite in York, Pennsylvania. The TCLP data has been included in Append F – Laboratory Analytical Reports.

3.2.7.6 One TCLP sample was collected from the Baker tanks representing pumped excavation water contaminated with elemental mercury. Another TCLP sample was collected from the decontamination water drums collected during the Level B PPE operations of elemental mercury removal. One sample was also collected and analyzed for TCLP representing the water collected after pressure washing PSB and horizontal drilling operation IDW. Based on the analytical results approximately 18,450 gallons of the liquid waste were shipped as hazardous liquid waste to DuPont Chambers Works in Deepwater, New Jersey. All sampling data and disposal manifests are provided in Appendix F and Appendix L, respectively.

3.2.8 Summary of Investigation Activities

3.2.8.1 Based on the findings and additional areas of investigations address during the PSB Phase 2 investigation, a review of all previous investigations in the vicinity of the AU PSB was conducted. A timeline table summarizing all investigative activities was developed. The review results are also illustrated in a series of figures that documented all the highlights of the results of each investigation activity. The figures show that the area in the vicinity of PSB has been investigated extensively. Therefore, no additional investigation activities are proposed. The timeline table and figures are included in Appendix P.

CHAPTER 4. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

4.0.0.1 **Introduction.** This chapter summarizes the results, conclusions, and recommendations for Phase 1 and 2 investigations at the American University Public Safety Building (AU PSB) (FUDS MEC/CWM Project No. C03DC091801), which were completed between 2006 and 2010. Parsons completed this report for USAESCH and USACE under Contract No. W912DY-04-D-0005, Task Order 0007. This study was completed at the AU PSB, located in Spring Valley, Washington, D.C. under the DERP/FUDS Program.

4.0.0.2 **Phase 1 and 2 Investigations.** Under Phase 1 investigations (August 21 through September 12, 2006), a geotechnical investigation was followed by advancement of boreholes and investigation of three test pits. Sampling for the geologic and geotechnical evaluations was completed in support of this phase. During Phase 2 (June 3, 2008 – June 3, 2010), activities included intrusive investigation of 12 single-item anomalies; intrusive investigation of two anomalous areas (PS-P1 and PS-P2); excavation of debris known to remain to the south of the AU PSB; and excavation of contaminated soil and associated debris around the utility trench to the east of the AU PSB. Additional investigations were also scoped to Parsons based on the findings of the investigations. These included removal of elemental mercury and HTW-contaminated soil and horizontal drilling to collect samples from beneath the PSB.

4.0.0.3 **Phase 1 Results.** Activities in this phase commenced on August 21, 2006 and concluded on September 2006. All intrusive operations were conducted under the low probability operations. The study results are noted below:

- **Geotechnical Evaluations and Borings.** CENAB completed this evaluation and advanced the borings. Sampling performed was used to support CENAB's evaluations.
- **Exploratory Test Pits.** After completion of dewatering activities, three test pits were excavated. In accordance with the work plan for the PSB Phase 1, grab samples were collected based on findings or observations made by the field crew during intrusive work. No such finding at Test Pit (TP) 1 warranted collection of a grab sample at this location. Two grab soil samples were collected at depths of 4.5 ft below ground surface (bgs), one from soil below the building footer at TP-2 at the southwest corner of the building and one from soil below the building footer in TP-3 at the southeast corner of the building. Agent/agent breakdown products (ABPs), explosives, cyanide, and volatile organic compounds were not detected in either sample. Three metals (mercury, thallium, and vanadium) exceeded the Spring Valley comparison values in the TP-2 sample. A stream of water shooting out through the concrete footer of the building in the location of TP-3 at the southeastern corner of the building was observed. The water was clear and appeared to be under pressure since the water streams were continuously shooting out from the concrete. AU was notified and their utility personnel came to the site to evaluate the situation. In an effort to determine the source of this water, USAESCH directed Parsons to collect sample of the water. Results from a grab water sample from TP-3 did not exceed any Spring Valley comparison values.
- **Recovered Items.** During installation of Sump 3, one MD item was recovered at approximately 2.5 ft bgs. The item was identified as a 75 mm shell casing. The item was

cleared for HD and L based on headspace analysis. Glassware was found around the area where the 75 mm shell was recovered. A batch of glassware (approximately 2 lbs) was headspaced clear. The glassware was disposed at a non-hazardous facility. A piece of suspected AUES-related ceramic crockery was recovered in TP-3, which was subsequently headspaced and cleared.

