DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON
4551 LLEWELLYN AVENUE, SUITE 5000
FORT GEORGE G. MEADE, MARYLAND 20755-5000

July 3, 2014

Environmental Division

Mr. John Burchette
NPL/BRAC/Federal Facilities Branch
U.S. Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Mr. Burchette:

Enclosed please find the July 2014 *Final Focused Feasibility Study FGGM-74, Architect of the Capitol, Revision 1* (Study). The Study was revised based on comments from the United Sates Environmental Protection Agency received on June 19, 2014. Copies of the Study have been furnished to Mick Butler (Fort George G. Meade), Francis Coulters (U.S. Army Environmental Command), Sherry Deskins (Architect of the Capitol), Elisabeth Green (Maryland Department of the Environment), and the Fort Meade Restoration Advisory Board.

While the Federal Facility Agreement allows for a 30 calendar day review period, the Army requests expedited review by July 11, 2014. If there are unresolved items, any outstanding written comments should be addressed to Fort. George. G. Meade, Attention: IMME-PWE (George Knight), 4215 Roberts Ave., Room 320, Fort Meade, Maryland 20755-7068 or george.b.knight7.civ@mail.mil.

If you have any questions, please feel free to contact Ms. Denise Tegtmeyer at (301) 677-9559 or me at (301) 677-7999.

Sincerely,

George B. Knight, PG
Acting Program Manager, Installation Restoration Program
Directorate of Public Works-Environmental Division

Enclosure

ARCADIS

Imagine the result

FINAL
Focused Feasibility Study, Revision 1

FGGM-74, Architect of the Capitol
Fort George G. Meade, Maryland

July 2014

Keith Shepherd
Task Manager

John Cherry
Phase Manager

Timothy Llewellyn
Project Manager

Final Focused Feasibility Study, Revision 1

FGGM-74, Architect of the Capitol, Fort George G. Meade, Maryland

Prepared for:
U.S. Army

Prepared by:
ARCADIS U.S., Inc.
1114 Benfield Boulevard
Suite A
Millersville
Maryland 21108
Tel 410.987.0032
Fax 410.987.4392

Our Ref.:
GP09MEAD.AOC1

Date:
July 2014

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List of Acronyms and Abbreviations

°F	degree Fahrenheit
%	Percent
µg/dL	micrograms per deciliter
µg/L	micrograms per liter
ALM	Adult Lead Model
AOC	Architect of the Capitol
AR	Army Regulation
ARAR	Applicable or Relevant and Appropriate Requirement
ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
BLL	blood lead level
BRAC	Base Realignment and Closure
CCl_4	carbon tetrachloride
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act 1980
CFR	Code of Federal Regulation
Coastal Plain	Coastal Plain physiographic province
COC	Constituents of Concern
COMAR	Code of Maryland Regulation
COPC	Constituents of Potential Concern
CSL	Closed Sanitary Landfill
DPT	Direct-push Technology
DRMO	Defense Reutilization and Marketing Office
EC	Engineering Control
FGGM	Fort George G. Meade
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study

List of Acronyms and Abbreviations (cont'd)

FOD	Frequency of Detection
ft	feet or foot
GIS	Geographic Information System
GRA	General Response Actions
GW-	groundwater alternative
HHRA	Human Health Risk Assessment
HSA	Hollow-stem Auger
IC	Institutional Control
IEUBK	Integrated Exposure Uptake Biokinetic
IQR	Interquartile Range
IRP	Installation Restoration Program
LPA	Lower Patapsco Aquifer
LTM	Long-Term Monitoring
LUC	Land Use Control
Malcolm Pirnie	Malcolm Pirnie, Inc.
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
mg/kg	milligrams per kilogram
MPC	middle Patapsco clay
msl	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and Maintenance
OU-4	Operable Unit 4
OU-5	Operable Unit 5
PCB	polychlorinated biphenyl
PQL	practical quantitation limit

List of Acronyms and Abbreviations (cont'd)

PRG	Preliminary Cleanup Goal
PW	Production Well
RAO	Remedial Action Objective
RA	Remedial Alternative
RD	Remedial Design
RG	Remedial Goal
RI	Remedial Investigation
RK&K	Rummel, Klepper & Kahl
ROD	Record of Decision
ROE	Right of Entry
RSL	Regional Screening Level
SC	clayey sands, sand-clay mixtures
SCL	Site Cleanup Level
SL-	soil alternative
SLERA	Screening-Level Ecological Risk Assessment
SM	silty sands, sand-silt mixtures
SP	poorly graded sands, gravelly sands, little or no fines
SVOC	Semi-Volatile Organic Compound
TBC	To Be Considered
TMP	Transportation Motor Pool Facility
U.S.	United States
URS	URS Group, Inc.
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

Executive Summary

This report presents the methodology and results of a Focused Feasibility Study (FFS) conducted to address environmental impacts at the Architect of the Capitol (AOC) property located at Fort George G. Meade (FGGM), Maryland. Fort George G. Meade's Installation Restoration Program activities operate principally under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300). Fort George G. Meade was placed on the National Priorities List on 28 July 1988.

This FFS was performed in accordance with the requirements CERCLA and is based on site characterization data and risk assessment work presented in the Final Remedial Investigation (RI) Report Package for AOC. The following documents comprise the Final AOC RI package, present all RI site characterization data, and summarize the risks associated with AOC soil and groundwater for which remedial alternatives are evaluated in this FFS:

- *Compendium of Responses to Comments on United States Environmental Protection Agency (USEPA) comments on the RI documents listed below;*
- *Technical Memorandum and Human Health Risk Assessment and Screening Level Ecological Risk Assessment* (Malcolm Pirnie, Inc. [Malcolm Pirnie], 2007)
- *Revised Final Remedial Investigation* (Malcolm Pirnie, 2008)
- *Final Supplemental Remedial Investigation – Subsurface Lead Delineation and Revised Human Health Risk Assessment* (ARCADIS, 2013)

The RI documents referenced above evaluate all potential hazardous releases and associated risks for all environmental media at AOC. The evaluation of chemicals of potential concern, risks to human health, and risks to ecological receptors are discussed in detail in the Final RI package. A summary of identified exposure pathways and associated risks is presented below. As indicated below, the only risks identified in the Final RI that are carried forward to this FFS for alternative evaluation include potential exposures to inorganics in shallow groundwater under a hypothetical drinking water use scenario (for hypothetical commercial worker and residential users)

and hypothetical exposure to two distinct hotspot areas at depths of 7 and 10 feet (ft) below ground surface (bgs).

- Commercial Worker

  Current: There is currently no use of shallow water for potable purposes so there is no risk from groundwater under a current commercial worker scenario. For lead in soil, there is no unacceptable risk from exposure to surface soils or combined surface/subsurface soil under a current commercial worker scenario across the entire 60 x 68 foot lead study area.

  Future: Under a potential future use scenario where the commercial worker is utilizing groundwater as a source of potable water, inorganics in groundwater present an elevated risk. The identified groundwater constituents of concern (COCs) include arsenic, chromium (evaluated as hexavalent chromium), and cobalt in total (unfiltered) groundwater and cobalt in dissolved (filtered) groundwater. The calculated hazard index and estimated cancer risk for hypothetical ingestion of total inorganics in shallow groundwater under a commercial worker scenario are 5 and 3E-04, respectively. For lead in soil, there is an unacceptable risk if regrading or other site activities lead to exposure under the commercial worker scenario to lead at two hot spot areas at depths of 7 and 10 ft bgs (**Figures 6-1** and **6-2** show the lead hot spots that are a subset of the 60 x 68 foot study area).

- Construction/Utility Worker

  Current/Future: There are no unacceptable risks to construction/utility workers under current or future use scenarios for either inorganics in groundwater or lead in soil.

- Hypothetical Resident

  Current: There is currently no residential use of the AOC parcel.

  Future: Under a hypothetical residential use scenario where the resident is utilizing groundwater as a source of potable water, inorganics in groundwater present an elevated risk. The identified groundwater COCs include aluminum, arsenic, chromium (evaluated as hexavalent chromium), cobalt, and iron in total (unfiltered) groundwater and arsenic, chromium, and cobalt in dissolved (filtered)

groundwater. The calculated hazard index and estimated cancer risk for hypothetical ingestion of total inorganics in shallow groundwater under a residential scenario are 31 and 3E-03, respectively.

For lead in soil, potential exposures to lead in surface soil do not exceed USEPA's risk management threshold level for lead. However, exposures to subsurface lead concentrations in the 60 x 68 foot lead study area (see **Figures 3-2 to 3-6**) do present a potential risk under a hypothetical residential use scenario at depth intervals of 7 and 10 ft bgs.

Risks to ecological receptors were assessed during the Screening Level Ecological Risk Assessment conducted in the 2006 RI (Malcolm Pirnie) and no unacceptable risks were identified. The results of the Human Health Risk Assessment (HHRA) (Malcolm Pirnie, 2008) indicate that surface soil, sediment, and surface water media at AOC do not present unacceptable risk to human receptors under current and future land use scenarios.

In summary, current conditions at AOC do not present potential risks or hazards to potential receptors (including commercial workers). Under hypothetical future use scenarios (including hypothetical residential use), conditions at AOC pose a potential risk that warrant an evaluation of remedial alternatives to address potential exposures to aluminum, arsenic, chromium, cobalt, and iron in shallow groundwater used as a future source of drinking water, and potential exposure to lead in soil at a depth of 7 ft and 10 ft bgs. As a result, only risks presented from lead in subsurface soil and inorganics in groundwater will be carried through this FFS.

It should be noted that the residential land-use scenario included in the HHRA is hypothetical and use of the property for residential development is not reasonably anticipated. However, Remedial Alternatives were developed in this FFS which are designed to address exposure to future residential receptors.

Based on the above determinations, response actions were determined necessary to address environmental impacts at AOC. Remedial Action Objectives (RAOs) were established for each COC identified at AOC. The RAOs are:

1. To prevent human exposure to soil that would cause unacceptable risk to human health.

2. To prevent human exposure to groundwater that would cause unacceptable risk until contaminant mass in groundwater is reduced and the aquifer's potential for beneficial use is restored.

Remedial Alternatives specific to soil and groundwater were developed to meet the applicable RAOs and to thereby address the quantified risks and hazards posed by the COCs. The alternatives developed and evaluated are listed below.

Soil

- Soil Alternative 1 (SL-1) – No Action, as required under CERCLA to provide a baseline against which other alternatives can be measured
- Alternative SL-2 – Land Use Controls (LUCs)
- Alternative SL-3 – Lead Hot Spot Soil Excavation with Off-site Disposal

Groundwater

- Groundwater Alternative 1 (GW-1) –No Action
- Alternative GW-2 – LUCs and Long-term Monitoring (LTM) of groundwater

For groundwater, LUCs and LTM of groundwater was the only remedial alternative considered. As presented in the Final RI package, investigation activities indicate elevated concentrations in shallow on-site groundwater for some inorganics which could present a risk under a hypothetical drinking water scenario; however there is no indication of identifiable sources or discernible plumes that warrant consideration of other remedial alternatives. A background evaluation of on-site inorganic concentrations relative to upgradient reference well concentrations showed comparable levels of inorganics. However, there are inorganics in shallow groundwater on-site that exceed concentrations in upgradient reference wells and, while they are not associated with discernible sources or plumes they are potentially site related. The alternatives listed above will be evaluated to meet the RAOs for groundwater (ARCADIS, 2013). In order to compare the alternatives for soil and groundwater, each was evaluated on an individual basis against the nine criteria identified in the NCP (NCP 40 CFR 300.430(e)(9)). The nine criteria include the two threshold criteria of overall protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirements; the five

balancing criteria of long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost; and the two modifying criteria of state acceptance and community acceptance.

The comparative analysis evaluated the anticipated performance of each alternative against each other. This analysis is designed to expose the strengths and weaknesses of each alternative.

1. Introduction

ARCADIS U.S. Inc. (ARCADIS) has been retained by the United States (U.S.) Army Contracting Agency to perform Installation Restoration Program (IRP) activities at Fort George G. Meade (FGGM), located in Anne Arundel County, Maryland. This work is being conducted under a Performance Based Contract associated with the environmental restoration program at FGGM. The full scope of services for this contract is defined in Contract W91ZLK-05-D-005 Task Order 0005.

The IRP activities at FGGM are conducted under the U.S. Army's Defense Environmental Restoration Program and operate principally under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 and National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 Code of Federal Regulations (CFR) 300]. FGGM was placed on the National Priorities List on 28 July 1988. Coordination and input are provided by the U.S. Environmental Protection Agency (USEPA) Region III, and as appropriate, with the other signatories of the FGGM Federal Facility Agreement (FFA), including the Architect of the Capitol (AOC)

This Focused Feasibility Study (FFS) was performed in accordance with the requirements of CERCLA and is based on site characterization data and risk assessment work presented in the Final Remedial Investigation (RI) Report Package for AOC.

1.1 Purpose of Report

This report presents the methodology and results of the FFS conducted to address environmental impacts at the AOC property, at FGGM, Maryland. The AOC property is hereafter referred to as the Site. Per 40 CFR 300 (a)(2), the purpose of an FFS is to assess site conditions and to develop and evaluate remedial options to assist in the selection of an appropriate response action for the Site. This FFS will be included within the Administrative Record as required within 40 CFR 300.800. This FFS addresses remediation of environmental media through the following steps:

- Develop Remedial Action Objectives (RAOs) and determine Site Cleanup Levels (SCLs) and Preliminary Cleanup Goals (PRGs) for specific constituents, affected media, and exposure pathways.

- Present remedial technologies that can treat, contain, or remove and dispose of site-related constituents.

- Present remedial alternatives based on those technologies that will, to the maximum extent practicable, utilize permanent solutions and alternative technologies to remediate principal threat wastes.

- Conduct a detailed analysis of the remedial alternatives using the nine evaluation criteria listed in NCP 40 CFR 300.430(e)(9).

Sustainability is not one of the nine evaluation criteria listed in the NCP 40 CFR 300.430(e) (9). However, sustainability is considered in the analysis and selection of a recommended response action, in light of Executive Order 13514 for Federal Leadership in Environmental, Energy, and Economic Performance. This executive order, dated October 5, 2009 sets sustainability goals for federal agencies and focuses on making improvements in environmental, energy, and economic performance.

1.2 Report Organization

The report is organized into the following sections:

- Section 2 – Environmental Setting: This section presents information regarding FGGM and the Site. Climate, geology, topography, hydrogeology, surface water are discussed.

- Section 3 – Historical Investigations and Results: The rationale and scope of previous environmental investigations is summarized. The nature and extent of contamination at the Site are discussed.

- Section 4 – Applicable or Relevant and Appropriate Requirements (ARARs) and RAOs: RAOs are identified for the Site and ARARs are identified where applicable. SCLs and/or PRGs are presented based on the results of the risk assessment.

- Section 5 – Identification and Screening of Remedial Technologies: Remedial technologies applicable to the Site are identified and then screened based on implementability, effectiveness, and relative cost.

- Section 6 – Development of remedial alternatives: Remedial alternatives are developed by combining the remedial technologies which successfully passed an initial screening process.

- Section 7 – Evaluation of Remedial Alternatives: A detailed evaluation of the alternatives retained from the initial screening process is presented using the nine NCP evaluation criteria [40 CFR 300.430(e)].

- Section 8 – References: The references used to develop this report are presented.

2. Environmental Setting

2.1 Installation History

FGGM is located midway between the cities of Baltimore, Maryland and Washington D.C. in Anne Arundel County, Maryland, as shown in **Figure 2-1**. FGGM became an Army installation in 1917 and encompassed 9,349 acres. The installation was originally named Camp Meade but changed to Fort George G. Meade on March 5, 1929. During World War I, over 100,000 soldiers passed through FGGM. The 79th, 92nd, and 11th Infantry Divisions trained at the installation and an Ordnance Supply School was established in 1918. When the war ended, FGGM served as a demobilization center for returning troops. FGGM became a permanent Army installation after World War I.

By 1940, there were 251 permanent and 218 temporary buildings and over 2,100 enlisted soldiers on post. By December 1941, the total land acquired by FGGM had grown to approximately 13,800 acres. After World War II, the National Security Agency relocated to FGGM, and Tipton Airfield was constructed in 1960. In 1988, FGGM was realigned under the first round of Base Realignment and Closure (BRAC). The BRAC program authorized 9,000 acres to be transferred from FGGM. Between 1991 and 2000, approximately 8,471 acres of BRAC property was transferred out of the U.S. Department of Defense control. The 93-acre parcel was transferred to the AOC from the Army effective September 30, 1994 (Malcolm Pirnie, 2008).

2.2 Site Description

The Site is located on the southeastern corridor of FGGM and is bound by Rock Avenue to the north, Route 32 to the south, Pepper Road to the east, and Remount Road to the west. The Site is also bisected by the Rouge Harbor Branch and rail road tracks. **Figure 2-2** illustrates the location of the Site.

Based on field reconnaissance and review of historical aerial photographs, portions of the Site have been used for a variety of purposes including a Transportation Motor Pool (TMP) area and various warehouse and storage areas. At the Site, the fieldwork portion of the RI was completed in phases between 1998 – 2012 and addressed various data gaps as they were identified. The following documents comprise the Final AOC RI package, present all RI site characterization data, and summarize the risks associated with AOC soil and groundwater for which remedial alternatives are evaluated in this FFS:

- *Compendium of Responses to Comments on USEPA comments on the RI documents listed below;*
- *Technical Memorandum and Human Health Risk Assessment and Screening Level Ecological Risk Assessment* (Malcolm Pirnie, Inc. [Malcolm Pirnie], 2007);
- *Revised Final Remedial Investigation* (Malcolm Pirnie, 2008); and
- *Final Supplemental Remedial Investigation – Subsurface Lead Delineation and Revised Human Health Risk Assessment* (ARCADIS, 2013).

Currently, much of the parcel is used for warehouse storage. The AOC constructed a new book storage facility (Building 100) and water tank located west of the existing warehouse area and additional construction is planned for the surrounding areas (Malcolm Pirnie, 2008). The 93-acre parcel is surrounded by on-post military housing, commercial, and industrial, uses to the west, north, and east. The Patuxent Research Refuge – North Tract, owned by the Department of Interior, borders the AOC parcel south of Route 32. The closest off-post residential and commercial areas are located more than 2,500 feet to the east in the town of Odenton.

2.3 Climate

The climate at FGGM is variable and influenced by the Chesapeake Bay and the Atlantic Ocean to the east and the Appalachian Mountains to the west. The winter weather in the area is influenced primarily by cold, dry, continental-polar winds from the west and northwest, and less frequent maritime-tropical winds from the south and southwest that bring warm, often humid, air to the region. During the summer, the dominance of these two air masses is reversed, and warm, humid weather dominates.

Local weather data are compiled by the National Oceanic and Atmospheric Administration's Climatic Data center for the Baltimore-Washington Thurgood Marshall International Airport weather station. Annual precipitation averages about 40 inches per year. The distribution of precipitation is essentially even throughout the year, although slightly lower averages are posted for the summer months. Historical average monthly precipitation ranges between 2.8 and 3.5 inches for all months. The annual mean daily temperature for the FGGM area is 61 degrees Fahrenheit (°F), with a daily annual maximum of 72°F and minimum of 45°F. Annual temperature extremes may vary from -6 to 101°F.

2.4 Topography

FGGM is located in the Coastal Plain physiographic province (Coastal Plain), which is characterized by low-rolling uplands and low-gradient streams. The ground elevation at FGGM generally ranges between 150 and 250 feet (ft) above mean sea level (msl). The topography of the Site is generally flat. The ground elevation at the Site ranges from about 120 ft above msl along Rogue Harbor Branch to about 140 ft above msl at the eastern and western boundaries (Malcolm Pirnie, 2008). A topographical map of the Site is provided as **Figure 2-3**.

2.5 Surface Water

FGGM is almost entirely located within the Patuxent River watershed (**Figure 2-4**), which is one of the primary drainage systems in Anne Arundel County. The extreme northeastern portion of FGGM is within the Severn River drainage basin. The Patuxent River watershed encompasses approximately 932 square miles and comprises eight sub-basins (**Figure 2-5**), from north to south:

- Brighton Dam;
- Middle Patuxent River;
- Little Patuxent River;
- Rocky Gorge Dam;
- Patuxent River Upper;
- Western Branch;
- Patuxent River Middle; and,
- Patuxent River Lower.

The portion of FGGM within the Patuxent River watershed lies completely within the Little Patuxent River sub-basin. Several streams drain FGGM within the Little Patuxent River sub-basin. The streams are, from west to east:

- Little Patuxent River;
- Rouge Harbor Branch; and,
- Franklin Branch.

The only significant lake/reservoir present on FGGM is Burba Lake (formerly called Kelly Pool). At the Site, Rogue Harbor Branch flows from the north to the south and crosses through the central portion of the Site. Surface water drainage within the Site is controlled and directed by storm water drains on the AOC parcel and the Rogue Harbor Branch (Malcolm Pirnie, 2008). The Rogue Harbor Branch is a shallow tributary of the Little Patuxent River and is approximately 5-10 ft wide with an average flow of less than 10 cubic feet per second (Malcolm Pirnie, 2008). No jurisdictional wetlands have been delineated within the AOC boundary.

2.6 Geology and Hydrogeology

FGGM is located just within the western boundary of the Coastal Plain. The Coastal Plain geology is characterized by a wedge of unconsolidated Cretaceous and Quaternary alluvial sediments (unconsolidated sands, silts and clays) that dip and thicken toward the Atlantic Ocean, as illustrated by the stratigraphic cross-section B-B' (**Figure 2-6**). The location of Section B-B' is shown in **Figure 2-7**. It is aligned northwest-southeast and includes several deep wells on FGGM.

Quaternary- and Cretaceous-aged unconsolidated deposits are exposed at the surface at FGGM. These deposits have a total thickness of about 700 ft at FGGM (URS Group, Inc. [URS], 2003) and are underlain by bedrock consisting of Precambrian crystalline rock composed predominately of gabbro, gneiss and schist. The unconsolidated deposits from youngest to oldest consist of:

- Quaternary alluvium and Patuxent River terraces;
- Patapsco Formation;
- Arundel Clay; and,
- Patuxent Formation.

The Patuxent Formation is exposed at the surface west of FGGM, the Arundel Clay crops out over the western portion of FGGM, and the Patapsco Formation crops out over the central and eastern portions of FGGM. Quaternary alluvium and river terrace deposits locally overlay the Potomac Group near the Patuxent and Little Patuxent Rivers.

The following general geologic setting is documented:

- **Patuxent and Patapsco Formations –** The Patuxent and Patapsco Formations are primarily composed of quartzose sand and gravel grading up to three inches in diameter. Sand beds range from clean sands with less than 5 percent fines passing the U.S. No. 200 sieve and classifying generally as poorly graded (SP) per the Unified Soil Classification System, to arkose sands classifying as silty and clayey sand (SM and SC). Individual clay layers within the Patapsco and Patuxent Formations are lenticular and laterally discontinuous. The Patapsco Formation is subdivided into upper and lower sand units with a silt and clay layer (the Middle Patapsco Clay [MPC]) separating them. The MPC is a low to moderately plastic and highly preconsolidated clay, which is brown, tan, maroon and dark gray in color. This unit has been shown to be an effective aquiclude separating the Upper and Lower Patapsco Aquifer (LPA) sands in the southeastern corner of FGGM and off-site under the town of Odenton.

- **Arundel Clay –** The Arundel Clay is of moderate to high plasticity, highly preconsolidated and hard, maroon to dark gray in color, and contains beds and fragments of lignite. The Arundel also contains thin beds of sand and silt. The Arundel Clay forms a major and regionally significant confining unit dividing the Patapsco Formation from the underlying Patuxent Formation.

AOC specific geological information is available from detailed site investigations on-going at FGGM including the southeast corner investigations at Operable Unit 4 (OU-4) / LPA Study Area and the Closed Sanitary Landfill (CSL), and the Defense Reutilization and Marketing Office (DRMO) (OU-5). Based on these studies, the LPA outcrops across the AOC parcel and extends to the Arundel Clay. Three continuously-logged borings completed on the AOC parcel in August 2010 encountered the Arundel Clay at depths of 174 ft below ground surface (bgs) (SB26), 166 ft bgs (SB27), and 133 ft bgs (SB15) (to be presented in the pending RI report for OU-4). The MPC overlies the LPA only on the eastern edge of the AOC parcel, and has not been encountered in other borings on the remainder of the AOC parcel.

From data collected during the AOC RI and the other investigations referenced above, regional groundwater in the LPA flows to the southeast. Locally, the occurrence of groundwater at the AOC parcel is inconsistent and levels are variable. In the west-central portion of the AOC localized groundwater may flow to the southwest toward the Rogue Harbor Branch (Malcolm Pirnie, 2008).

2.7 Groundwater and Surface Water Use

FGGM obtains water from the Little Patuxent River and six deep production wells (PW-1 through PW-6) installed within the Patuxent Aquifer. The FGGM Water Treatment Plant surface water intake is located north of Route 198. The six FGGM production wells are screened between 500 and 800 ft bgs (the Patuxent Formation). Production wells PW-1 and PW-2 are located on the FGGM cantonment area north of Route 32. Wells PW-3 through PW-6 are located near Range Road on the extreme eastern side of the Base Realignment and Closure parcel. These deep wells are all screened well below the thick Arundel Clay regional aquitard.

Groundwater at the Site is located in a surficial aquifer composed of Lower Patapsco sands (primarily fine to medium grained sands as described above). Groundwater elevations at the Site ranged from 97.84 ft above msl (NW-04) to 84.54 ft above msl (MW-14). A groundwater potentiometric surface map presenting groundwater elevations in July 2006 is provided as **Figure 2-8**. Groundwater flow in the LPA is predominately to the southeast.

At the Site no shallow groundwater from the LPA or surface water is used as a potable drinking water source. Off-post, in the Town of Odenton, the LPA is used for drinking water purposes.

3. Historical Investigations and Results

Previous environmental investigations and sampling have been conducted at the Site. The previously collected data is summarized in the *Revised Final Remedial Investigation for the Architect of the Capitol, Library of Congress Campus Facility Report* (Malcolm Pirnie, 2008). Included in the subsequent subsections include a brief summary of the major investigation activities completed at the AOC parcel.

The comprehensive analytical results are presented in the Final RI package and are summarized in Section 3.3. The laboratory analytical reports for the historical investigations are included in the previously submitted documents referenced above.

3.1 Previous Investigations

3.1.1 Soil Vapor Study (1990)

A Phase 1 of the AOC land parcel associated with the land transfer to the AOC was conducted in 1994 by Rummel, Klepper, & Kahl (RK&K). According to the 1994 Phase 1 Report, a soil vapor study was completed in 1990 that indicated petroleum hydrocarbon contamination was present in the TMP in the vicinity of several underground storage tanks (USTs) located in the eastern portion of the Site (Malcolm Pirnie, 2008). Elevated petroleum concentrations were also observed near the former UST at Building 15, but it was reported that the contamination was confined to the proximity of the UST.

3.1.2 Phase 1 of the Library of Congress Parcel (RK&K 2004)

The Phase 1 of the AOC land parcel was completed by RK&K in 2004 and included evaluations of the property, natural environment, hazardous wastes, utilities, and transportation (Malcolm Pirnie, 2008). It should be noted that the Phase 1 included the area west of Remount Road associated with the current DRMO facility and the Former DRMO (OU-5, FGGM-07). Previous investigations of this area indicate soil and groundwater contamination and the Phase 1 Report recommended this area west of Remount Road (Current DRMO Facility, OU-5) be excluded from the parcel being considered for transfer to the AOC.

Findings of the Phase 1 Investigation included petroleum contamination in soil and groundwater in the vicinity of USTs associated with the warehouses in the eastern portion of the land parcel.

3.1.3 Carbon Tetrachloride Delineation (2000)

In 2000, a source area investigation was conducted to delineate carbon tetrachloride (CCl_4) that was discovered during a previous investigation of the current DRMO facility (OU-5). During these investigations, groundwater samples were collected from four existing monitoring wells and 16 direct-push technology (DPT) borings (Malcolm Pirnie, 2008). The CCl_4 investigation determined that the CCl_4 contamination originates along Remount Road off of the AOC parcel but has migrated onto the southwest corner of the AOC land parcel. Detailed findings of the CCl_4 delineation are presented in the Revised Final RI Report (Malcolm Pirnie, 2008). Note that investigation or remedial activities related to OU-5/DRMO and the CCl_4 contamination are being completed as a separate CERCLA site and will be addressed in a future Record of Decision (ROD) that is separate from the AOC Site.

3.1.4 UST Tank Removal and Remediation (1988 - 2000)

Numerous USTs located adjacent to warehouse buildings on the AOC parcel have been removed. The majority of these USTs were fiberglass, 550 – 1,000 gallon capacity, and used for the storage of No. 2 fuel oil (Malcolm Pirnie, 2008). Between 1988 and 2000 the USTs were removed under the supervision of FGGM and Maryland Department of the Environment (MDE) representatives. UST closure compliance reports were submitted by FGGM and approved by MDE.

3.1.5 Remedial Investigation (2000 - 2005)

Malcolm Pirnie initiated the RI of the 93-acre AOC parcel in 1998, and the primary field efforts were conducted in two phases: 2000/2001 and 2004/2005. The following work was performed as part of the RI effort. Analytical results and investigation findings are presented and discussed in detail in the Revised Final RI Report (Malcolm Pirnie, 2008). Soil and groundwater sampling locations completed as part of the RI are displayed on **Figure 3-1**.

3.1.5.1 2000/2001 Phase

- Six surface soil samples were collected using manual methods (hand auger) from a maximum depth of 2.5 ft bgs and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and metals.

- Ten surface soil samples were collected using manual methods (hand auger) from a depth of 1 ft bgs to investigate the presence of PCBs in soil at electrical transformer locations. The surface soil samples were analyzed for PCBs.

- Sixteen soil borings were installed to approximately 10 ft bgs using DPT methods. At each soil boring location, one surface soil sample was collected from 0.5 ft to 2.5 ft bgs and one subsurface soil sample was collected from 8 to 10 ft bgs. An additional 13 DPT soil borings were installed to depths ranging from 15 to 20 ft bgs for collection of an additional deeper soil sample. All DPT soil samples collected were analyzed for VOCs, SVOCs, PCBs, pesticides, and metals. Eight DPT groundwater samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and total and dissolved metals.

- Eleven monitoring wells were installed using hollow-stem auger (HSA) drilling methodology across the AOC land parcel. Soil samples were collected at three discrete depths (surface, mid-depth, and above water table) at seven of the 11 well locations during installation.

- Twelve groundwater samples were collected from monitoring wells using low-flow sampling methodology. Groundwater samples were collected from the 11 new installed monitoring wells and one previously installed monitoring well and analyzed for VOCs, SVOCs, pesticides, PCBs, and total and dissolved metals.

- Three surface water samples were collected from Rogue Harbor Branch using a discrete sampler from mid-depth of the tributary. Surface water sampling was conducted in a downstream to upstream order. All surface water samples were analyzed for VOCs, SVOCs, PCBs, and total metals.

- Three sediment samples were collected from Rogue Harbor Branch using manual methods (hand auger). Sediment sampling was conducted in a downstream to upstream order and was conducted following surface water sampling activities. All sediment samples were analyzed for VOCs, SVOCs, PCBs, and metals.

3.1.5.2 2004/2005 Phase

- One subsurface soil sample was using manual methods (hand auger) from a depth of 6 ft bgs and analyzed for VOCs, SVOCs, PCBs, pesticides, and metals.

- Twenty-five soil borings were installed to approximately 10 ft bgs using DPT methods. At each soil boring location, one surface soil sample was collected from a maximum depth of 2.5 ft bgs. Nineteen subsurface soil samples were collected from a maximum depth of 10 ft bgs. All DPT soil samples collected were analyzed for VOCs, SVOCs, PCBs, pesticides and/or metals. Eleven DPT groundwater samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and total and dissolved metals.

- Two monitoring wells were installed using HSA drilling methodology. No soil samples were collected during the well installation activities during this phase.

- Sixteen groundwater samples were collected from monitoring wells using low-flow sampling methodology. Groundwater samples were collected from 14 previously installed monitoring wells and two newly installed monitoring wells and analyzed for VOCs, SVOCs, pesticides, PCBs, and total and dissolved metals.

- During the DPT investigation, lead was observed in the soil sample collected at 6 to 8 ft bgs from DPT/GW-29 at a concentration of 3,350 milligrams per kilogram (mg/kg) (**Figure 3-1**). In a surface soil sample (AOC-SS-29) collected at this same location, lead was detected at a concentration of 118 mg/kg. Groundwater samples were also collected at this location via a temporary well screen installed from 10 to 15 ft bgs and analyzed for a suite of analytes including total and dissolved metals. Total and dissolved lead concentrations were observed at 246 micrograms per liter (µg/L) and 2.1 µg/L, respectively. The dissolved lead concentration was below the action level of 15 µg/L established by the USEPA. At nearby sampling point, DPT-08 (**Figure 3-1**) installed during the 2000/2001 mobilization of the RI, lead was observed at 5.1 mg/kg in the soil sample collected from 9 ft bgs, and no groundwater sample was collected from that location.

3.1.6 Supplemental Remedial Investigation (2010 - 2011)

As a follow-up to the elevated sub-surface lead detection in 2004/2005 at DPT/GW-29, additional lead sampling was completed in this area in 2010 and 2011. Two rounds of DPT soil sampling were conducted on November 22, 2010 and June 6 and 7, 2011 to delineate lead contamination in subsurface soil surrounding boring DPT/GW-29. The exact location of DPT/GW-29 could not be confirmed in the field using available documentation so grid sampling was completed across this area. A network of 34 borings (AOC GP01 – AOC GP34) was installed in a grid pattern surrounding the approximate location of DPT/GW-29, with 10 ft spacing between borings. During

Round 1, a uniform sampling approach was implemented and soil samples were collected from four discreet depths (1 ft bgs, 4 ft bgs, 7 ft bgs, and 10 ft bgs) at 16 locations for a total of 64 soil samples. During Round 2, soil samples were collected from five discreet depths (1 ft bgs, 4 ft bgs, 7 ft bgs, 10 ft bgs, and 14 ft bgs) at 18 locations for a total of 77 soil samples. During Round 2, three borings were advanced adjacent to locations AOC GP01, AOC GP09, and AOC GP10 where elevated lead concentrations were detected at depths ranging from 7 to 10 ft bgs during the Round 1 mobilization. AOC GP32, AOC GP33, and AOC GP34 were installed directly adjacent to AOC GP09, AOC GP10, and AOC GP01, respectively. Only one soil sample was collected from AOC GP32 and AOC GP33 at a depth of 14 ft bgs to complete vertical delineation at these Round 1 locations. In addition, two groundwater samples were collected from 11 to 15 ft bgs at AOC GP33 and AOC GP34 using Hydropunch® groundwater sampling methodology. All soil and groundwater samples were submitted for laboratory analysis for lead via USEPA Method 6010C.

During Round 1, all soil samples analyzed from 1 ft bgs (**Figure 3-2**) and 4 ft bgs (**Figure 3-3**) were below the residential screening criteria for lead of 400 mg/kg (32 samples total). At 7 ft bgs, two elevated lead detections were observed, AOC GP01 (6,800 mg/kg) and AOC GP06 (5,200 mg/kg) (**Figure 3-4**). At 10 ft bgs, two elevated lead detections were also observed, AOC GP09 (3,300 mg/kg) and AOC GP10 (5,600 mg/kg) (**Figure 3-5**). All other soil samples were below the 400 mg/kg comparison criterion.

During Round 2, all soil samples collected from 1 ft bgs (**Figure 3-2**), 4 ft bgs (**Figure 3-3**), and 7 ft bgs (**Figure 3-4**) were below 400 mg/kg (45 samples total). At 10 ft bgs, two elevated lead detections were observed, AOC GP21 (1,500 mg/kg) and AOC 27 (1,200 mg/kg) (**Figure 3-5**). All other samples collected from 10 ft bgs were below screening criteria. At 14 ft bgs (**Figure 3-6**), no elevated lead detections were observed in any of the soil samples. Dissolved lead concentrations detected in groundwater at AOC GP33 (5.8 µg/L) and AOC GP34 (7.5 µg/L) were both below their respective action level of 15 µg/L (**Figure 3-6**). It should be noted that during the installation of AOC GP34, a bullet fragment was observed in the soil core collected from 7 to 10 ft bgs, at an equivalent depth of the elevated lead detection in adjacent soil boring AOC GP01 (6,800 mg/kg at 7 ft bgs).

3.2 Nature and Extent of Contamination

The following summarizes the nature and extent of subsurface soil and groundwater constituents present at the Site for the media (soil and groundwater) where the Human

Health Risk Assessment (HHRA) has identified potential unacceptable risks under hypothetical use scenarios. Analytical sampling data are presented in detail in the RI Report (Malcolm Pirnie, 2008) and the *Supplemental Remedial Investigation – Subsurface Lead Delineation and Revised Human Health Risk Assessment* (ARCADIS, 2013).

The AOC Supplemental RI concluded that lead in subsurface soil and inorganics in groundwater present potential risks to human health (see Section 3.1.8), the nature and extent of contamination in these media are discussed below.

3.2.1 Soil

Constituents tested for in soils at the Site during the 2000/2001 and 2004/2005 RI soil investigations included various VOCs, SVOCs, metals, pesticides, and PCBs. **Figure 3-1** illustrates the RI sampling locations.

An area of elevated lead concentrations above residential risk based concentration criteria (400 mg/kg) was identified in one location during the 2004/2005 event; DPT/GW-29 (3,350 mg/kg) (**Figure 3-1**), (Malcolm Pirnie, 2008).

The objective of the follow-up soil investigation completed in 2010/2011 was to vertically and laterally delineate a lead hot spot in subsurface soil that was discovered during the 2004/2005 phase of the RI. Results of the Supplemental RI – *Subsurface Lead Delineation and Revised Human Health Risk Assessment* (ARCADIS, 2013) suggest that lead is the only risk driving constituent of concern (COC) in soil. Section 4.4.1 presents the methodology used to develop PRGs for lead in soil used to quantify risks to human health.

Figures 3-2 through **Figures 3-6** present lead detections observed in surface and subsurface soil in the lead hot spot area delineated during the Supplemental RI completed in 2010/2011. Lead detections in soils are presented in **Table 3-1**.

Lead exceedances in subsurface soil observed during the two rounds of sampling completed during the Supplemental RI are summarized below:

- At 7 ft bgs, two elevated lead detections were observed, AOC GP01 (6,800 mg/kg) and AOC GP06 (5,200 mg/kg) (**Figure 3-4**);

- At 10 ft bgs, four elevated lead detections were observed, AOC GP09 (3,300 mg/kg), AOC GP10 (5,600 mg/kg), AOC GP21 (1,500 mg/kg), and AOC 27 (1,200 mg/kg) (**Figure 3-5**).

3.2.2 Groundwater

To identify groundwater compounds of potential concern (COPC) for further evaluation in the Revised HHRA, a comparison was made of maximum detected concentrations in groundwater (as dissolved fraction and as total concentrations) to USEPA Regional Screening Levels (RSLs) protective of drinking water exposures (USEPA, 2012). The RSLs represent conservative risk-based concentrations derived by USEPA using default exposure assumptions. RSLs based on cancer endpoints are derived by USEPA using a target cancer risk level of one in one million ($1x10^{-6}$). RSLs based on non-cancer endpoints are derived by USEPA using a hazard limit of 1; these RSLs were further adjusted downward by a factor of 10 (representing a hazard limit of 0.1) to address the potential for similar target endpoints prior to use in identifying COPCs.

During the 2000/2001 and 2004/2005 phases of the RI, groundwater samples were collected using DPT sampling methodology and conventional monitoring well sampling methodology. The Revised HHRA (ARCADIS, 2013) concluded that cobalt, iron, arsenic, chromium (evaluated as hexavalent chromium), and aluminum are risk driving groundwater COCs based on total (unfiltered) groundwater, and cobalt, arsenic, and chromium (evaluated as hexavalent chromium) as risk driving groundwater COCs based on dissolved (filtered) groundwater. Inorganic risk driving COCs detections in groundwater are presented in **Table 3-2**.