4.0.0.4 **Phase 2 Results.** Intrusive operations were conducted under the PSB Phase 2 investigations between 3 June 2008 and 3 June 2010. All intrusive operations were conducted under the low probability operations. Excavated soil, aqueous waste, and investigation derived waste was characterized and ultimately disposed of as hazardous or non-hazardous waste in accordance with applicable regulations. The PSB area was restored in July 2010. The key results are noted below:

- **Single-Item Anomalies.** Twelve single-item anomalies were investigated during the PSB investigation on June 25- 27, 2008. All anomalies were investigated successfully by hand-digging in open air. None of the items recovered during the investigation of the anomalies were MEC, RCWM, or AUES-related item. Seven of these anomalies investigated had 90 percent signal reduction after intrusive investigation and consisted of items such as nails, wire, scrap metal, metal strapping, and hot rocks. The five anomalies that did not receive a 90 percent reduction were due to underground pipe, root baskets, and wire.
- **Anomalous Areas.** Two anomalous areas (PS-P1 and PS-P2) were investigated by excavating three trenches each within the anomalous areas. Trench PS-P1-3 was the only trench in anomalous area PS-P1 that had 90 percent signal reduction after intrusive investigation. Anomalous area PS-P2 trenches did not achieve a 90 percent signal reduction after investigation. The items recovered from these anomalous area trenches were not MEC, RCWM, or AUES-related. The items recovered from these trenches were nails, metal cables, cast iron pipe, and similar cultural debris.
- **Recovered Items from Debris and Utility area.** Thirteen closed cavity items recovered were assessed as closed cavity rounds and intact containers and did not contain agent/ABPs. These items include three closed cavity 75 mm projectiles, one burster tube for a 75 mm projectile – later classified as MEC due to the presence of residual energetic, one pressurized gas cylinder, two metal pipes with end caps, and six intact containers. Fifty six MD items recovered include open cavity 75 mm shrapnel rounds, open cavity 75 mm projectiles, an open cavity empty 75 mm HE projectile, Mark 2 bomb tail fins and nose cones, a 3-inch open cavity armor piercing round, a 3-inch Stokes mortar, a rotating band, a brass fuse body, point detonating fuses, adapter boosters/open cavity Mk IV Adapter boosters, a motor tail boom, a spent fuse, and 4.7-inch projectiles. These open and closed cavity munitions-related items were demilitarized under the T-30 operation and disposed. The intact containers were cleared for HD and L based on the headspace analysis and low levels agent analysis. Intact containers were either disposed at ECBC or returned to the site and disposed of with the other AUES-related broken lab glassware debris at the King and Queen Landfill in Plymouth, VA.
- **Elemental Mercury.** Elemental mercury was encountered during the Phase 2 debris area investigation. All elemental mercury and associated soil were excavated and disposed off-site at a mercury retort facility at Port Washington, WI. Based on the total mercury and TCLP analytical results, 30 drums contained total mercury concentrations higher than 200

mg/kg and were disposed in Port Washington. The remaining 54 drums were shipped to a hazardous wastes stabilization facility, Envirite at York, PA.

- **Headwall Tie-in.** During the Phase 2 investigation of these trenches, the field team located the terracotta pipe and connected it to the original headwall in the AU Lot 18 area. An 18-inch high density polyethylene (HDPE) pipe was installed and connected to the end of the terracotta pipe (12-inch diameter) in accordance with HDPE pipe manufacturer specifications. The pipe excavation was started in June 2009 and the pipe tie-in was completed in September 2009. Additional areas of suspected AUES-related debris were encountered in four areas. Debris clearance was performed in these areas. A closed metal pipe with end caps was found at 3 ft bgs. The item was empty based on TE's X-ray review and submitted as a scrap batch sample for headspace analysis. All samples collected from the headwall debris clearance were cleared for the headspace analysis with MINICAMS and DAAMS.
- **Debris Area Soil Sampling.** The four grab samples and 23 pit characterization soil sample results were evaluated against the Spring Valley comparison levels. Based on this comparative analysis, 6 metals exceeded the Spring Valley comparison levels. These metals were aluminum, antimony, cobalt, iron, mercury, and vanadium. The exceedances were addressed in the PSB HHRA (ERT 2013), which is referred to previously in Paragraph 3.2.3.2.1.
- **Hazardous Toxic Waste Over-Excavation.** Arsenic impacted soil (exceeding 20 mg/kg) in the utility area was excavated and disposed off-site.
- **Horizontal Drilling Sampling.** No munitions or suspected AUES-related debris were encountered beneath the building. One broken pipette was encountered near the building footer and cleared for HD and L by headspace analysis.