Information presented in previous reports documenting investigations conducted at the Site, including the RI (Malcolm Pirnie, 2008) and a technical memorandum (Malcolm Pirnie, 2007) have concluded there is no discernible plume of metals contamination or identifiable source(s) of inorganics in groundwater at the Site. This determination is supported by a background evaluation presented in the Supplemental RI (ARCADIS, 2013). The background evaluation compared detected levels of inorganics in groundwater at the Site to upgradient groundwater reference wells NW-5, NW-6, and NW-7, located on the north side of Rock Avenue (**Figure 3-1)**.

Based on the conclusions of this evaluation, the concentrations of the majority of the inorganics in Site groundwater are at levels comparable to upgradient groundwater, including aluminum, antimony, barium, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, mercury, nickel, selenium, thallium and vanadium. Because

the background evaluation concluded that these inorganics are comparable to the concentrations in upgradient reference wells, no actions are warranted based on these COCs. However, the initial background evaluation for arsenic and cobalt was less conclusive regarding whether the concentrations of these inorganics are attributable to background. The on-site concentrations for both total and dissolved arsenic and cobalt are higher than upgradient background samples. Because of this uncertainty and because of their Maximum Contaminant Level (MCL) exceedances, arsenic and cobalt remain COCs and remedial alternatives to address inorganics in groundwater are evaluated in this FFS.

However, to further evaluate the nature and extent of the arsenic and cobalt impacts at the site and to respond to USEPA questions regarding the potential need for active remedy for the inorganics in groundwater (see **Appendix B**), an “outlier evaluation” was completed as a follow-up to the initial background study provided in the Revised HHRA (ARCADIS, 2013),

The “outlier evaluation,” discussed in **Appendix B**, focused on on-site arsenic and cobalt groundwater concentrations relative to upgradient reference well concentrations. **Appendix B** (Response to Comments) Attachment 1 includes figures prepared to provide visual comparison of the inorganic concentrations of dissolved and total concentrations of arsenic and cobalt detected in AOC monitoring wells relative to that detected in upgradient reference wells. The figures include simple dot plots noting the relative range in concentrations among the background dataset and Site dataset. These figures identify potential outliers in the dataset. Arsenic was detected as both dissolved fraction and total concentrations in all the background groundwater samples, but in 62% of the Site groundwater samples as “total” concentration, and as “dissolved arsenic” in only 8% of the groundwater samples. Furthermore, dissolved phase arsenic was detected in only one of the 13 samples representing Site groundwater indicating that the total arsenic concentrations are likely influenced by re-suspended soil particulates (turbidity) and not necessarily representative of groundwater conditions. The one dissolved arsenic detection was 11 µg/L (which only slightly exceeds the 10 µg/L MCL for arsenic). Given the observation of infrequent elevated arsenic concentrations that are potential outliers that may be related to turbidity, and that the arithmetic mean arsenic concentrations (total and dissolved fraction) in AOC groundwater are lower than the mean concentrations in upgradient reference groundwater, arsenic concentrations in AOC groundwater are considered comparable to upgradient reference concentrations and would not warrant active remediation.

For cobalt, the maximum detected total and dissolved concentrations (127 µg/L) was observed in a groundwater sample from a single well (NW-14) and exceeds the highest detected concentrations in groundwater representing the upgradient reference locations. Total cobalt concentrations were detected at a total of two monitoring wells at levels above reference concentrations (**Appendix B**, Figure 2); dissolved fraction cobalt was detected in groundwater at five AOC monitoring wells at concentrations above that in reference locations. Although the concentrations of cobalt in AOC groundwater were not significantly elevated relative to concentrations in reference wells (**Appendix B**, Figure 2), the detections were associated with both total and dissolved fraction concentrations in more than a few groundwater samples, with the arithmetic mean concentrations of dissolved fraction and total cobalt in AOC groundwater elevated relative to mean concentrations at the upgradient reference locations. The highest two AOC total cobalt concentrations (127 µg/L at NW-14 and 16.3 µg/L at NW-4-GW-01) and highest dissolved cobalt concentration (127 µg/L at NW-14) were evaluated as potential outliers. The arithmetic mean cobalt concentration without the potential outlier cobalt results associated with NW-14 (127 µg/L as both total and dissolved fraction) is 5.12 µg/L for total cobalt and is less than arithmetic mean total cobalt concentration in groundwater representing the upgradient reference location. The mean dissolved cobalt concentration without this outlier result is 3.84 µg/L and is slightly above the mean dissolved cobalt concentration (3.43 µg/L) in groundwater representing the upgradient reference location. Given the infrequent observation of elevated cobalt in groundwater at levels that are considered to be potential outliers observations that may be related to turbidity in groundwater, cobalt levels in groundwater are considered comparable to upgradient reference concentrations. As with arsenic, because of this uncertainty and because of their MCL exceedances, arsenic and cobalt remain COCs for which remedial alternatives should be evaluated in this FFS, though active treatment alternatives are not warranted.

While cobalt is used at low concentrations in numerous industrial applications, no such anthropogenic sources of cobalt have been identified during historical site investigation activities. It is possible that small, discrete and spatially limited sources of cobalt are present in the subsurface that could be contributing to groundwater concentrations above criteria. However, considering there is no definable cobalt groundwater plume and only sporadic and isolated concentrations above criteria have been observed, there is no evidence to suggest a large-scale cobalt source is present at the Site, either in soil or groundwater, which would require treatment. It is also possible that the sporadic cobalt detections are related to naturally-occurring non-anthropogenic cobalt present in the formation.

The sporadic cobalt concentrations in the AOC and OU-4/LPA study area support the hypothesis that concentrations above criteria are due to slight changes in geochemical conditions (specifically redox conditions or pH) which mobilize cobalt from naturally occurring soil minerals or, possibly, small, discrete, and spatially limited, anthropogenic cobalt sources. It is noted that the highest cobalt detection (127 µg/L at NW-14) is located on the eastern side of the AOC property and falls within the VOC plume originating in the upgradient OU-4 area and migrating south/southeast across the AOC parcel within the LPA. Geochemical conditions in the AOC and OU-4/LPA study area are highly spatially variable but there is evidence of incomplete reductive dechlorination, nitrate and sulfate reduction to indicate the presence of reducing conditions. Elevated concentrations of dissolved iron are also present at some monitoring locations, which supports the presence of conditions suitable for the mobilization of redox-sensitive metals, including cobalt. In addition, pH concentrations at the Site are variable and have the potential to influence metal speciation, solubility and mobility, particularly at pH values of less than 5, or greater than 9, as observed at some monitoring locations.

In the OU-4/LPA study area, implementation of an Interim Removal Action Plan is currently underway at Building 2250 (air sparge/soil vapor extraction) and Building 2286/Former Building 2276 (in-situ chemical oxidation injections) to address VOC source contamination in the LPA. The two source area removal actions are located upgradient of the eastern portion of the AOC parcel (including the high cobalt detection at NW-14). Additionally, downgradient of NW-14, a hydraulic containment system was installed in 2014 as part of the Interim Removal Action Plan to capture and remediate the VOC plume migrating south/southeast from OU-4. During operation, the VOC source area removal actions may affect downgradient geochemical conditions in the LPA, resulting in the continued mobilization of redox-sensitive metals species (such as iron, manganese, copper, nickel, arsenic and cobalt). In situations, like the AOC and OU-4/LPA study area, where ambient groundwater is naturally reducing, or mildly reducing, these metals once mobilized can persist outside of the treatment area and elevated concentrations can be detected down-gradient, even when VOC concentrations are below detection or strongly reducing conditions are no longer present.

The remedial timeframe for the OU-4 source area remediation, specifically at Building 2286/Former Building 2276, is approximately 20 years. It is anticipated that successful remediation of the VOC plume in the source area and within the plume will affect geochemical conditions within the LPA. Concentrations of metals will decline via physical attenuation mechanisms along the flow path, or when the geochemical

conditions are more conducive to their precipitation, or via a combination of these mechanisms. It is noted a robust long-term monitoring program will be implemented as part of the final remedy for the OU-4/LPA study area (which encompasses the NW-14 and the eastern portion of the AOC). The monitoring program will include testing for VOCs, inorganics, and water quality parameters to evaluate groundwater geochemistry and COC concentrations until remedial action objectives are achieved.

3.3 Summary of Human Health Risk Assessments

As presented in the RI Report (Malcolm Pirnie, 2008) and the Technical Memorandum (Malcolm Pirnie, 2007), an HHRA was completed to identify COPCs at or from the Site to be quantitatively evaluated as part of a hazard evaluation. The results of the HHRA (Malcolm Pirnie, 2008) indicate that surface soil, sediment, and surface water media at AOC do not present unacceptable risk to human receptors under current and future land use scenarios. A Supplemental RI including a Revised HHRA (ARCADIS, 2013) was completed to fill data gaps identified during the RI and update risks associated with the lead hot spot in subsurface soil and inorganics in groundwater. The Revised HHRA was completed in accordance with USEPA guidance (USEPA, 1991). A summary of the risks and hazards as determined by the revised HHRA is presented below:

- Commercial Worker

  Current: There is currently no use of shallow water for potable purposes so there is no risk from groundwater under a current commercial worker scenario. For lead in soil, there is no unacceptable risk from exposure to surface soils or combined surface/subsurface soil under a current commercial worker scenario across the entire 60 x 68 foot lead study area.

  Future: Under a potential future use scenario where the commercial worker is utilizing groundwater as a source of potable water, inorganics in groundwater present an elevated risk. The identified groundwater COCs include arsenic, chromium (evaluated as hexavalent), and cobalt in total (unfiltered) groundwater and cobalt in dissolved (filtered) groundwater. The calculated hazard index and estimated cancer risk for hypothetical ingestion of total inorganics in shallow groundwater under a commercial worker scenario are 5 and 3E-04, respectively. For lead in soil, there is an unacceptable risk if regrading or other site activities lead to exposure under the commercial worker scenario to lead at two hot spot

areas at depths of 7 and 10 ft bgs (**Figures 6-1** and **6-2** show the lead hot spots that are a subset of the 60 x 68 foot study area).

- Construction/Utility Worker

  Current/Future: There are no unacceptable risks to construction/utility workers under current or future use scenarios for either inorganics in groundwater or lead in soil.

- Hypothetical Resident

  Current: There is currently no residential use of the AOC parcel.

  Future: Under a hypothetical residential use scenario where the resident is utilizing groundwater as a source of potable water, inorganics in groundwater present an elevated risk. The identified groundwater COCs include aluminum, arsenic, chromium (evaluated as hexavalent chromium), cobalt, and iron in total (unfiltered) groundwater and arsenic, chromium, and cobalt in dissolved (filtered) groundwater. The calculated hazard index and estimated cancer risk for hypothetical ingestion of total inorganics in shallow groundwater under a residential scenario are 31 and 3E-03, respectively.

  For lead in soil, potential exposures to lead in surface soil do not exceed USEPA's risk management threshold level for lead. However, exposures to subsurface lead concentrations in the 60 x 68 foot lead study area (see **Figures 3-2** to **3-6**) do present a potential risk under a hypothetical residential use scenario at depth intervals of 7 and 10 ft bgs.

In summary, current conditions at AOC do not present potential risks or hazards to potential receptors (including commercial workers). Under hypothetical future use scenarios (including hypothetical residential use), conditions at AOC pose a potential risk that warrant an evaluation of remedial alternatives to address potential exposures to aluminum, arsenic, chromium (evaluated as hexavalent chromium), cobalt, and iron in unfiltered groundwater, and arsenic, chromium, and cobalt in dissolved (filtered) shallow groundwater used as a future source of drinking water, and potential exposure to lead in soil at a depth of 7 ft and 10 ft bgs. As a result, only risks presented from lead in subsurface soil and identified inorganics in groundwater will be carried through this FFS.

It should be noted that the residential land-use scenario included in the HHRA is hypothetical and that decisions regarding remedial actions presented this FFS taken to address risk to human health were made on current and reasonably anticipated future land-uses consistent with CERCLA guidance. Although use of the property for residential development is not reasonably anticipated Remedial Alternatives (RAs) were developed in this FFS which are designed to address exposure to future residential receptors.

3.4 Screening Level Ecological Risk Assessment Summary

As presented in the RI Report (Malcolm Pirnie, 2008) and Technical Memorandum (Malcolm Pirnie, 2007), a Screening Level Ecological Risk Assessment (SLERA) was completed to evaluate potential risks to ecological receptors at the Site. The SLERA was completed in accordance with USEPA Methodology presented in Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA, 1997). To identify the site-specific COPCs, the detected concentrations in surface soil, surface water, and sediment were compared to ecotoxicity benchmarks that are considered protective of detrimental effects on vegetative and invertebrate communities (Malcolm Pirnie, 2008).

In surface soil, a number of inorganics pose the potential for adverse ecological effects in terrestrial plants and soil invertebrates. The SLERA results indicate that 4,4'- dichlorodiphenyltrichloroethane and its derivatives (4,4'-dichlorodiphenyldichloroethane , and 4,4'- dichlorodiphenyldichloroethylene) and a few metals including arsenic, lead, and zinc may pose the potential for adverse health effects. However, consideration should be given to the areas where samples were collected and the fact that these areas are associated with former industrial activities which are less likely to be used by wildlife receptors with the same frequency and intensity as the exposure assessment indicates (Malcolm Pirnie, 2008).

Similarly in surface water and sediment, a number of inorganic constituents pose the potential for adverse health effects in aquatic organisms and benthic invertebrates based on comparison to maximum detected concentrations to conservative benchmarks (Malcolm Pirnie, 2008). However, based on the dietary exposure estimates for upper trophic level semi-aquatic wildlife, there is little to no potential for adverse health risks (Malcolm Pirnie, 2008).

In conclusion, the SLERA process is designed to result in over-estimation of the potential for adverse ecological health effects. Using the maximum detected concentrations as the Exposure Point Concentrations (EPC) and the no observed adverse effect level-based threshold reference values in the risk estimates contribute to over-estimation of the potential for actual ecological risks present at the Site (Malcolm Pirnie, 2007 and 2008).

4. Applicable or Relevant and Appropriate Requirements and Remedial Action Objectives

RAOs for the Site have been developed to implement the decision to address the COCs in both soil and groundwater. The objectives are developed based on the criteria outlined in Section 300.430(e)(2) of the NCP and Section 121 (d)(2) of CERCLA.

4.1 Scope of the Remedial Action

COCs that pose an unacceptable cancer risk or non-cancer hazard have been identified in soil and groundwater. No COCs were identified in surface water or sediment during the RI (Malcolm Pirnie, 2008). The following sub-sections are organized by media type and present the COCs and specific exposure pathways that must be mitigated and controlled by the recommended remedial action. Note that VOC groundwater contamination on the eastern and western portions of AOC are being handled separately under investigation and remedial activities associated with OU-4 and OU-5 respectively.

4.1.1 Soil Constituents of Concern

No COCs were identified for surface soils, and exposure to surface soils do not result in unacceptable risk to human health for current use receptors. Between the two rounds of soil sampling completed to delineate the lead, 31 surface soil samples were collected. Lead detections observed in surface soil ranged from 3.2 mg/kg to 120 mg/kg and the site-wide EPC (average concentration) for surface soil was calculated to be 15 mg/kg in the 60 x 68 ft exposure area and 66 mg/kg in the 37 x 43 ft exposure area. The surface soil EPCs are well below the 418 mg/kg residential EPC.

Lead concentrations in subsurface soil explicit to depths at 7 ft and 10 ft bgs pose a level of concern for future receptors. Lead concentrations in soil associated with sampling locations AOCGP01 and AOCGP06 at 7 ft bgs and in sampling locations AOCGP09 and AOCGP10 at 10 ft bgs are identified as the primary contributors to the high lead EPCs at each of these depth-specific subsurface exposure areas. At 7 ft bgs, in an approximately 10 ft by 20 ft area, two elevated lead detections were observed at AOC GP01 (6,800 mg/kg) and AOC GP06 (5,200 mg/kg). The EPC in this small area is 6,000 mg/kg which would exceed the 418 mg/kg PRG. At 10 ft bgs, in an approximately 10 ft by 20 ft area, elevated lead detections were observed at AOC GP09 (3,300 mg/kg) and AOC GP10 (5,600 mg/kg). The EPC in this small area (4,450 mg/kg) also exceeds the residential PRG for lead. Though unlikely, under a future

hypothetical scenario, such as soil removal and regrading across the study area, it was assumed that soil at depths of either 7 or 10 ft bgs in these areas would be available for potential exposure for future receptors (including commercial workers and hypothetical residential receptors) (e.g., in an open excavation at a depth of 7 ft bgs or 10 ft bgs).

4.1.2 Groundwater Constituents of Concern

No COCs were identified for groundwater for current use scenarios as there is no current groundwater use at the Site. The estimated non-cancer hazards and cancer risks associated with hypothetical assumptions about inorganics in untreated groundwater used as a source of drinking water by either a commercial worker or a hypothetical resident exceed USEPA risk management levels.

Inorganics in groundwater present an elevated risk under a hypothetical groundwater use scenario in which shallow untreated groundwater from the LPA is used for drinking water purposes. Under a potential commercial worker land-use scenario, the identified groundwater COCs include arsenic, chromium (evaluated as hexavalent chromium), and cobalt in total (unfiltered) groundwater and cobalt in dissolved (filtered) groundwater. Under the potential future residential land-use scenario, the identified groundwater COCs include aluminum, arsenic, chromium (evaluated as hexavalent chromium), cobalt, and iron in total (unfiltered) groundwater, and arsenic, chromium, and cobalt in dissolved (filtered) groundwater.

4.2 Applicable or Relevant and Appropriate Requirements

This section describes the regulatory standards and guidance that may be applied to remedial action at the Site in accordance with 40 CFR 300.400(g). These regulatory standards and guidance are divided into three categories: chemical-specific, action-specific, and location-specific requirements.

4.2.1 Chemical-Specific ARARs and TBC Guidance

Table 4-1 presents chemical-specific ARARs and to be considered (TBC) guidance identified for the Site. For groundwater, potential chemical–specific ARARs include the Safe Drinking Water Act National Primary Drinking Water Regulations *40 CFR 141 - 149* which establishes USEPA MCLs as potential ARARs.

4.2.2 Location-Specific ARARs and TBC Guidance

There are no location-specific ARARs identified for the AOC land parcel.

4.2.3 Action-Specific ARARs and TBC Guidance

Table 4-2 presents action-specific ARARS and TBC guidance identified for the Site. Potential action-specific ARARs include substantive provisions of the Erosion and Sediment Control *Code of Maryland Regulation (COMAR) 26.17.01.07* and *26.17.01.11*, Disposal of Controlled Hazardous Substances *COMAR 26.13.02.02, 26.13.02.03, 26.13.02.05A (1), and 26.13.03.01 through 26.13.03.06*, and Control of Noise Pollution *COMAR 26.02.03.02 and 26 02.03.03*. For potential removal actions including excavation, best management practices will be implemented to control storm water, erosion and sediment transport in order to comply with applicable ARARs.

4.3 Remedial Action Objectives

The RAOs for the Site have been developed to be protective of human health and to meet identified ARARs. The RAOs for each COC for the Site are:

- To prevent human exposure to soil that would cause unacceptable risk to human health.

- To prevent human exposure to groundwater that would cause unacceptable risk until contaminant mass in groundwater is reduced and the aquifer's potential for beneficial use is restored.

4.4 Identification of Remediation Goals

SCLs for groundwater are MCLs where they exist, and risk based concentrations in the absence of promulgated MCLs, in accordance with the requirements of CERCLA. For groundwater COCs without MCLs, the higher of the practical quantitation limit (PQL) and USEPA's tap water RSL will be the selected SCL. The SCLs are listed below:

- Aluminum (total) 16,000 ug/L (RSL)
- Arsenic (total/dissolved) 10 ug/L (MCL)
- Chromium (total/dissolved)[1] 100 ug/L (MCL)
- Cobalt (total/dissolved) 6 ug/L (RSL)
- Iron (total) 11,100 ug/L (RSL)

[1] Chromium evaluated as hexavalent chromium

4.4.1 Preliminary Remediation Goals in Soil

This section presents a discussion of the derivation for risk-based SCLs for soil.

The conclusions of the Revised HHRA (ARCADIS, 2013) were that lead concentrations in subsurface soil explicit to depths at 7 ft and 10 ft bgs pose a level of concern for future commercial workers and future hypothetical residents but do not pose a level of concern for current receptors.

The lead PRG was derived using USEPA's Integrated Exposure and Uptake Biokinetic (IEUBK) Model (win 32 Version 1.1 Build 11) assuming Geometric Standard Deviation of 1.6 in baseline blood lead levels, and a 5% probability of exceeding the 10 micrograms per deciliter (µg/dL) blood lead threshold. The PRG for lead is the site-wide EPC for residential exposures (418 mg/kg). In order for the site to meet the residential PRG and be suitable for unrestricted use (e.g., no land use controls related to soil), the EPC which is calculated by averaging the lead results within the study area must be below 418 mg/kg. For instance, following remedial action (e.g., excavation to remove soil with elevated lead concentrations) the EPC calculated using data from the remaining soil (and any fill material added to the study area) will be compared to the residential PRG for lead. Even if some individual soil samples remaining in place have lead concentrations greater than the 418 mg/kg PRG, such as samples GP21 and GP27 with lead at 1,500 mg/kg and 1,200 mg/kg, respectively, as long as the EPC (average lead concentration for the study area) is below 418 mg/kg then the site will be suitable for unrestricted use.

Note: Because the Center for Disease Control now recommends 5 µg/dL blood-lead as the reference level, a hypothetical evaluation was completed to determine how this change would affect the lead PRG in the event USEPA makes the corresponding

change. If the blood lead level (BLL) threshold is reduced from 10 to 5 µg/dL, and the acceptable risk management decision point is no greater than a 5% probability of exceeding a BLL of 5 µg/dL, then the corresponding soil concentration protective of this threshold is 153 mg/kg.

5. Identification and Screening of Remedial Technologies

This section presents the identification and screening of potentially applicable remedial technologies for attaining the RAOs at the site.

Remedial technologies have been identified for the Site based on the media of concern, COCs, RAOs and the ARARs previously identified. The intent of the AOC FFS is to evaluate remedial alternatives that will achieve the RAOs and serve as the final corrective action for the Site and also meet completion requirements under CERCLA. In the following sections, the technologies are analyzed for their effectiveness, implementability, and cost in achieving these objectives. In later sections, alternatives based on the technologies are presented and further screened against both set criteria and against one another before ultimately selecting the best alternative to address the Site.

5.1 General Response Actions

General response actions (GRAs) are categories of remedial actions that may be implemented alone or in combination to satisfy remedial goals (RGs). Appropriate GRAs are developed based on the RAOs developed in Section 4, site specific conditions, and contaminant characteristics. Potential remedial technologies and process options are identified and evaluated based on technical feasibility. The retained process options are screened based on effectiveness, implementability, and cost to determine which process options should be used in the development of the Remedial Alternatives. While the No Action Alternative does not meet the RAOs, it must be retained with the other applicable GRAs as a baseline for comparison.

5.2 Identification of General Response Actions

Potential GRAs that may be used to meet the RAOs and achieve the RGs at the site include:

- No Action;
- Land use controls (LUCs);
- Long term monitoring (LTM);
- Removal;

- Disposal;
- In-situ soil stabilization/solidification; and
- Impermeable capping.

5.2.1 No Action

The No Action technology is evaluated to establish a baseline for the comparison of the remaining technologies. No response action of any kind would be employed at the Site under this category. Inclusion of a no action alternative is required per 40 CFR Section 300.430(e)(6).

5.2.2 Land Use Controls

LUCs consist of both administrative (institutional) and physical (engineering) means to control activities at the site. Institutional controls affect site management and/or activities occurring at the site. Institutional controls do not physically alter conditions at the site and do not, or are not intended to, reduce the mobility, toxicity, or volume of contamination at the site as part of the remedial alternative. Institutional controls can limit the potential for exposure to site contamination in both soil and groundwater. Engineering controls rely upon constructed physical barriers to contain and/or prevent exposure to contamination on a property. Engineering controls typically are designed to restrict Site access to prevent exposure to contaminants (e.g., fencing or barricades).

According to the NCP, LUCs may be used while conducting the RI/Feasibility Study, during implementation of the remedial action and, where necessary, as a component of the completed response action [40 CFR 300.430 (a)(1)(iii)(D)]. The use of LUCs does not substitute for active response measures such as treatment or containment of source material as the sole response action unless such active measures are determined not to be practicable, based on the balancing of trade-offs among alternatives that is conducted during the selection of the response action [40 CFR 300.430 (a)(1)(iii)(D)]. The NCP regulation specifies the conditions under which LUCs can be incorporated into a response action, but it does not provide specific guidance on how to incorporate them into the remedy selection process. The USEPA directive entitled land use in the CERCLA Remedy Selection Process provides insight into USEPA's position on LUCs (USEPA, 1995). USEPA specifies that LUCs be evaluated and implemented with the same degree of care given to other elements of the

response action. The directive states that in evaluating a response action that includes an LUC, USEPA determines (USEPA, 1995):

- The type of LUC to be used;
- The existence of the authority to implement the LUC; and
- The appropriate entities' resolve and ability to implement the LUC.

The objective for implementing LUCs at a site is to protect remedies that are in place so that protection of human health and the environment is maintained. Additionally, LUCs serve to restrict land use until site conditions allow for unrestricted use and unlimited exposure. The USEPA and Army prefer to implement LUCs when site contaminant levels do not allow unrestricted use and unlimited exposure. They can also serve to notify current and future users about the environmental conditions of the property. LUCs may be appropriate to use when complete remediation is technically or economically infeasible, remediation risks to the health and safety of construction workers and/or community members are too great, or collateral ecological damage associated with remediation is too extensive. LUCs are often used to supplement active remediation measures. Their primary purpose is to prevent exposure which could result in unacceptable risks to human health.

LUCs include any restrictions on the current and future use of the property in order to maintain an appropriate level of protection. These restrictions are a necessary component of response actions if soil, buried waste, and/or groundwater that results in an unacceptable risk under an unrestricted land use scenario remains at the site. Therefore LUCs are necessary components of Remedial Alternatives that include stabilization, covering, and capping to confirm continued effectiveness; and are necessary components of remedial alternatives which aim to control or eliminate certain exposure pathways (i.e. groundwater use restriction).

5.2.3 Long Term Monitoring

LTM of groundwater ensures the continued protectiveness of the institutional controls (ICs) and/or engineering controls (ECs) that may be implemented at the site. A LTM plan would be required and will specify the following: frequency of sampling, analyte list, sample collection locations, quality control procedures for groundwater sampling, and the criteria that the success of the LUCs will be evaluated by (e.g., applicable federal or state screening criteria and/or Site specific RGs). In addition to groundwater

sampling, LTM would also include periodic site inspections to verify that land use of the Site has not changed to an unacceptable land use and that the ICs / ECs continue to be effectively administered.

5.2.4 Removal

Under the removal category of the GRAs, soil containing COCs in excess of PRGs would be removed from the site. Removal actions are typically conducted using standard excavation and construction equipment. Removal activities require pre-construction and site preparation activities and site restoration. In addition, any removal action requires that the excavation be backfilled with clean soil; graded to prevent the accumulation of surface water and assure positive drainage; and seeded/vegetated. Focused removals may also be effective in meeting RAOs. This technology is only viable in combination with disposal.

5.2.5 Disposal

Disposal options can generally be categorized as off-site and on-site disposal. The primary off-site disposal option is landfilling. On-site disposal options generally include on-site consolidation and/or reuse as an on-site excavation fill material. Disposal is a GRA that is used in conjunction with other technologies (e.g., removal). Prior to disposal the soil containing COCs would need to be fully characterized to ensure that the material is transported and disposed of in accordance with applicable guidelines. Soil containing lead at concentrations above toxicity characteristic leaching procedure standards may require treatment prior to disposal.

5.2.6 In-Situ Soil Stabilization/Solidification

In-situ remediation technologies for soil can utilize chemical mechanisms for either stabilization or solidification of a COC. Stabilization refers to a chemical process that reduces the leachability of a contaminant. In-situ stabilization and solidification is typically accomplished by injecting the binding agent into the soil. Solidification refers to a process by which a contaminated media is chemically bound to a reagent, changing its physical attributes to increase compressive strength, decrease permeability, and encapsulating the contaminated media to form a solid material.

Long term monitoring of groundwater and application of LUCS would be a requisite component of in-situ stabilization/solidification to ensure that site conditions have not changed, as changes in soil chemistry may potentially remobilize solidified/stabilized

contaminants. A LTM plan would be required and will specify the following: frequency of sampling, analyte list, sample collection locations, quality control procedures for groundwater sampling, and the criteria that the success of the LUCs will be evaluated by (e.g., applicable federal or state screening criteria and/or Site specific remedial goals). In addition to groundwater sampling, LTM would also include periodic site inspections to verify that land use of the Site has not changed to an unacceptable land use and that the ICs / ECs continue to be effectively administered.

5.2.7 Impermeable Capping

Impermeable capping remedial technologies involve isolating contaminated soil and preventing human and ecological contact with contaminants. Caps do not reduce the concentration or remove the contaminant. An impermeable cap prevents infiltration of rainwater from seeping through contaminated soils can enabling migration of the contaminant to groundwater.

Long term monitoring of groundwater and application of LUCS would be a requisite component of impermeable capping to ensure that land-use has not be altered such that the effectiveness of the cap has been compromised. A LTM plan would be required and will specify the following: frequency of sampling, analyte list, sample collection locations, quality control procedures for groundwater sampling, and the criteria that the success of the LUCs will be evaluated by (e.g., applicable federal or state screening criteria and/or Site specific remedial goals). In addition to groundwater sampling, LTM would also include periodic site inspections to verify that land use of the Site has not changed to an unacceptable land use and that the ICs / ECs continue to be effectively administered.

5.3 Screening Criteria

This evaluation is focused on effectiveness factors and institutional implementability with less emphasis on cost evaluation. This initial screening analysis evaluates the feasibility of each technology as it relates to site characteristics, specific contaminant types and concentrations as a measure of effectiveness, implementability, past performance, and relative cost. Of these criteria, implementability and effectiveness of the technology are the most critical.

5.3.1 Implementability

The evaluation of implementability focuses on technical feasibility, availability, and administrative feasibility. Technical feasibility refers to the capability to build and reliably operate/maintain a technology, whereas administrative feasibility refers to the likelihood of receiving approval from regulators and other agencies and obtaining the necessary materials and skilled labor.

The NCP instructs that alternatives "that are technically or administratively infeasible or that would require equipment, specialists, or facilities that are not available within a reasonable period of time may be eliminated from further consideration" [40 CFR 300.430(e)(7)(ii)].

5.3.2 Effectiveness

The effectiveness criterion focuses on the ability of a technology to:

- Reduce toxicity, mobility, or volume through treatment
- Minimize residual risks
- Afford long-term protection
- Comply with ARARs
- Minimize short-term impacts
- Achieve protection within a reasonable timeframe

The NCP [40 CFR 300.430(e)(7)(i)] instructs that "alternatives providing significantly less effectiveness than other, more promising alternatives may be eliminated. Alternatives that do not provide adequate protection of human health and the environment shall be eliminated from further consideration."

5.3.3 Cost

The evaluation of cost addresses direct and indirect capital costs and annual operation and maintenance (O&M) costs. When the information is available, the cost range is presented quantitatively. Otherwise, qualitative descriptions of low, moderate, and

high are used. The cost ranges are based on a review of the literature and data prepared for other studies.

The NCP [40 CFR 300.430(e)(7)(iii)] instructs that "costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives. Alternatives providing effectiveness and implementability similar to that of another alternative by employing a similar method of treatment or engineering control, but at greater cost, may be eliminated."

5.4 Technology Screening for Soil Response Actions

The preamble to the NCP identifies a preference for alternatives that involve on-site treatment; however, on-site treatment options would be much more expensive than the off-site options due to the small volume of impacted material. Therefore, the treatment alternative presented in this FFS focuses on off-site disposal of the impacted material.

Numerous remedial alternatives were considered as potential response actions for soil at the Site. **Table 5-1** outlines the comparative analysis of implementability, effectiveness, and relative costs of the technologies identified as response actions. Of the five potential actions summarized in **Table 5-1**, three remedial approaches were retained for further evaluation: No Further Action; LUCs; and Lead Hot Spot Soil Excavation with Off-site Disposal. The following remedial alternatives were also considered but were not retained because of low ratings for effectiveness, cost, and/or implementability during the screening process as summarized in T**able 5-1**:

- In-Situ Soil Stabilization/Solidification; and
- Impermeable Capping

The following sections provide further detail on the remedial alternatives retained for further analysis in the FFS.

5.4.1 Description of Technology 2 – Land Use Controls

LUCs are both administrative and physical means to control activities at the Site. Examples of soil LUCs include prohibition of excavation on the Site, signage to indicating that excavation is not permitted at the Site, as well as an excavation permitting process that would trigger a review of possible excavation prohibitions. The implementation of LUCs does not reduce the volume, toxicity, or mobility of

constituents. However, if impacted media remains at the Site, LUCs can limit unauthorized access to the Site, minimizing the exposure to potential receptors and also control potential exposure during future authorized activities such as utility maintenance or construction without treating or removing the contaminated media.

Implementability: Readily implemented.

Effectiveness: If properly enforced, land-use restrictions are an effective means of preventing exposure to contaminated media. Because the Site is under the control of the AOC and located within the boundary of a controlled military base, access is already restricted to authorized personnel only. LUCs would restrict use of the Site for residential purposes.

Cost: This has a low capital cost and low O&M cost.

5.4.2 Description of Technology 3 – Lead Hot Spot Soil Excavation with Off-Site Disposal

Excavation of impacted soil can be achieved by employing standard excavation and construction equipment to remove a portion of the contaminated soils or remove the entire area of contamination. Excavation activities also include but are not limited to clearing underground utilities, establishing staging area for equipment, and establishing storage areas for soil roll-off containers. Any removal action requires that the excavation area is backfilled with soil and re-graded to promote positive drainage and also that the excavation area is revegetated.

Implementability: Low complexity for implementation to engineer and complete the lead hot spot soil excavation.

Effectiveness: Provides protection to human health (future commercial and future hypothetical resident) by permanently removing constituents in soil and reducing risk to human health posed by site COCs. There is no unacceptable risk to ecological receptors under this alternative.

Cost: This technology has a moderate capital cost and low O&M cost.

5.5 Technology Screening for Groundwater Remedial Alternatives

In addition to the No Action Alternative, one remedial technology was also identified to address the impacted groundwater at the Site, thereby protecting human health and

complying with ARARs. For groundwater, LUCs and LTM were combined as the only remedial alternative considered. As previously mentioned, detected levels of inorganics in groundwater at the Site are similar to upgradient background groundwater reference wells NW-5, NW-6, and NW-7; though there are some constituents at higher concentrations in on-site groundwater than in upgradient reference wells. While there is no discernible plume or source of the inorganic exceedances observed in groundwater at the Site which warrants an active remedial approach, there are concentrations in on-site groundwater (unrelated to background) that may be site related from historical activities, present a potential risk under a drinking water scenario, and warrant evaluation of alternatives to prevent exposure. **Table 5-2** outlines the comparative analysis of implementability, effectiveness, and relative costs of the technologies identified as response actions for groundwater.

5.5.1 Description of Technology 2 – Land Use Controls and Long-term Monitoring of Groundwater

LUCs are both administrative and physical means to control activities at the Site. Examples of groundwater LUCs include prohibition of drilling wells for potable use on the Site, signage indicating that drilling of potable wells is not permitted at the Site, as well as a permitting process that would trigger a review of possible drilling prohibitions. O&M for groundwater LUCs is typically administrative, although physical inspection of the Site may also be performed to ensure that groundwater is not being used. The implementation of LUCs does not reduce the volume, toxicity, or mobility of constituents. However, Site LUCs can limit unauthorized access to the Site, minimizing the exposure to potential receptors without treating or removing groundwater with elevated concentrations of inorganics. The LTM component of the technology establishes routine monitoring of COCs in groundwater to ensure that concentrations are not increasing or migrating Off-Post.

Implementability: Readily implemented.

Effectiveness: If properly enforced, LUCs are an effective means of preventing exposure to contaminated groundwater. Because the Site is within the fence line of a controlled military base, access is already restricted to authorized personnel only. LTM is an effective means of tracking the frequency of detections and concentrations of COCs. LTM would occur in accordance with the CERCLA Section 121(c) five year review process.

Cost: This technology has a low capital cost and low O&M cost.

5.6 Retained Technologies

In summary, the following conclusions are drawn regarding retention of the screened soil technologies:

- LUCs are retained for further consideration as potentially applicable.
- Lead Hot Spot Soil Excavation with Off-site Disposal is retained.

In summary, the following conclusions are drawn regarding retention of the screened groundwater technologies:

- LUCs and LTM of Groundwater are retained for further consideration as potentially applicable.

6. Development of Remedial Alternatives

Three remedial alternatives for soil and two for groundwater including No Action as required by the NCP 40 CFR 300.430(e)(6) have been developed from the technologies retained from the screening processes. This section describes the alternatives developed and their conceptualized implementation at the Site.

6.1 Identification of Remedial Alternatives for Soil

6.1.1 SL-1 – No Action

Alternative SL-1 assumes that no corrective action of any kind would be employed at the Site to address soil contamination. This alternative would not prevent exposure to impacted soil at the Site. The No Action alternative must be evaluated to establish a baseline of comparison regarding future performance and risk for the other alternatives presented in accordance with the NCP.

6.1.2 SL-2 – Land Use Controls

Alternative SL-2 would involve the implementation of LUCs. Alternative SL-2 would reduce risk to human health by controlling or removing pathways of exposure to COCs in soil. LUCs would restrict future residential land use and all groundwater use. Under Alternative SL-2, existing LUCs already in place at FGGM, specifically ICs, would be maintained and enhanced. As previously mentioned, these LUCs would restrict the Site to non-residential use only.

The four general categories of ICs evaluated or already in use at FGGM, which provide layers of protection, are: governmental controls, proprietary controls, enforcement and permitting, and informational devices, each of which would assist with the management and implementation of LUCs. Most of these measures are already in place as elements of required procedures at FGGM and/or the AOC parcel. These elements include requirements to obtain excavation permits from the FGGM Directorate of Public Works for any intrusive activity at FGGM, Master Plan Regulations to ensure that installation projects are sited to meet operational, safety, physical security, and environmental requirements, the FGGM Geographic Information System (GIS) Database where restricted areas are demarcated; and FGGM access restrictions. In addition, the AOC requires the use of Right of Entry (ROE) documentation and the application for excavation permits for activities which may disturb soils. These controls have been developed taking into consideration all reasonably anticipated land uses at

AOC, including residential, administrative, and industrial operations, and outdoor recreation. All existing LUCs, together with any additional requirements, would be incorporated into the CERCLA remedy for the Site under this alternative.

The following LUCs are in place at the AOC parcel located within the FGGM fence line to the extent allowed under the FFA:

- **Master Plan Regulations, Army Regulation (AR) 210-20**: The Army issued Master Planning for Army Installations, AR 210-20, on 16 May 2005 updating an earlier regulation dated 13 July 1987. AR 210-20 "establishes the requirement for an Installation Master Plan and planning board and specifies procedures for developing, submitting for approval, updating, and implementing the Installation Master Plan." This regulation provides for comprehensive planning at Army installations and not only allows, but requires incorporation of existing land-use and conditions into the Master Plan. The master plan regulations provide a framework for comprehensive planning through the use of component plans, which include, but are not limited to, the following:

    - Natural Resources Plan
    - Environmental Protection Plan
    - Installation Layout Vicinity Plan
    - Land-use Plan
    - Future Development Plan

The overall objective is to provide each installation with a master plan through the integration of each component plan into the Installation Master Plan. The component plans form a series of narrative, tabular, and graphic plans. Their integration into an Installation Master Plan provides many benefits as outlined in AR 210-20. The Army and AOC will coordinate to ensure LUCs are consistently documented in both Army and/or AOC Master Planning efforts relevant to the AOC parcel.