4.0.0.5 **Conclusions.** The results of the Phase 1 and 2 investigations confirm the presence of AUES-related operations at the locations investigated at PSB. The investigations removed impacted soil and recovered and safely disposed of 1 MEC, 62 MD, 6 intact containers and approximately 400 pounds of AUES-related intact and broken lab glassware debris discovered, effectively completing a removal action. The degree of residual risk was evaluated in the subsequent HHRA.

4.0.0.6 **Recommendations**. Based on the results of the Phase 1 and 2 investigations, Parsons recommends:

1. No additional investigations of the PSB are warranted. Operations completed under the Phase 1 and Phase 2 investigations and previously have effectively characterized the site, removed impacted soil, MEC/MD, and other items associated with AUES historic operations.

2. Completion of the risk assessment for PSB based on the data collected during this and previous investigations to quantify the potential residual risk to current and future human receptors. Note the risk assessment was completed under a separate contract to evaluate the effect on human health of COPCs detected in the PSB area (ERT 2013). The PSB HHRA has been finalized on May 31, 2013. The HHRA evaluated and quantified the potential health risks to on-site workers that might result from exposure to COPCs in soil and none were found.

CHAPTER 5. REFERENCES

CENAB, 2006. Public Safety Building, American University, Washington, D.C. Geotechnical Analysis. September 2006.

ERT, 2013. Final Risk Assessment for the Public Safety Building, American University, Spring Valley Formerly Used Defense Site, Washington, D.C. Prepared for the U.S. Army Corps of Engineers, Baltimore District. Prepared by Earth Resources Technology, Inc., Laurel, Maryland. FINAL Report. May 31, 2013.

USACE, 1995. Remedial Investigation Report for the Operation Safe Removal Formerly Used Defense Site, Washington, D.C.

USACE, 2003. Waste Disposal Summary for the June 2003 Shipments, Spring Valley DERP/FUDS Site, Washington, D.C.

USACE, June 8, 2004a. Site-Wide Chemical Safety Submission Site Specific Annex F – American University Lot 18, Spring Valley DERP/FUDS, Washington, D.C.

USACE, September 2004b Final Site-Specific Removal Report, Small Disposal Area, Spring Valley, Operable Unit 3, DERP/FUDS, Washington, D.C., September

USACE, April 18, 2005a. Site-Wide Chemical Safety Submission Site Specific Annex G – American University Lot 18, Revision 1, Spring Valley DERP/FUDS, Washington, D.C.

USACE, July 2005b. Final Site-Wide Local Approved Work Plan (LAWP), Revision 5, Spring Valley DERP/FUDS Site, Washington, D.C.

USACE, March 2006a. Final SSWP for Intrusive Investigation of Anomalies at American University Bamboo Area, Spring Valley, Operable Unit 4, DERP/FUDS Site, Washington, D.C.

USACE, May 24, 2006b. Final Site Specific Work Plan for HTW Over-excavation Activities at AU Lot 18, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C.

USACE, July 6, 2006c. Addendum 01, Pre-Excavation Sample Data Report, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C.

USACE, August 2006d. Final Site-Specific Work Plan (SSWP) for Structural, Geologic and Geotechnical Investigation at the American University Public Safety Building, Spring Valley, Operable Unit 4, DERP/FUDS Site, Washington, D.C.

USACE, September 2006e. Final Geophysical Investigation Report – Public Safety Building Property, Spring Valley FUDS, Washington, D.C., Weston Solutions Inc.

USACE, December 2006f. Final Site Specific Anomaly Investigation Report- American University Bamboo Area, Spring Valley, Operable Unit4, DERP/FUDS, Washington, D.C.

USACE, 2006g. Site-Wide Locally Approved Work Plan, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE USACE, March 2007. Site-Wide Work Plan for the Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, May 16, 2008a. Site-Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, July 14, 2008b. Site-Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Amendment 1, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, August 29, 2008c. Final Site-Specific Anomaly Investigation Report AU Lot 18, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, October 22, 2008d. American University Lot 18 Human Health Risk Assessment, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, March 20, 2009a. Site-Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Amendment 2, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, June 5, 2009b. Site-Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Amendment 3, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, June 24, 2009c. Site-Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Amendment 4, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USACE, February 22, 2010. Site-Specific Work Plan for the Phase 2 Investigation at the Public Safety Building – American University, Amendment 5, Spring Valley Formerly Used Defense Site, Spring Valley, Washington, D.C., prepared by Parsons for USACE

USAESCH, August 2003. Position Paper for American University Lot 18, Spring Valley, Washington D.C., August 19, 2003

USEPA Region 3, 1997. Hazard Evaluation Handbook, A Guide to Removal Actions, EPA 903/B-97-006