- **FGGM GIS Database:** FGGM maintains a comprehensive installation-wide GIS database. The database includes descriptions of existing land and environmental restrictions, locations of known contamination, and locations of munitions response areas / munitions response sites. This information will allow future end-users and

tenants of FGGM to make rapid and accurate inquiries regarding sites within FGGM and will specify the LUCs in-place at specific locations. Existing wells, chemical contamination, building restrictions, munitions and explosives of concerns, and many other lines of inquiry will quickly be available to support the decision making process. The Army and AOC will coordinate to ensure LUCs are consistently documented in both Army and/or AOC GIS database efforts relevant to the AOC parcel.

- **FGGM Access Regulations**: Access regulations and controls are in place at FGGM, including identification checks and vehicle inspections. Trespassing and unauthorized activities on FGGM are illegal.

- **AOC Access Regulations**: Access regulations and controls are in place at the AOC, including obtaining valid ROEs to operate on the property. It is noted that the FGGM access regulations also help control access to the AOC parcel since AOC is only accessible through the FGGM visitor gates.

Note that the FGGM FFA establishes responsibilities for both the Army and AOC with regard to LUCs selected in any CERCLA response decision documents. These responsibilities will be incorporated into the Remedial Design (RD).

6.1.3 SL-3 – Lead Hot Spot Soil Excavation with Off-site Disposal

Under Alternative SL-3, lead concentrations in subsurface soil associated with sampling locations AOCGP01 and AOCGP06 at 7 ft bgs and in sampling locations AOCGP09 and AOCGP10 at 10 ft bgs are considered lead hotspots and would be excavated as these areas contribute to the high lead exposure point concentrations at each of these subsurface exposure areas. The approximate lateral extent of the lead hot spot excavation at 7 ft bgs and 10 ft bgs are displayed on **Figures 6-1** and **6-2**, respectively. Once excavated, confirmation samples would be collected from the bottom and sidewalls of the excavation. Samples would be analyzed for lead. Analytical results would be used to recalculate the EPC prior to backfilling the excavation to determine if PRGs had been attained.

Overburden material (0 - 5 ft bgs) from each sub-area will be staged onsite and used as fill material once the lead hot spot removal is complete. Clean soil imported from off-post, unless an approved on-post source is identified will be transported to the Site for use as fill material needed to backfill the excavated sub-areas. Upon completion of the backfill activities, the area will be graded and seeded with grass to minimize the

potential for erosion. If required, erosion and sediment controls will be established and maintained throughout the duration of the removal action in accordance with the ARARs identified in Section 4.

Following the lead hotspot removal the site-wide EPC for all soil (0 – 10 ft bgs) is anticipated to be below 418 mg/kg (residential PRG) and no additional LUCs for soil would be required. In order for the site to meet the residential PRG and be suitable for unrestricted use (e.g., no land use controls related to soil), the EPC which is calculated by averaging the lead results within the study area must be below 418 mg/kg. For instance, following remedial action (e.g., excavation to remove soil with elevated lead concentrations) the EPC calculated using data from the remaining soil (and any fill material added to the study area) will be compared to the residential PRG for lead. Even if some individual soil samples remaining in place have lead concentrations greater than the 418 mg/kg PRG, such as samples GP21 and GP27 with lead at 1,500 mg/kg and 1,200 mg/kg, respectively, as long as the EPC (average lead concentration for the study area) is below 418 mg/kg then the site will be suitable for unrestricted use.

Note: Because the Center for Disease Control now recommends 5 µg/dL blood-lead as the reference level, a hypothetical evaluation was completed to determine how this change would affect the lead PRG in the event USEPA makes the corresponding change. If the BLL threshold is reduced from 10 to 5 µg/dL, and the acceptable risk management decision point is no greater than a 5% probability of exceeding a BLL of 5 µg/dL, then the corresponding soil concentration protective of this threshold is 153 mg/kg. The arithmetic average concentration of lead in soil (exposure point concentration or EPC) following removal of soil samples AOCGP01, AOCGP06, AOCGP09 and AOCGP10 is 69 mg/kg representing the entire area. The arithmetic average lead concentration in a smaller ~20x30 foot area (includes all soil samples bounded by GP21 to GP29, GP29 to GP10, GP10 to GP23, GP23 to GP21) is 153 mg/kg. Both residual exposure concentrations of lead in soil are acceptable for residential exposures (unrestricted use) based on this possible change to USEPA's lead policy.

6.2 Identification of Remedial Alternatives for Groundwater

6.2.1 GW-1 – No Action

Alternative 1 assumes that no corrective action of any kind would be employed at the Site to address inorganics in groundwater. This alternative would not prevent exposure to COCs in groundwater at the Site. The no action alternative must be evaluated to establish a baseline of comparison regarding future performance and risk for the other alternatives presented in accordance with the NCP 40 CFR 300.430(e)(6).

6.2.2 GW- 2 – Land Use Controls and Long-term Monitoring of Groundwater

Similar to Alternative SL-2, Alternative GW-2 would involve the implementation of LUCs. Alternative GW-2 would reduce risk to human health by controlling or removing pathways of exposure to COCs in groundwater. LUCs would restrict all shallow groundwater use within the Site. Existing LUCs already in place at FGGM and AOC, specifically ICs, will be maintained and enhanced and ECs could be added. Examples of groundwater LUCs include prohibition of drilling wells for potable use on the site, as well as a permitting process that would trigger a review of possible drilling prohibitions. O&M for groundwater LUCs is typically administrative, although physical inspection of the Site may also be performed to ensure that groundwater is not being used. Annual inspections of the Site will be performed to establish that all on-site LUCs) are in good condition, to confirm that the land use of the Site has not changed, and that through visual inspection that no unauthorized excavations were performed. The five-year review process and the annual land use certifications/inspections will be used to document that the remedy remains protective.

Alternative GW-2 includes an LTM component to monitor COCs in groundwater. The LTM activities would monitor COC concentrations and verify that concentrations of COCs are not migrating Off-Post. LTM would include groundwater monitoring for total and dissolved metals from select monitoring wells at the Site annually for the first five years and then every five years as part of the five-year review process for a total of 30 years (or 10 LTM sampling events). Actual LTM frequency will depend on approval from USEPA, MDE, and AOC. As discussed in Section 2.3.3, it should be noted that a Hydraulic Containment groundwater treatment system was recently installed at the OU-4 / LPA Study Area located down-gradient of the eastern portion of the AOC land parcel where the highest impacts from inorganics in groundwater, specifically cobalt, have been observed. This system and the other on-going OU-4 source area treatment systems are expected to reduce VOC concentrations and affect groundwater quality

parameters overtime which may limit mobilization of inorganics within the LPA over time (see Section 2.3.3 for further detail).

7. Evaluation of Remedial Alternatives

Section 300.430(e) of the NCP lists nine criteria against which each RA must be assessed. The acceptability or performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified. The detailed criteria are as follows:

1. Protection of human health and the environment
2. Compliance with ARARs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

The NCP [Section 300.430(f)] states that the first two criteria, protection of human health and the environment and compliance with ARARs, are "threshold criteria" which must be met by the selected remedial action unless a waiver can be granted under Section 121(d)(4) of CERCLA. Criteria three through seven are "primary balancing criteria," and the trade-offs within this group must be balanced. The preferred alternative will be the alternative which is protective of human health and the environment, is ARAR-compliant, and provides the best combination of primary balancing attributes. The final two criteria, state and community acceptance, are "modifying criteria" which are evaluated following the comment period on the FFS report and the proposed plan. Criteria one through seven are described in further detail in the following sections. Only the first seven criteria are evaluated in this report. State and community acceptance will be evaluated in the ROD following the public comment period.

7.1 Evaluation Criteria

7.1.1 Overall Protection of Human Health and the Environment

This criterion involves an assessment based on a composite of factors addressed under other evaluation criteria, including long-term effectiveness, short-term effectiveness, and compliance with ARARs.

This criterion provides an evaluation of how the remedial alternative, as a whole, achieves RAOs and maintains protection of human health and the environment. A determination and declaration that this criterion will be met by the proposed remedial action must be made in the ROD; therefore, this is a threshold criterion, which must be met by the selected response action. This criterion will be met if the risks associated with exposure of ecological receptors to contaminated media are eliminated, reduced, or controlled through treatment, engineering, or ICs, and if the remedial action is protective of the environment.

7.1.2 Compliance with ARARs

This criterion assesses the compliance of an alternative with all contaminant-specific, action-specific, and location-specific ARARs. In the absence of ARARs, TBCs may also be taken into consideration as well as any other appropriate state or federal criteria, advisories, and guidance as they apply.

7.1.3 Long-Term Effectiveness and Permanence

This criterion examines the protection of human health and the environment after construction and implementation of the RA. This criterion addresses the long-term adequacy, reliability, and permanence of the RA.

7.1.4 Reduction of Toxicity, Mobility, and Volume through Treatment

This criterion examines the effectiveness of the RA in reducing the toxicity, mobility, and volume of contaminants through treatment. The statutory preference for remedial technologies that significantly and permanently reduce the toxicity, mobility, or volume of the waste is addressed by this criterion. The following factors will be considered:

- The amount of hazardous materials that will be destroyed or treated

- The degree of expected reduction in toxicity, mobility, or volume
- The degree to which the treatment will be irreversible
- The type and quantity of treatment residuals that will remain following treatment

7.1.5 Short-Term Effectiveness

The effects of the remedial alternative from construction and implementation to completion are addressed under this criterion. The following factors will be addressed:

- Protection of the community during the remedial action, including the effects of dust from excavation, transportation of contaminated materials, and air-quality impacts from on-site treatment
- Protection of workers during the remedial action
- Environmental impacts of the remedial action
- Time required to achieve RAOs

7.1.6 Implementability

This criterion considers the technical and administrative feasibility of each alternative, as well as availability of required resources. Factors considered in assessing this criterion include construction, operation, and maintenance of the RA; required approvals and permits from regulatory agencies; availability of required off-site treatment or disposal services; and availability of necessary equipment, materials, and personnel for implementation.

7.1.7 Cost

This criterion involves development and evaluation of the capital cost of construction, equipment, land, buildings, engineering services, and project administration, and O&M costs for labor, spare parts, materials, and administration. In addition, the present worth of each alternative is calculated using a discount rate of seven percent. Costs are then compared on a common, present-worth basis in terms of year 2012 dollars. The level of detail employed in developing these estimates is considered appropriate

for making choices between alternatives, but the estimates are not intended for use in detailed budgetary planning.

7.2 Analysis of Soil Alternatives

This section includes individual and comparative analyses of the alternatives proposed for the Site with respect to the seven evaluation criteria described in Section 7.1. The comparative analysis of remedial alternatives to address soil at the Site is summarized in **Table 7-1**.

7.2.1 Individual Analysis of Soil Alternatives

7.2.1.1 Alternative SL-1 – No Action

According to the NCP, the level of protectiveness achieved must be compared to the required expenditure of time and materials as an integral portion of the response action selection process. The no action alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives. Under this alternative, no remedial actions would be performed and no efforts would be made to contain, remove, or monitor impacted soil at the Site.

- Overall Protection of Human Health and the Environment: The no-action alternative provides no control of exposure to impacted soil at the Site and no reduction in risk to human health. Currently there is no unacceptable risk to human health under the current land use; however, future land use scenarios suggest unacceptable risks may occur. Therefore, Alternative 1 does not meet this criterion for overall protection of human health and the environment.

- Compliance with ARARs: ARARs are not met by the No Action alternative.

- Long-Term Effectiveness and Permanence: The no-action alternative does not provide controls for monitoring reduction of concentrations over time, reduction of exposure, or long-term management measures. Potential future risks would remain under this alternative.

- Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative does not employ treatment that would reduce the toxicity, mobility, or volume of impacted soil; therefore, it does not meet this criterion.

- Short-Term Effectiveness: Implementation of this alternative does not mitigate any potential future risks from site-related constituents. However, the no-action alternative does not pose any additional risks to the community, the workers, or the environment because there are no remedial activities associated with it.

- Implementability: There are no implementability concerns posed by this option.

- Cost: There are no present overhead costs and capital costs for the no-action alternative because there would be no action taken.

7.2.1.2 Alternative SL-2 – Land Use Controls

Alternative SL-2 includes maintenance of existing LUCs to restrict future land uses at the Site and prevent exposure to Site COCs in soil.

- Overall Protection of Human Health and the Environment: LUCs to restrict future land use and preclude residential use would limit uncontrolled exposure to soil, thereby controlling potential future unacceptable risks to human health.

- Compliance with ARARs: This alternative would address potential commercial worker risk by controlling access to the soils and comply with ARARs.

- Long-Term Effectiveness and Permanence: Implementation of LUCs would be effective in the long-term preventing future risks to human health posed by soils at the Site. The permanence would require maintenance of the LUCs which is readily achievable through existing controls that would remain in place for the foreseeable future as ownership of the Site is not planned to change and will remain with the AOC.

- Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative would not reduce toxicity, mobility, and volume through treatment at the Site.

- Short-Term Effectiveness: Implementation of this alternative does not pose any additional risks to the community, the workers, or the environment as there are no active remedial activities associated with it.

- Implementability: There are no implementability concerns posed by this option as this alternative requires minimal time and coordination of labor, materials, and resources for completion.

- Cost: The costs and detailed assumptions associated with the implementation of Alternative SL-2 are presented in **Appendix A-1.** The total projected present worth cost to implement LUCs to restrict future land use at the Site is estimated to be low to moderate:

    - Capital Cost – $0

    - Present Worth O&M Cost – $82,186

    - Total Present Worth Cost - $82,186

7.2.1.3 Alternative SL- 3 – Lead Hot Spot Soil Excavation with Off-site Disposal

Alternative SL-3 incorporates excavation of soil in known lead hot spot areas with off-site disposal. Excavation of subsurface soil encompassing sampling locations AOCGP01 and AOCGP06 at 7 ft bgs and sampling locations AOCGP09 and AOCGP10 at 10 ft bgs as depicted on **Figures 6-1** and **6-2**, respectively.

- Overall Protection of Human Health and the Environment: Alternative SL-3 is protective of human health and the environment. Excavation of the two hot spot areas would permanently remove subsurface soils containing COCs at the highest concentrations such that the site-wide EPC for lead is below the lead PRG for residential exposures (418 mg/kg).

- Compliance with ARARs: This alternative would be implemented in compliance with action-specific ARARS.

- Long-Term Effectiveness and Permanence: A removal action for soil would provide a long-term and permanent solution to impacted soil at the Site.

- Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative would reduce the on-site toxicity, mobility, and volume of impacted soil through excavation.

- Short-Term Effectiveness: Marginal short-term risks to the community and construction workers are present when soils are excavated and transported to an off-site facility for disposal. However, the potential for exposure during excavation would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques.

- Implementability: There are no implementability concerns posed by this option. However this alternative will require logistical coordination with the FGGM Environmental Division, and AOC to ensure impacted soil is trucked through, and off, the installation in a safe manner.

- Cost: The costs and detailed assumptions associated with the implementation of Alternative SL-3 are presented in **Appendix A-2.** The total projected present worth cost to implement removal and disposal at the Site is estimated to be moderate:

    - Capital Cost – $69,387

    - Present Worth O&M Cost – $0

    - Total Present Worth Cost - $69,387

7.2.2 Comparative Analysis of Soil Alternatives

The comparative analysis of alternatives includes an evaluation of the expected performance of each alternative relative to the other alternatives with respect to the seven criteria described in Section 7.1. The objective of this analysis is to identify the respective advantages and disadvantages of the alternatives.

7.2.2.1 Overall Protection of Human Health and the Environment

Alternative 1 does not address potential exposures at the site. Both alternatives SL-2 and SL-3 either remove or control possible future exposure to COCs in impacted soil.

7.2.2.2 Compliance with ARARs

The no action alternative does not comply with ARARs. Both alternatives SL-2 and SL-3 comply with ARARs as the exposure pathway would be eliminated through site-

specific LUCs (SL-2) or through hot spot excavation such that the remaining site-wide EPC is below the lead PRG for residential exposures (418 mg/kg).

7.2.2.3 Long-Term Effectiveness and Permanence

Under Alternative SL-1, potential residual risk would remain unchanged and the adequacy and reliability of this alternative would be poor. Alternatives SL-2 and SL-3 are effective in the long-term because they would reduce risk to human health by controlling or removing pathways of exposure to COCs in soil. For Alternative SL-2, LUCs are required to restrict land use and remove pathways of exposure. Alternative SL-3 proposes the excavation of lead hot spots so the resulting site-wide EPC for lead is below established PRGs for residential exposures. Of these three alternatives, Alternative SL-3 would be most effective in the long-term since it permanently removes impacted soils from the Site.

7.2.2.4 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives SL-1 and SL-2 would not reduce the toxicity, mobility, and volume through treatment of impacted soil at the Site. Alternative SL-3 would reduce the toxicity, mobility, and volume by excavating contaminated soil.

7.2.2.5 Short-Term Effectiveness

Alternative SL-1 is considered effective in the short-term as there are no risks to human health under the current land use. However, Alternative SL-1 is ineffective overall because there is no action taken to address risk to human health under future l land use scenarios. Alternative SL-2 is also considered effective in the short-term as it addresses risks to human health under l future land use scenarios through controlling exposure pathways. Under Alternative 3, marginal short-term risks to the community and construction workers are present when soils are excavated and transported to an off-site facility for disposal. However, the potential for exposure during excavation would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques.

7.2.2.6 Implementability

The most readily implementable alternatives are Alternatives SL-1 and SL-2. Alternative SL-3 presents additional complexities but they can be handled through industry standard construction and excavation techniques.

7.2.2.7 Cost

Based on the present worth estimates of probable costs for the alternatives, Alternative SL-2 is the more costly alternative and only controls but does not eliminate the hazards posed by site COCs to receptors under future hypothetical land use scenarios. SL-3 eliminates potential future risk by permanently removing the lead hotspots resulting in a site-wide EPC below the residential PRG for lead (418 mg/kg), and would therefore be considered cost-effective. Although there is no cost associated with Alternative SL-1, there is also no risk reduction under hypothetical land use scenarios or effectiveness provided by this alternative. Therefore, Alternative SL-1 would not be considered to be cost effective. Therefore, when considering risk reduction applicable to future land use scenarios in relation to cost for these three alternatives, Alternative SL-3 is the most cost effective option.

7.3 Analysis of Groundwater Alternatives

This section includes individual and comparative analyses of the alternatives proposed for the Site with respect to the seven evaluation criteria described in Section 7.1. The comparative analysis of groundwater remedial alternatives for the Site is summarized in **Table 7-2**.

7.3.1 Individual Analysis of Groundwater Alternatives

Individual analysis of alternatives consists of an evaluation and assessment of the proposed alternatives with respect to the seven evaluation criteria described in Section 7.1.

7.3.1.1 Alternative GW-1 – No Action

According to the NCP, the level of protectiveness achieved must be compared to the required expenditure of time and materials as an integral portion of the remedial alternative selection process. The no action alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives. Under this alternative, no remedial actions would be performed and no efforts would be made to contain, remove, or monitor impacted soil and groundwater at the Site.

- Overall Protection of Human Health and the Environment: The no-action alternative provides no control of exposure to impacted groundwater at the Site

and no reduction in potential future risk to human health or the environment. Currently groundwater is not used as a drinking source; however, MCLs are exceeded and future land use scenarios suggest unacceptable risks may occur should groundwater be used as a drinking water source. Therefore, Alternative GW-1 does not meet this criterion for overall protection of human health and the environment.

- Compliance with ARARs: ARARs are not met by the No Action alternative.

- Long-Term Effectiveness and Permanence: The no-action alternative does not provide controls for monitoring reduction of groundwater COCs concentrations over time, reduction of exposure, or long-term management measures. Potential future risks would remain under this alternative.

- Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative does not employ treatment that would reduce the toxicity, mobility, or volume of impacted groundwater; therefore, it does not meet this criterion.

- Short-Term Effectiveness: Implementation of this alternative does not mitigate any potential future risks from site-related constituents in groundwater. However, the no-action alternative does not pose any additional risks to the community, the workers, or the environment because there are no remedial activities associated with it.

- Implementability: There are no implementability concerns posed by this option.

- Cost: There are no present overhead costs and capital costs for the no-action alternative because there would be no action taken.

7.3.1.2 Alternative GW-2 – Land Use Controls and Long-term Monitoring of Groundwater

Alternative GW-2 includes installation of new and maintenance of existing LUCs to restrict shallow groundwater use at the Site to prevent exposure to Site COCs in groundwater.

- Overall Protection of Human Health and the Environment: Installation and maintenance of LUCs to implement a restriction on groundwater use would limit uncontrolled exposure to groundwater, thereby controlling potential future unacceptable risks to human health.

- Compliance with ARARs: This alternative would comply with ARARs through control of exposure pathways and LTM to document future groundwater conditions.

- Long-Term Effectiveness and Permanence: Implementation of LUCs would be effective in the long-term preventing hypothetical future risks to human health posed by groundwater use at the Site. The permanence would require maintenance of the LUCs which is readily achievable through existing controls that would remain in place for the foreseeable future as ownership of the Site is not planned to change and will remain with the AOC. Further, the LTM component of the remedy establishes means to monitor COCs in groundwater.

- Reduction of Toxicity, Mobility, and Volume through Treatment: This alternative would not reduce toxicity, mobility, and volume through treatment at the Site. However, it should be noted that a Hydraulic Containment groundwater treatment system was recently installed at the OU-4 / LPA Study Area located down-gradient of the eastern portion of the AOC land parcel where the highest impacts from inorganics in groundwater, specifically cobalt, have been observed. This system and the other on-going OU-4 source area treatment systems are expected to reduce VOC concentrations and affect groundwater quality parameters overtime which may limit mobilization of inorganics within the LPA over time (see Section 2.3.3 for further detail).

- Short-Term Effectiveness: This alternative is effective in the short-term given there is currently no risk under the current land use as groundwater is not used at the Site.

- Implementability: There are no implementability concerns posed by this option as this alternative requires minimal time and coordination of labor, materials, and resources for completion.

- Cost: The costs and detailed assumptions associated with the implementation of Alternative GW-2 are presented in **Appendix A-3.** The total projected present worth cost to implement LUCs to restrict future land use at the Site is estimated to be low to moderate:

    - Capital Cost – $0

    - Present Worth O&M Cost – $148,646

- Total Present Worth Cost - $148,646

7.3.2 Comparative Analysis of Groundwater Alternatives

7.3.2.1 Overall Protection of Human Health and the Environment

Under current land use, Alternatives GW-1 and GW-2 both provide protection to human health and the environment as there is no current risk. However, future land use scenarios at the Site present unacceptable risks. Alternative GW-2 would implement a groundwater use restriction which would control/prevent human contact with COCs in groundwater.

7.3.2.2 Compliance with ARARs

ARARs are not met by the No Action alternative. Under Alternative GW-2 exposure pathways are controlled and the LTM component of the remedy would establish a program to monitor COC concentrations in groundwater. There is no cohesive groundwater plume and active remedies would not be applicable or effective, However, LTM will document groundwater conditions and continue until such time as they fall below respective MCLs.

7.3.2.3 Long-Term Effectiveness and Permanence

Under Alternative GW-1, potential residual risk would remain unchanged, not monitored, and the adequacy and reliability of this alternative would be poor. Alternative GW-2 is effective in the long-term because it would reduce risk to human health by restricting groundwater use, thus, removing pathways of exposure to COCs in groundwater. The long-term effectiveness of the remedy would be monitored through annual inspections and five-year reviews.

7.3.2.4 Reduction of Toxicity, Mobility, or Volume of Wastes

Alternatives GW-1 and GW-2 would not reduce the toxicity, mobility, and volume through treatment of impacted groundwater at the Site. However, there is no cohesive groundwater plume and active remedies would not be applicable or effective.

7.3.2.5 Short-Term Effectiveness

Implementation of either alternative does not pose any additional risks to the community, the workers, or the environment as there are no active remedial activities associated with them.

7.3.2.6 Implementability

There are no implementability concerns posed by Alternative GW-2 as minimal time and coordination of labor, materials, and resources are needed for completion.

7.3.2.7 Cost

Although there is no cost associated with Alternative GW-1, there is also no risk reduction or effectiveness provided by this alternative. Alternative GW-2 mitigates risk posed by groundwater use under future land-use scenarios via a groundwater use restriction. Therefore, when considering risk reduction applicable to future land use scenarios in relation to cost for these two alternatives, Alternative GW-2 is the most cost effective option.

8. References

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Tables

Table 3-1
Lead Detections in Soil
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

			Sample ID (depth ft)	AOCGP01 (1)	AOCGP01 (4)	AOCGP01 (7)	AOCGP01 (10)	AOCGP02 (1)	AOCGP02 (4)	AOCGP02 (7)	AOCGP02 (10)	AOCGP03 (1)	AOCGP03 (4)	AOCGP03 (7)	AOCGP03 (10)	AOCDUP01	AOCGP04 (1)	AOCGP04 (4)	AOCGP04 (7)	AOCGP04 (10)	AOCGP05 (1)
			Location ID	AOCGP01	AOCGP01	AOCGP01	AOCGP01	AOCGP02	AOCGP02	AOCGP02	AOCGP02	AOCGP03	AOCGP03	AOCGP03	AOCGP03	AOCGP03	AOCGP04	AOCGP04	AOCGP04	AOCGP04	AOCGP05
			Sample Date	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		3.6	4.9	**6800**	1.7 J	7.3	11	9.8	2.2	4	16	0.41 J	12	8.1	22	86	1.4	1.1	160

			Sample ID (depth ft)	AOCGP05 (10)	AOCDUP02	AOCGPO6 (1)	AOCGPO6 (4)	AOCGPO6 (7)	AOCGPO6 (10)	AOCGPO7 (1)	AOCGPO7 (4)	AOCGPO7 (7)	AOCGPO7 (10)	AOCGPO8 (1)	AOCGPO8 (4)	AOCGPO8 (7)	AOCGPO8 (10)	AOCGPO9 (1)	AOCGPO9 (4)	AOCGPO9 (7)	AOCGPO9 (10)
			Location ID	AOCGP05	AOCGP05	AOCGP06	AOCGP06	AOCGP06	AOCGP06	AOCGP07	AOCGP07	AOCGP07	AOCGP07	AOCGP08	AOCGP08	AOCGP08	AOCGP08	AOCGP09	AOCGP09	AOCGP09	AOCGP09
			Sample Date	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010
			Sample Type	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		180	93	4.1	6.7	**5200**	4.1	3.2	6.6	0.30 J	1	45	100	0.86	1.4	97 J	38	14	**3300**

			Sample ID (depth ft)	AOCGP10 (4)	AOCGP10 (7)	AOCGP10 (10)	AOCGP11 (1)	AOCGP11 (4)	AOCGP11 (7)	AOCGP11 (10)	AOCGP12 (1)	AOCGP12 (4)	AOCGP12 (7)	AOCGP12 (10)	AOCGP13 (1)	AOCGP13 (4)	AOCGP13 (7)	AOCGP13 (10)	AOCDUP04	AOCGP14 (1)	AOCGP14 (4)
			Location ID	AOCGP10	AOCGP10	AOCGP10	AOCGP11	AOCGP11	AOCGP11	AOCGP11	AOCGP12	AOCGP12	AOCGP12	AOCGP12	AOCGP13	AOCGP13	AOCGP13	AOCGP13	AOCGP14	AOCGP14	AOCGP14
			Sample Date	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		5.5	200 J	**5600 J**	80 J	6.0 J	8.5 J	0.54 J	2.0 J	9.4 J	1.7 J	0.22 J	89 J	14 J	11 J	85 J	7	77 J	5.6 J

			Sample ID (depth ft)	AOCGP15 (1)	AOCGP15 (4)	AOCGP15 (7)	AOCGP15 (10)	AOCGP16 (1)	AOCGP16 (4)	AOCGP16 (7)	AOCGP16 (10)	AOC DUP 4	AOC GP17 (1)	AOC GP17 (4)	AOC GP17 (10)	AOC GP17 (7)	AOC GP17 (14)	AOC GP18 (1)	AOC GP18 (4)	AOC GP18 (7)	AOC GP18 (10)
			Location ID	AOCGP15	AOCGP15	AOCGP15	AOCGP15	AOCGP16	AOCGP16	AOCGP16	AOCGP16	AOCGP17	AOCGP17	AOCGP17	AOCGP17	AOCGP17	AOCGP17	AOCGP18	AOCGP18	AOCGP18	AOCGP18
			Sample Date	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	11/22/2010	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
			Sample Type	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		22 J	9.8	9.6	0.58	23	11	5.5	0.58	< 1.8 UJ	93 J	26 J	2.5 J	2.9 J	< 1.8 UJ	150	27	< 0.85 U	< 0.92 U

			Sample ID (depth ft)	AOC GP19 (4)	AOC GP19 (7)	AOC GP19 (10)	AOC GP19 (14)	AOC GP20 (1)	AOC GP20 (4)	AOC GP20 (7)	AOC GP20 (10)	AOC GP20 (14)	AOC GP21 (1)	AOC GP21 (4)	AOC GP21 (7)	AOC GP21 (10)	AOC GP21 (14)	AOC DUP 3	AOC GP22 (1)	AOC GP22 (4)	AOC GP22 (7)
			Location ID	AOCGP19	AOCGP19	AOCGP19	AOCGP19	AOCGP20	AOCGP20	AOCGP20	AOCGP20	AOCGP20	AOCGP21	AOCGP21	AOCGP21	AOCGP21	AOCGP21	AOCGP22	AOCGP22	AOCGP22	AOCGP22
			Sample Date	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		1.9	< 0.70 U	< 0.85 U	< 0.69 U	130 J	16 J	10 J	200	< 0.52 U	3.2	4.6 J	310 J	**1500 J**	3.1 J	< 1.9 UJ	86	4.9	240

Notes:
[1]Lead preliminary remediation goals (PRGs) for Residential Soil (418 mg/kg) were dereived using USEPA Integrated Exposure and Uptake Biokinetic (IEUBK) Model (win 32 Version 1.1 Build 11) assuming Geometric Standard Deviation of 1.6 in baseline blood levels, and a 5% probability of exceeding the 10 micrograms per deciliter (ug/dL) blood lead threshold. Lead PRG for Industrial Soil obtained from the USEPA Regional Screening Level Table (June, 2011).

Sample ID - Location (Depth in Feet) i.e. AOCGP15 (1)
N - normal sample
FD - duplicate sample
RBC - Risk Based Concentration
mg/kg - milligrams per kilogram
J - estimated concentration
U - Indicates the analyte was analyzed for but not detected
Results exceeding the United States Environmental Protection Agency Region III Residential Soil Risk Based Concentrations are shaded gray
Results exceeding the Residential PRG for lead is bolded

Table 3-1
Lead Detections in Soil
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

			Sample ID (depth ft)	AOCGP05 (4)	AOCGP05 (7)	AOC GP23 (1)	AOC GP23 (4)	AOC GP23 (7)	AOC GP23 (10)	AOC GP23 (14)	AOC GP24 (1)	AOC GP24 (4)	AOC GP24 (7)	AOC GP24 (10)	AOC GP24 (14)	AOC GP25 (1)	AOC GP25 (4)	AOC GP25 (7)	AOC GP25 (10)	AOC GP25 (14)	AOC DUP 2
			Location ID	AOCGP05	AOCGP05	AOCGP23	AOCGP23	AOCGP23	AOCGP23	AOCGP23	AOCGP24	AOCGP24	AOCGP24	AOCGP24	AOCGP24	AOCGP25	AOCGP25	AOCGP25	AOCGP25	AOCGP25	AOCGP25
			Sample Date	11/22/2010	11/22/2010	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		7.1	50	120	13	< 0.86 U	< 1.1 U	< 0.55 U	70 J	7.7 J	7.5 J	350 J	0.64 J	40 J	17 J	45 J	260 J	2.4 J	6.6 J

			Sample ID (depth ft)	AOCDUP03	AOCGP10 (1)	AOC GP26 (14)	AOC GP27 (1)	AOC GP27 (4)	AOC GP27 (7)	AOC GP27 (10)	AOC GP27 (14)	AOC GP28 (1)	AOC GP28 (4)	AOC GP28 (7)	AOC GP28 (10)	AOC GP28 (14)	AOC DUP 1	AOCGP29(1)	AOCGP29(4)	AOCGP29(7)	AOCGP29(10)
			Location ID	AOCGP10	AOCGP10	AOCGP26	AOCGP27	AOCGP27	AOCGP27	AOCGP27	AOCGP27	AOCGP28	AOCGP28	AOCGP28	AOCGP28	AOCGP28	AOCGP28	AOCGP29	AOCGP29	AOCGP29	AOCGP29
			Sample Date	11/22/2010	11/22/2010	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/7/2011	6/6/2011	6/6/2011	6/6/2011	6/6/2011
			Sample Type	FD	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		200 J	6	< 0.55 UJ	82 J	20 J	250 J	**1200 J**	< 0.56 UJ	93 J	3.2 J	10 J	77 J	3.4 J	< 1.5 UJ	88 J	12 J	2.4 J	200 J

			Sample ID (depth ft)	AOCGP14 (7)	AOCGP14 (10)	AOCGP30(10)	AOCGP30(14)	AOCGP31(14)	AOCGP31(10)	AOCGP31(7)	AOCGP31(4)	AOCGP31(1)	AOCGP32(14)	AOCGP33(14)	AOC-SB-18-5-6-(122204)	AOC-SB-19-5-6-(122204)	AOC-SB-20-6-7-(122204)	AOC-SB-21-7-8-(122204)	AOC-SB-22-6-7-(122304)	AOC-SB-23-7-8-(122304)	AOC-SB-24-6-7-(122204)
			Location ID	AOCGP14	AOCGP14	AOCGP30	AOCGP30	AOCGP31	AOCGP31	AOCGP31	AOCGP31	AOCGP31	AOCGP32	AOCGP33	AOC-SB-18	AOC-SB-19	AOC-SB-20	AOC-SB-21	AOC-SB-22-6-7	AOC-SB-23-7-8	AOC-SB-24
			Sample Date	11/22/2010	11/22/2010	6/6/2011	6/6/2011	6/6/2011	6/6/2011	6/6/2011	6/6/2011	6/6/2011	6/6/2011	6/6/2011	12/22/2004	12/22/2004	12/22/2004	12/22/2004	12/23/2004	12/23/2004	12/22/2004
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		45 J	6.3 J	8.1 J	0.34 J	1.7 J	180 J	3.7 J	10 J	36 J	1.9 J	3.0 J	4.4	1.9	0.58 B	1.5	1.2 B	0.8 B	0.91 B

			Sample ID (depth ft)	AOC GP18 (14)	AOC GP19 (1)	AOC-SB-31-9-10-(122004)	DC-SB-31-DUP-9-10-(12200	AOC-SB-32-(122004)	AOC-SB-32-6-7-(122004)	AOC-SB-33-6-8-(122004)	AOC-SB-34-7-8-(122104)	AOC-SB-35-6-7-(122104)	AOC-SB-39-5-6-(121604)	AOC-SB-39-8-9(121604)	AOC-SS-18-(122204)	AOC-SS-19-(122204)	AOC-SS-20-(122204)	AOC-SS-21-DUP-(122204)	AOC-SS-21-(122204)	AOC-SS-22-(122304)	AOC-SS-23-(122304)
			Location ID	AOCGP18	AOCGP19	AOC-SB-31	AOC-SB-31	AOC-SB-32	AOC-SB-32	AOC-SB-33	AOC-SB-34	AOC-SB-35	AOC-SB-39	AOC-SB-39	AOC-SS-18	AOC-SS-19	AOC-SS-20	AOC-SS-21	AOC-SS-21	AOC-SS-22	AOC-SS-23
			Sample Date	6/7/2011	6/7/2011	12/20/2004	12/20/2004	12/20/2004	12/20/2004	12/20/2004	12/21/2004	12/21/2004	12/16/2004	12/16/2004	12/22/2004	12/22/2004	12/22/2004	12/22/2004	12/22/2004	12/23/2004	12/23/2004
			Sample Type	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		< 1.0 U	4.7	1.9	2.2	28.7	1.8	3.9	< 0.49 U	< 0.39 U	3.4	1.8	6.3	2.7	6.2	7	8.7	31.9	7.2

			Sample ID (depth ft)	AOC GP22 (10)	AOC GP22 (14)	AOC-SS-30-(122004)	AOC-SS-31-(122004)	AOC-SS-33-(121604)	AOC-SS-34-(122104)	AOC-SS-35-(122104)	AOC-SS-36-(122304)	AOC-SS-37-(122304)	AOC-SS-39-(121604)	AOC-SS-41-(122304)	AOC-SS-41-DUP-(122304)	AOC-SS-42-(122304)	DPT-10A-20000720	DPT-10B-20000720	DPT-11-A-20000607	DPT-11-B-20000607	DPT-12A-20000720
			Location ID	AOCGP22	AOCGP22	AOC-SS-30	AOC-SS-31	AOC-SS-33	AOC-SS-34	AOC-SS-35	AOC-SS-36	AOC-SS-37	AOC-SS-39	AOC-SS-41	AOC-SS-41	AOC-SS-42	DPT-10A	DPT-10B	DPT-11A	DPT-11B	DPT-12A
			Sample Date	6/7/2011	6/7/2011	12/20/2004	12/20/2004	12/16/2004	12/21/2004	12/21/2004	12/23/2004	12/23/2004	12/16/2004	12/23/2004	12/23/2004	12/23/2004	7/20/2000	7/20/2000	7/6/2000	7/6/2000	7/20/2000
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		3.2	< 1.6 U	4.6	4.4	7.6	3	2.2	4.1	18.6	1.9	82.6	36.5	3.9	3.6	4.1	7.7	3	1.6

Notes:
[1]Lead preliminary remediation goals (PRGs) for Residential Soil (418 mg/kg) were dereived using USEPA Integrated Exposure and Uptake Biokinetic (IEUBK) Model (win 32 Version 1.1 Build 11) assuming Geometric Standard Deviation of 1.6 in baseline blood levels, and a 5% probability of exceeding the 10 micrograms per deciliter (ug/dL) blood lead threshold. Lead PRG for Industrial Soil obtained from the USEPA Regional Screening Level Table (June, 2011).

Sample ID - Location (Depth in Feet) i.e. AOCGP15 (1)
N - normal sample
FD - duplicate sample
RBC - Risk Based Concentration
mg/kg - milligrams per kilogram
J - estimated concentration
U - Indicates the analyte was analyzed for but not detected
Results exceeding the United States Environmental Protection Agency Region III Residentia
Results exceeding the Residential PRG for lead is bolded

Table 3-1
Lead Detections in Soil
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

			Sample ID (depth ft)	AOC GP26 (1)	AOC GP26 (4)	AOC GP26 (7)	AOC GP26 (10)	DPT-14B-20000720	DPT-15A-20000720	DPT-15B-20000720	DPT-16A-20000720	DPT-16B-20000720	DPT-17-A-20000607	DPT-17-B-20000607	DPT-1A-20000721	DPT-1B-20000721	DPT-3A-20000721	DPT-3B-20000721	DPT-4A-20000721	DPT-4B-20000721	DPT-5-A-20000607
			Location ID	AOCGP26	AOCGP26	AOCGP26	AOCGP26	DPT-14B	DPT-15A	DPT-15B	DPT-16A	DPT-16B	DPT-17A	DPT-17B	DPT-1A	DPT-1B	DPT-3A	DPT-3B	DPT-4A	DPT-4B	DPT-5A
			Sample Date	6/7/2011	6/7/2011	6/7/2011	6/7/2011	7/20/2000	7/20/2000	7/20/2000	7/20/2000	7/20/2000	7/6/2000	7/6/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/6/2000
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		51 J	76 J	4.6 J	12 J	1.2	9.9	0.45 B	3.5	3.3	0.63	1.4	4.7	36	1.8	4	4.7	0.6	0.39 B

			Sample ID (depth ft)	AOCGP29(14)	AOCGP30(1)	AOCGP30(4)	AOCGP30(7)	DPT-8-B-20000607	DPT-9-A-20000607	DPT-9-B-20000607	NW-2A-20000721	NW-2B-20000721	NW-2C-20000721	NW-4A-20000720	NW-4B-20000720	NW-4C-20000720	RHB-LWR-20000719-SS	RHB-MID-20000719-SS	RHB-UPR-20000719-SS	SB01-DPT-02-20000724	SB01-DPT-09-20000724
			Location ID	AOCGP29	AOCGP30	AOCGP30	AOCGP30	DPT-8B	DPT-9A	DPT-9B	NW-2A	NW-2B	NW-2C	NW-4A	NW-4B	NW-4C	RHB-LWR	RHB-MID	RHB-UPR	SB01-DPT-02	SB01-DPT-09
			Sample Date	6/6/2011	6/6/2011	6/6/2011	6/6/2011	7/6/2000	7/6/2000	7/6/2000	7/21/2000	7/21/2000	7/21/2000	7/20/2000	7/20/2000	7/20/2000	7/19/2000	7/19/2000	7/19/2000	7/24/2000	7/24/2000
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		3.8 J	82 J	11 J	1.9 J	5.1	5.4	24	1.5	2.1	0.54 B	0.79	2	1.4	10	3.1	9.8	5	6

			Sample ID (depth ft)	AOC-SB-24-5-6-(122304)	AOC-SB-28-6-8-(122104)	AOC-SB-29-6-8-(122104)	AOC-SB-30-9-10-(122004)	SB02-DPT-02-20000803	SB02-DPT-11-20000803	SB02-DPT-15-20000803	SB02-DPTD-02-20000725	SB02-DPTD-11-20000803	SB02-LOC-02-20000721	SB02-LOC-02D-20000721	SB02-LOC-09-20000721	SB02-LOC-09D-20000721	SB03-DPT-02-20000727	SB03-DPT-11-20000727	SB03-DPTD-11-20000727	SB03-HSA-02-20000731	SB03-HSA-11-20000731
			Location ID	AOC-SB-24-5-6	AOC-SB-28	AOC-SB-29	AOC-SB-30	SB02-DPT-02	SB02-DPT-11	SB02-DPT-15	SB02-DPTD-02	SB02-DPTD-11	SB02-LOC-02	SB02-LOC-02D	SB02-LOC-09	SB02-LOC-09D	SB03-DPT-02	SB03-DPT-11	SB03-DPTD-11	SB03-HSA-02	SB03-HSA-11
			Sample Date	12/23/2004	12/21/2004	12/21/2004	12/20/2004	8/3/2000	8/3/2000	8/3/2000	7/25/2000	8/3/2000	7/21/2000	7/21/2000	7/21/2000	7/21/2000	7/27/2000	7/27/2000	7/27/2000	7/31/2000	7/31/2000
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		< 1.3 U	26.7	**3350**	1.8	3.6	1.3	1	2.8	1.6	2.5	3	3.1	3	1.6	2.3	3.1	8	3.5

			Sample ID (depth ft)	AOC-SS-24-DUP-(122204)	AOC-SS-24-(122204)	AOC-SS-28-(122104)	AOC-SS-29-(122104)	SB05-DPT-09-20000728	SB05-DPT-18-20000728	SB05-HSA-02-20000727	SB05-HSA-11-20000727	SB05-HSA-19-20000727	SB06-HSA-02-20000727	SB06-HSA-11-20000727	SB06-HSA-20-20000727	SB07-DDT-02-20000801	SB07-DPT-09-20000801	SB07-DPT-17-20000801	SB07-HSA-02-20000724	SB07-HSA-09-20000724	SB07-HSA-25-20000725
			Location ID	AOC-SS-24	AOC-SS-24	AOC-SS-28	AOC-SS-29	SB05-DPT-09	SB05-DPT-18	SB05-HSA-02	SB05-HSA-11	SB05-HSA-19	SB06-HSA-02	SB06-HSA-11	SB06-HSA-20	SB07-DDT-02	SB07-DPT-09	SB07-DPT-17	SB07-HSA-02	SB07-HSA-09	SB07-HSA-25
			Sample Date	12/22/2004	12/22/2004	12/21/2004	12/21/2004	7/28/2000	7/28/2000	7/27/2000	7/27/2000	7/27/2000	7/27/2000	7/27/2000	7/27/2000	8/1/2000	8/1/2000	8/1/2000	7/24/2000	7/24/2000	7/25/2000
			Sample Type	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		4.1	4.5	7.8	118	2.9	0.77	6.8	1	0.26 B	2.8	2.4	0.49 B	4.4	0.58	0.62	85	2.7	1

			Sample ID (depth ft)	DPT-12B-20000720	DPT-13A-20000720	DPT-13B-20000720	DPT-14A-20000720	SB08-HSA-20-20000728	SB08-HSAB-11-20000728	SB09-DPT-02-20000728	SB09-DPT-09-20000728	SB09-DPT-18-	SB10-DDT-02-20000731	SB10-DPT-09-20000731	SB10-DPTD-09-20000731	SB11-DPT-02-20000802	SB11-DPT-09-20000802	SB11-DPT-11-20000802	SB12-DPT-02-20000802	SB12-DPT-11-20000802	SB12-DPT-15-20000802
			Location ID	DPT-12B	DPT-13A	DPT-13B	DPT-14A	SB08-HSA-20	SB08-HSAB-11	SB09-DPT-02	SB09-DPT-09	SB09-DPT-18	SB10-DDT-02	SB10-DPT-09	SB10-DPTD-09	SB11-DPT-02	SB11-DPT-09	SB11-DPT-11	SB12-DPT-02	SB12-DPT-11	SB12-DPT-15
			Sample Date	7/20/2000	7/20/2000	7/20/2000	7/20/2000	7/28/2000	7/28/2000	7/28/2000	7/28/2000	7/28/2000	7/31/2000	7/31/2000	7/31/2000	8/2/2000	8/2/2000	8/2/2000	8/2/2000	8/2/2000	8/2/2000
			Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)																		
Lead	mg/kg	418		1.2	2.2	2.9	13	2.2	4	2.4	0.39 B	0.76	2.1	0.81	0.73	2.1	0.69	0.16 B	11	1.4	1.7

Notes:
[1]Lead preliminary remediation goals (PRGs) for Residential Soil (418 mg/kg) were derived using USEPA Integrated Exposure and Uptake Biokinetic (IEUBK) Model (win 32 Version 1.1 Build 11) assuming Geometric Standard Deviation of 1.6 in baseline blood levels, and a 5% probability of exceeding the 10 micrograms per deciliter (ug/dL) blood lead threshold. Lead PRG for Industrial Soil obtained from the USEPA Regional Screening Level Table (June, 2011).

Sample ID - Location (Depth in Feet) i.e. AOCGP15 (1)
N - normal sample
FD - duplicate sample
RBC - Risk Based Concentration
mg/kg - milligrams per kilogram
J - estimated concentration
U - Indicates the analyte was analyzed for but not detected
Results exceeding the United States Environmental Protection Agency Region III Residentia
Results exceeding the Residential PRG for lead is bolded

Table 3-1
Lead Detections in Soil
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

			Sample ID (depth ft)	DPT-5-B-20000607	DPT-6-A-20000607	DPT-6-B-20000607	DPT-7-A-20000607	DPT-7-B-20000607	DPT-8-A-20000607	SS-2-20000607	SS-3-20000607	SS-4-20000607	SS-5-20000607	SS-6-20000607
			Location ID	DPT-5B	DPT-6A	DPT-6B	DPT-7A	DPT-7B	DPT-8A	SS-2	SS-3	SS-4	SS-5	SS-6
			Sample Date	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000	7/6/2000
			Sample Type	N	N	N	N	N	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)											
Lead	mg/kg	418		1.4	5.7	1.8	5.3	1.9	55	4.1	3.4	6.6	2.5	13

			Sample ID (depth ft)	SB01-DPT-18-20000725	SB01-DPTD-02-20000725	SB01-DPTD-18-20000725	SB01-HSA-02-20000725	SB01-HSA-11-20000725	SB01-HSA-23-20000725
			Location ID	SB01-DPT-18	SB01-DPTD-02	SB01-DPTD-18	SB01-HSA-02	SB01-HSA-11	SB01-HSA-23
			Sample Date	7/25/2000	7/25/2000	7/25/2000	7/25/2000	7/25/2000	7/25/2000
			Sample Type	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)						
Lead	mg/kg	418		11	9.4	10	1.7	5.7	2

			Sample ID (depth ft)	SB03-HSA-41-20000731	SB04-DPT-02-20000804	SB04-DPT-11-20000804	SB04-DPT-19-20000804	SB04-DPTD-19-20000804	SB05-DPT-02-20000728
			Location ID	SB03-HSA-41	SB04-DPT-02	SB04-DPT-11	SB04-DPT-19	SB04-DPTD-19	SB05-DPT-02
			Sample Date	7/31/2000	8/4/2000	8/4/2000	8/4/2000	8/4/2000	7/28/2000
			Sample Type	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)						
Lead	mg/kg	418		6	2.1	0.54	1.2	0.81	23

			Sample ID (depth ft)	SB07-HSAD-09-20000724	SB08-DPT-02-20000803	SB08-DPT-11-20000803	SB08-DPT-16-20000803	SB08-HSA-02-20000728	SB08-HSA-11-20000728
			Location ID	SB07-HSAD-09	SB08-DPT-02	SB08-DPT-11	SB08-DPT-16	SB08-HSA-02	SB08-HSA-11
			Sample Date	7/24/2000	8/3/2000	8/3/2000	8/3/2000	7/28/2000	7/28/2000
			Sample Type	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)						
Lead	mg/kg	418		3	3.6	0.26 B	1.3	1.7	5.2

			Sample ID (depth ft)	SB12-DPTD-11-20000802	SB13-DPT-02-20000802	SB13-DPT-18-20000802	SD01-LWRD-01-20000724	SS05-LOCD-01-20000724	SS-1-20000607
			Location ID	SB12-DPTD-11	SB13-DPT-02	SB13-DPT-18	SD01-LWRD-01	SS05-LOCD-01	SS-1
			Sample Date	8/2/2000	8/2/2000	8/2/2000	7/24/2000	7/24/2000	7/6/2000
			Sample Type	N	N	N	N	N	N
Constituent	Units	Residential PRG (mg/kg)[1]	Units (mg/kg)						
Lead	mg/kg	418		0.99	13	0.72	8.2	4.2	8.9

Notes:
[1]Lead preliminary remediation goals (PRGs) for Residential Soil (418 mg/kg) were derived using USEPA Integrated Exposure and Uptake Biokinetic (IEUBK) Model (win 32 Version 1.1 Build 11) assuming Geometric Standard Deviation of 1.6 in baseline blood levels, and a 5% probability of exceeding the 10 micrograms per deciliter (ug/dL) blood lead threshold. Lead PRG for Industrial Soil obtained from the USEPA Regional Screening Level Table (June, 2011).

Sample ID - Location (Depth in Feet) i.e. AOCGP15 (1)
N - normal sample
FD - duplicate sample
RBC - Risk Based Concentration
mg/kg - milligrams per kilogram
J - estimated concentration
U - Indicates the analyte was analyzed for but not detected
Results exceeding the United States Environmental Protection Agency Region III Residentia
Results exceeding the Residential PRG for lead is bolded

Table 3-2
Summary of Analytical Data for Constituents of Concern in Groundwater
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

				Sample ID	AOC-GW-18-(122204)	AOC-GW-19-(122204)	AOC-GW-19-DUP-(122204)	AOC-GW-29-(122104)	AOC-GW-30-(122004)	AOC-GW-34-(122104)	AOC-GW-35-(122104)	AOC-GW-39-(121604)	AOC-GW-43-(122304)	NW10-GW-01-20050125	AOC-SG-19-(122204)	EW03-LOC-20000828	EW2-GW-01-(011205)	EW3-GW-01-(011205)	GW01-DPT-20000725
				Location ID	AOC-GW-18	AOC-GW-19	AOC-GW-19	AOC-GW-29	AOC-GW-30	AOC-GW-34	AOC-GW-35	AOC-GW-39	AOC-GW-43	AOC-NW-10	AOC-SG-19	EW03-LOC	EW2-GW-01	EW3-GW-01	GW01-DPT
				Sample Date	12/22/2004	12/22/2004	12/22/2004	12/21/2004	12/20/2004	12/21/2004	12/21/2004	12/16/2004	12/23/2004	1/17/2005	12/22/2004	8/28/2000	1/12/2005	1/12/2005	7/25/2000
				Sample Type	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N
Constituent (ug/L)	Screening Levels [1]	USEPA region III MCLs	Units	fraction															
Aluminum	3700	NS	ug/l	T	1090	**6030**	2470	**11100 J**	1280	**7570 J**	**4070 J**	**22300**	**23100**	**12800 J**	--	--	39.9	2560	--
Arsenic	0.045	10	ug/l	D	< 0.12 UJ	--	**25.2**	< 0.15 U	< 0.12 UJ	< 0.27 U	< 0.29 U	**3.9 J**	< 0.12 UJ	< 5 UJ	**25.5**	< 2.6 U	< 1.1 U	< 0.12 UJ	**3.8 B**
Arsenic	0.045	10	ug/l	T	< 0.12 UJ	**24.6**	**20**	**6.9**	**1.7 J**	**19**	**48.2**	**17.9 J**	**0.59 J**	**23.7**	--	--	< 1.1 U	**3.1 B**	--
Chromium	0.043	100	ug/l	D	< 0.72 U	--	< 0.064 U	< 0.064 UJ	< 0.064 U	< 0.52 U	< 0.64 U	< 0.14 U	< 0.7 UJ	< 2 UJ	< 0.064 U	< 0.6 U	**5.4**	**3.9**	< 0.6 U
Chromium	0.043	100	ug/l	T	< 0.75 U	**18.3**	**8**	**23.6**	< 5.3 U	**56.4**	**85.5**	**104**	**29.3 J**	**98.3 J**	--	--	**5.1**	**23.9**	--
Cobalt	1.1	NS	ug/l	D	**9.2**	--	< 0.029 U	**2.7**	**15.3**	**4.7**	**5**	**3.4**	**2.4 J**	**4.1**	< 0.035 U	**6.7 B**	0.59 B	**3.3**	**26**
Cobalt	1.1	NS	ug/l	T	**9.6**	**1.4**	0.63 B	**7.1**	**20.6**	**5.9**	**6.3**	**53.3**	**6.3 J**	**5.9**	--	--	< 0.48 U	**3.6**	--
Iron	2600	NS	ug/l	T	504 J	**74600 J**	**68200 J**	**15600**	**6560**	**21800**	**51500**	**144000**	**9260 J**	**54300**	--	--	1930	**3040**	--

				Sample ID	GW01-LOC-20000825	GW01-LOCD-20000825	GW02-DPT-20000804	GW02-LOC-20000824	GW04-LOC-20000825	GW05-LOC-20000828	GW06-LOC-20000824	GW07-LOC-20000824	GW08-LOC-20000825	GW09-DPT-20000731	GW09-LOC-20010404	GW09-LOCD-20010404	GW10-LOC-20010504	GW11-LOC-20010504	GW12-LOC-20010404
				Location ID	GW01-LOC	GW01-LOCD	GW02-DPT	GW02-LOC	GW04-LOC	GW05-LOC	GW06-LOC	GW07-LOC	GW08-LOC	GW09-DPT	GW09-LOC	GW09-LOCD	GW10-LOC	GW11-LOC	GW12-LOC
				Sample Date	8/25/2000	8/25/2000	8/4/2000	8/24/2000	8/25/2000	8/28/2000	8/24/2000	8/24/2000	8/25/2000	7/31/2000	4/4/2001	4/4/2001	4/5/2001	4/5/2001	4/4/2001
				Sample Type	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Constituent (ug/L)	Screening Levels [1]	USEPA region III MCLs	Units	fraction															
Aluminum	3700	NS	ug/l	T	--	--	--	--	--	--	--	--	--	--	3600	3500	210	220	1200
Arsenic	0.045	10	ug/l	D	**7.1 B**	**6.5 B**	**11**	< 2.6 U	< 2.6 U	< 2.6 U	< 2.6 U	< 2.6 U	**6.1 B**	< 2.9 U	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U
Arsenic	0.045	10	ug/l	T	--	--	--	--	--	--	--	--	--	--	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U
Chromium	0.043	100	ug/l	D	**1.4 B**	**2.3 B**	< 0.6 U	**1.5 B**	**2 B**	< 0.6 U	< 0.6 U	< 0.6 U	**2 B**	< 0.6 U	**8.9 B**	**4 B**	**0.96 B**	**1.3 B**	**2.6 B**
Chromium	0.043	100	ug/l	T	--	--	--	--	--	--	--	--	--	--	**18**	**12**	**6.6 B**	**9.4 B**	**21**
Cobalt	1.1	NS	ug/l	D	**3.8 B**	**7.6 B**	**1.9 B**	**8.8 B**	**12**	**7 B**	**5.5 B**	**7.7 B**	**3.3 B**	**2.1 B**	**37**	**22**	**6.5 B**	**5.2 B**	**18**
Cobalt	1.1	NS	ug/l	T	--	--	--	--	--	--	--	--	--	--	**29**	**27**	**8.7 B**	**9.7 B**	**27**
Iron	2600	NS	ug/l	T	--	--	--	--	--	--	--	--	--	--	430 N	380 N	250 N	290 N	820 N

				Sample ID	NW11-GW-01-20050121	NW-12-(011205)	NW13-GW-01-20050117	NW13-GW-01-20050125	NW-14-(011205)	NW1-GW-01-20050125	NW2-GW-01-20050125	NW2-GW-01-DUP-20050125	NW4-GW-01-20050117	NW4-GW-01-20050125	NW5-GW-01-20050121	NW6-GW-01-20050121	NW7-GW-01-20050121	NW8-GW-01-20050121	NW9-GW-01-20050113
				Location ID	NW11-GW-01	NW-12	NW13-GW-01	NW13-GW-01	NW-14	NW1-GW-01	NW2-GW-01	NW2-GW-01-DUP	NW4-GW-01	NW4-GW-01	NW5-GW-01	NW6-GW-01	NW7-GW-01	NW8-GW-01	NW9-GW-01
				Sample Date	1/13/2005	1/12/2005	1/17/2005	1/17/2005	1/12/2005	1/17/2005	1/17/2005	1/17/2005	1/17/2005	1/17/2005	1/13/2005	1/13/2005	1/13/2005	1/13/2005	1/13/2005
				Sample Type	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Constituent (ug/L)	Screening Levels [1]	USEPA region III MCLs	Units	fraction															
Aluminum	3700	NS	ug/l	T	**6290 J**	561	3680 J	--	2960	< 100 J	**25400 J**	**21400 J**	**12000 J**	--	< 5 UJ	**37200 J**	**21500 J**	**5320 J**	**5020 J**
Arsenic	0.045	10	ug/l	D	< 5 UJ	< 0.12 UJ	--	< 5 UJ	< 0.3 U	< 5	< 5 UJ	< 5 UJ	--	< 5 UJ	**4.2 B**	**1.9 J**	**4.5 B**	**11.4**	--
Arsenic	0.045	10	ug/l	T	**2.8 J**	< 0.28 U	--	**9.7**	< 0.21 U	< 5	**63.2**	**49.1**	--	**14.7**	**23.9**	**24.8**	**7**	**18.1**	--
Chromium	0.043	100	ug/l	D	< 2 U	< 1.4 U	--	< 2 UJ	**3.7**	**1.2 UJ**	**0.064 UE**	**0.41 UJ**	--	**1.5 UJ**	**25.3**	**8.3**	**51.3**	**3.5**	--
Chromium	0.043	100	ug/l	T	**24.4**	**42.2**	--	**27.2 J**	**8.5**	< 2 J	**76.5 J**	**54.8 J**	--	**162 J**	**118**	**75.6**	**235**	**38.2**	--
Cobalt	1.1	NS	ug/l	D	0.84 J	**7**	--	**8.1**	**127**	0.61 B	**2**	**2.5**	--	**10.1**	**3.9 J**	**2 J**	**4.4 J**	0.76 J	--
Cobalt	1.1	NS	ug/l	T	0.96 J	**7.1**	--	**8.5**	**127**	0.92 B	**7.1**	**5.8**	--	**16.7**	**6.6 J**	**8.8 J**	**8.7 J**	**2 J**	--
Iron	2600	NS	ug/l	T	**9260**	480	--	**13600**	518	< 50	**173000**	**129000**	--	**13900**	**105000**	**70200**	**13200**	**24000**	--

				Sample ID	NW9-GW-01-20050121	NW9-GW-01DUP -20050121	NW9-GW-01DUP-20050121
				Location ID	NW9-GW-01	NW9-GW-01	NW9-GW-01
				Sample Date	1/13/2005	1/13/2005	1/13/2005
				Sample Type	N	FD	FD
Constituent (ug/L)	Screening Levels [1]	USEPA region III MCLs	Units	fraction			
Aluminum	3700	NS	ug/l	T	--	--	**3750 J**
Arsenic	0.045	10	ug/l	D	< 5 UJ	< 5 UJ	--
Arsenic	0.045	10	ug/l	T	**9.6**	--	**5.5**
Chromium	0.043	100	ug/l	D	< 2 U	< 2 U	--
Chromium	0.043	100	ug/l	T	**15.4**	--	**9.9**
Cobalt	1.1	NS	ug/l	D	**1.7 J**	**1.7 J**	--
Cobalt	1.1	NS	ug/l	T	**2.2 J**	--	**1.9 J**
Iron	2600	NS	ug/l	T	**8650**	--	**4930**

Notes:
[1] USEPA Regional Screening Levels (RSLs) for Tap water (USEPA, 2011, May) used as Screening Criteria. RSLs based on noncancer endpoints ("n") were adjusted downward to reflect an Hazard Quotient limit of 0.1 for use as Screening Criteria for all compounds.
D - dissolved
T - total
ug/l - micrograms per liter
J - estimated concentration
U - Indicates the analyte was analyzed for but not detected
N - normal sample
FD - duplicate sample
Cells exceeding the USEPA RSLs for Tap Water are bolded
Cells exceeding the United States Environmental Protection Agency Region III Maximum Contaminant Levels standard are shaded and boldfaced

Table 4-1
Chemical-Specific ARARs and TBC Guidance
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

Media	Authority	Regulation	Synopsis	Status
Groundwater	Federal Regulatory Requirement	Safe Drinking Water Act (SDWA) National Primary Drinking Water Regulations 40 CFR 141.62(b)(5)(16)	This regulation sets Maximum Contamination Levels (MCLs), which are maximum allowable concentrations of specified contaminants, as enforceable standards for surface or groundwater to be used in the drinking water supply. Subsections cited for arsenic and chromium.	ARAR

Notes:
ARAR – Applicable or Relevant and Appropriate Requirement
CFR – Code of Federal Regulations
TBC – To Be Considered

Table 4-2
Action-Specific ARARs and TBC Guidance
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

Activity	Authority	Regulation	Synopsis	Status
Excavation and Temporary On-site Staging	State Regulatory Requirement	Erosion and Sediment Control *COMAR 26.17.01.07 and 26.17.01.11*	This regulation is applicable when excavation, backfilling and regrading of soil are contemplated. It establishes procedures to prevent erosion through run-off and discharge of sediment in water bodies Construction projects that disturb in excess of 5,000 square feet or more than 100 cubic yards of earth must prepare an erosion and sediment control (E&SC) plan and retain a copy of the E&SC plan at the construction site. Further, construction projects that disturb greater than 1.0 acre, but less than 150 acres, must meet the substantive requirements of the General Permit for Stormwater Associated with Construction Activities. These requirements include special conditions (e.g., notification and response procedures for spills above reportable quantities), effluent limitations, the prevention of the discharge of significant amounts of sediments, monitoring, recording, and reporting. Finally, these regulations provide the standards and specifications for the design and implementation of E&SC and stormwater management.	ARAR
Excavation and Off-site Disposal	State Regulatory Requirement	Disposal of Controlled Hazardous Substances *COMAR 26.13.02.02, 26.13.02.03, 26.13.02.05A(1) and (2), and 26.13.03.01 through 26.13.03.06*	These regulations provides for the prevention, abatement, and control of contamination by addressing the identification and disposal of hazardous substances.	ARAR
General Remediation Activities	State Regulatory Requirement	Control of Noise Pollution *COMAR 26.02.03.02 COMAR 26 02.03.03*	This regulation applies to activities that produce regular or continuous sound that exceeds or may exceed established limits. It restricts noise to a level that protects the health, general welfare, and property of the people of the state. It also establishes an Environmental Noise Advisory Council and authorizes standards for ambient noise levels and equipment noise performance levels to be promulgated by the Department of Environment.	ARAR

Notes:
ARAR – Applicable or Relevant and Appropriate Requirement
COMAR – Code of Maryland Regulations
E&SC - erosion and sediment control
mg/L – milligrams per liter
TBC – to be considered

Table 5-1
Screening of the Soil Technologies
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

Criteria	**Technology 1 No Action**	**Technology 2 Land Use Controls**	**Technology 3 Lead Hot Spot Soil Excavation with Off-site Disposal**	**Technology 4 In-Situ Soil Stabilization/Solidification**	**Technology 5 Impermeable Capping**
Implementability	High: Readily implemented	High: Readily implemented	High: Easy implementation to engineer and complete the lead hot spot removal.	Moderate: Implementable, although may require semi-permanent infrastructure.	Moderate: Implementable, although may restrict future Site uses. May require significant regrading to control ponding of surface water.
Effectiveness	Low: Does not achieve remedial action objectives.	High: If properly enforced, land-use restrictions are an effective means of preventing exposure to contaminated soil. Because the site is a controlled military base, access is already restricted through institutional controls to limit authorized personnel only.	High: Provides protection to human health by permanently removing constituents in soil. There is no unacceptable risk to ecological receptors under this alternative.	High: Effective in reducing mobility of metals; does not remediate Site contaminants but does make the less bioavailable.	High: Reduces the potential for exposure; however, it does not remediate environmental impacts. Long-term effectiveness depends of future maintenance.
Cost	Low: Low capital cost, no O&M cost	Low: Low capital cost, low O&M cost	Moderate: Moderate capital cost, low O&M cost	Moderate: Moderate capital cost, low O&M cost	High: High capital costs, low O&M costs.
Screening Result	Retained	Retained	Retained	Not Retained: This technology was not considered for complete evaluation due to the higher complexity for implementation compared to other technologies.	Not retained: Does not offer significant benefits over less expensive technologies and does not permanently treat or remove COCs in soil.
Notes	The no action alternative must be fully evaluated according to 40 CFR 300.43(e)(6).		Permanent remedy for soil	Permanent remedy for soil	Permanent remedy for soil

Notes:
CFR - Code of Federal Regulations
COC - Constituent of Concern
O&M - Operation and Maintenance

Table 5-2
Screening of Groundwater Technologies
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

Criteria	**Technology 1** **No Action**	**Technology 2** **Land Use Controls and Long-term Monitoring of Groundwater**
Implementability	High: Readily implementable.	High: Readily implementable
Effectiveness	Low: Does not achieve remedial action objectives.	High: If properly enforced, land-use restrictions are an effective means of preventing exposure to contaminated groundwater. Land Use Controls would include a shallow groundwater use restriction at the Site. Further, the Site is within the fence line of a controlled military base, and access is already restricted to authorized personnel only. LTM is an effective means of tracking the frequency of detections and concentrations of COC at the Site, and ensuring that concentrations of COCs are not migrating Off-Post. LTM would occur in accordance with the CERCLA Section 121(c) five year review process.
Cost	Low Low capital cost, no O&M cost	Low: Low capital cost, low O&M cost
Screening Result	Retained	Retained
Notes	The no action alternative must be fully evaluated according to 40 CFR 300.43(e)(6).	

Notes:
CFR - Code of Federal Regulation
O&M - Operation and Maintenance

Table 7-1
Comparative Analysis of Remedial Alternatives for Soil
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

Criteria	Alternative SL-1 No Action	Alternative SL-2 Land Use Controls	Alternative SL-3 Hot Spot Soil Excavation with Off-Site Disposal
Overall Protection of Human Health and the Environment	There is no unacceptable risk to human health under current use land-use, but potential future use scenarios show unacceptable risk. There is no unacceptable risk to ecological receptors if no action is taken.	Provides protection to human health through the use of institutional or land use controls to prevent site constituents in soil from reaching human populations. There is no unacceptable risk to ecological receptors under this alternative.	Provides protection to human health by permanently removing constituents in soil presenting risk under reasonably anticipated future land use. There is no unacceptable risk to ecological receptors under this alternative.
Compliance with ARARs	Would not be incompliance with chemical-specific ARARs because constituents would remain in soil. Action-specific ARARs would not apply to this alternative.	Under the reasonable anticipated future land use there are no unacceptable risks or hazards and therefore chemical specific ARARs do not apply. However, for hypothetical future use where there are calculated risks because constituents would remain in soil and LUCs would be required. This alternative would comply with action-specific ARARs	This alternative would be implemented in compliance with action-specific ARARs.
Long-Term Effectiveness and Permanence	Magnitude of the residual risk would remain unchanged and the adequacy and reliability of this alternative would be poor.	Land use controls would be effective in the long-term. The permanence would require that the land use controls be maintained.	Effective in the long-term because constituents in soil exceeding PRGs would be excavated and permanently removed.
Reduction of Toxicity, Mobility, and Volume through Treatment	No reduction of toxicity, mobility or volume under this alternative.	No reduction of toxicity, mobility or volume through treatment is applicable under this alternative.	There would be a reduction of toxicity, mobility, and volume through removal of constituents in soil.
Short-Term Effectiveness	There is no risk posed under current land- use, however, there is no risk reduction applicable under potential future land-use scenarios.	This alternative is effective in the short-term considering that there is no risk under current use scenarios.	Marginal short-term risks to the community and construction workers are present when soils are excavated and transported to an off-site facility for disposal. However, the potential for exposure during excavation would be reduced through the use of suitable protective clothing and equipment, good construction practices, and standard dust suppression techniques.
Implementability	Readily implemented.	Readily implemented.	Low complexity for implementation to engineer and complete the excavation
Cost	Low cost because of no capital or overhead costs.	Low to moderate cost associated with maintaining the land use controls (Total Present Worth Cost - $82,186).	Moderate capital cost and low O&M cost (Total Present Worth Cost - $139,452)

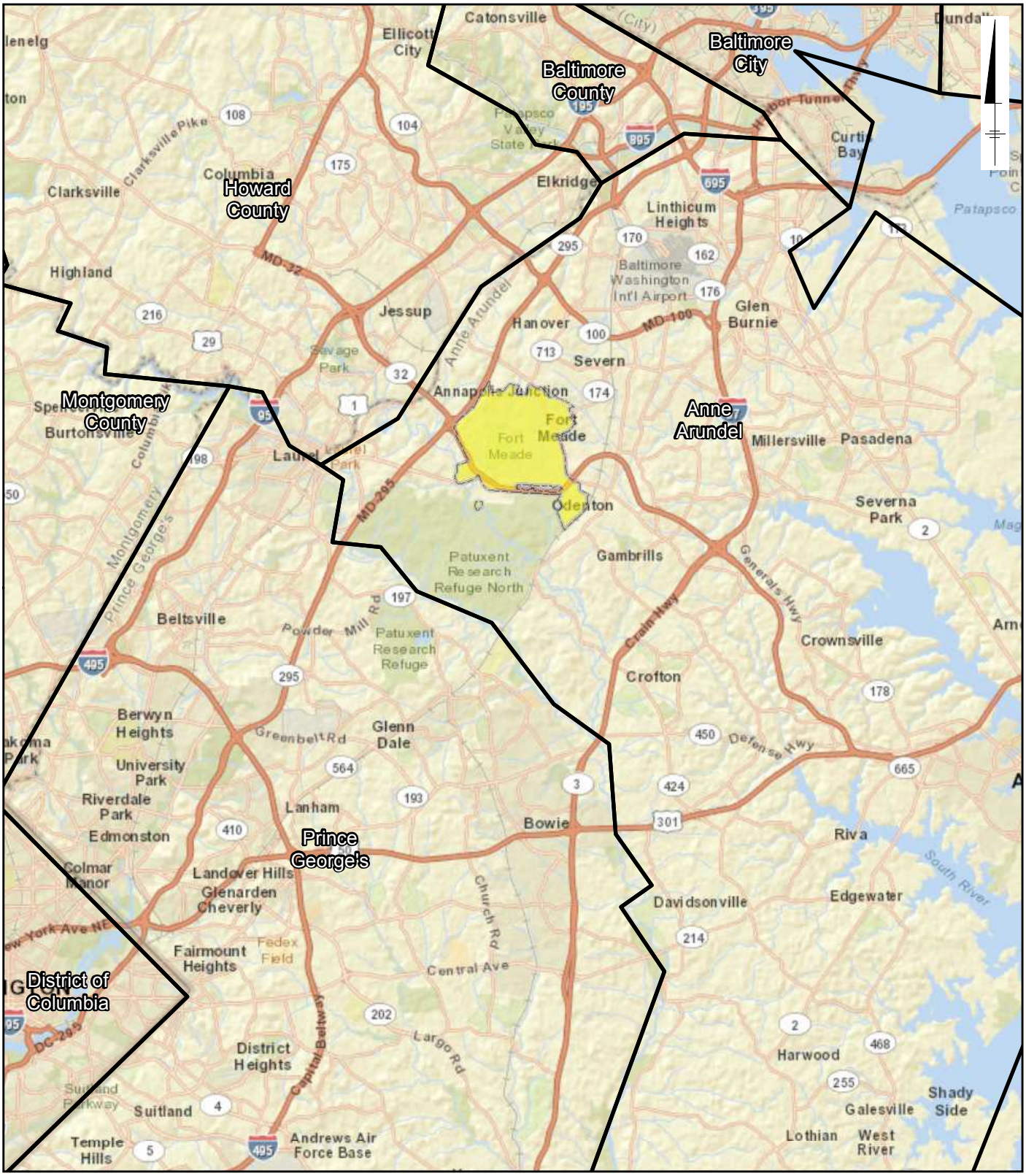
Notes:
ARAR – Applicable or Relevant and Appropriate Requirement
O&M – Operations and Maintenance

Table 7-2
Comparative Analysis of Remedial Alternatives for Groundwater
Architect of the Capitol, FGGM-74
Fort George G. Meade, Maryland

Criteria	Alternative GW-1 No Action	Alternative GW-2 Land Use Controls and Long-term Monitoring of Groundwater
Overall Protection of Human Health and the Environment	There is no unacceptable risk to human health under current land-use as groundwater is not used as a drinking source, however, potential future land-use scenarios present unacceptable risk. There is no unacceptable risk to ecological receptors if no action is taken.	Provides protection to human health through the use of institutional controls or land-use controls to prevent site constituents from reaching human populations. There is no unacceptable risk to ecological receptors under this alternative.
Compliance with ARARs	Would not be incompliance with chemical-specific ARARs because constituents would remain in groundwater. Location- and action-specific ARARs would not apply to this alternative.	Under the reasonable anticipated future land use there are no unacceptable risks or hazards and therefore chemical specific ARARs do not apply. However, under hypothetical future residential land use there are calculated risks, and MCL exceedances are documented, so Land Use Controls would be required.
Long-Term Effectiveness and Permanence	Magnitude of the residual risk would remain unchanged and the adequacy and reliability of this alternative would be poor.	Land Use Controls would be effective in the long-term. The permanence would require that the land-use controls be maintained.
Reduction of Toxicity, Mobility, and Volume through Treatment	No reduction of toxicity, mobility or volume through treatment.	No reduction of toxicity, mobility or volume through treatment.
Short-Term Effectiveness	There is no risk posed under current land-use, however, there is no risk reduction applicable under potential future land-use scenarios.	This alternative is effective in the short-term considering that there is no risk under current use scenarios.
Implementability	Readily implemented.	Readily implemented.
Cost	Low cost because of no capital or overhead costs.	Low to moderate cost associated with maintaining the land use controls (Total Present Worth Cost - $116,000).

Notes:
ARAR – Applicable or Relevant and Appropriate Requirements

Figures



Legend:

Installation Boundary

0 1 2 3 4 Miles

GRAPHIC SCALE

Notes:

1. Imagery accessed through Bing Maps via ArcGIS Online Layer Packages by ESRI (12/1/2010) (C) 2010 Microsoft Corporation and its data suppliers accessed on 5/1/2012 through ArcGIS 10

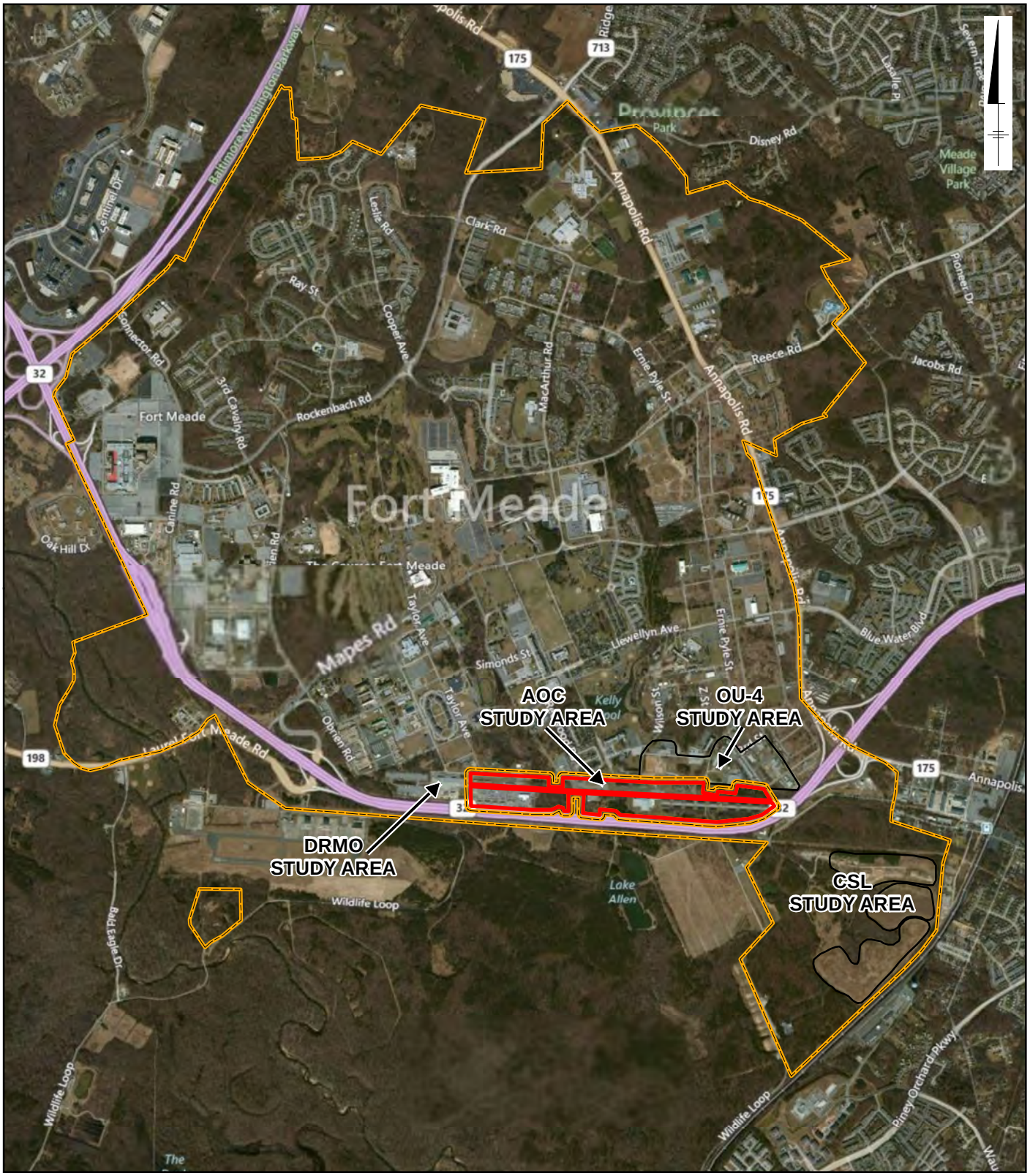
FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Fort George G. Meade Location Map

ARCADIS

FIGURE 2-1

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
FORT MEADE
Path: G:\GIS\Projects\Fort_Meade\ArcMap\AOC\AOC_FFS\Location_Map_20130328.mxd



Legend:

- Architect of the Capitol Boundary
- Installation Boundary

0 1,500 3,000 Feet

GRAPHIC SCALE

Notes:

1. Imagery accessed through Bing Maps via ArcGIS Online Layer Packages by ESRI (12/1/2010) (C) 2010 Microsoft Corporation and its data suppliers accessed on 5/1/2012 through ArcGIS 10

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Architect of the Capitol Location

ARCADIS

FIGURE
2-2

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
FORT MEADE
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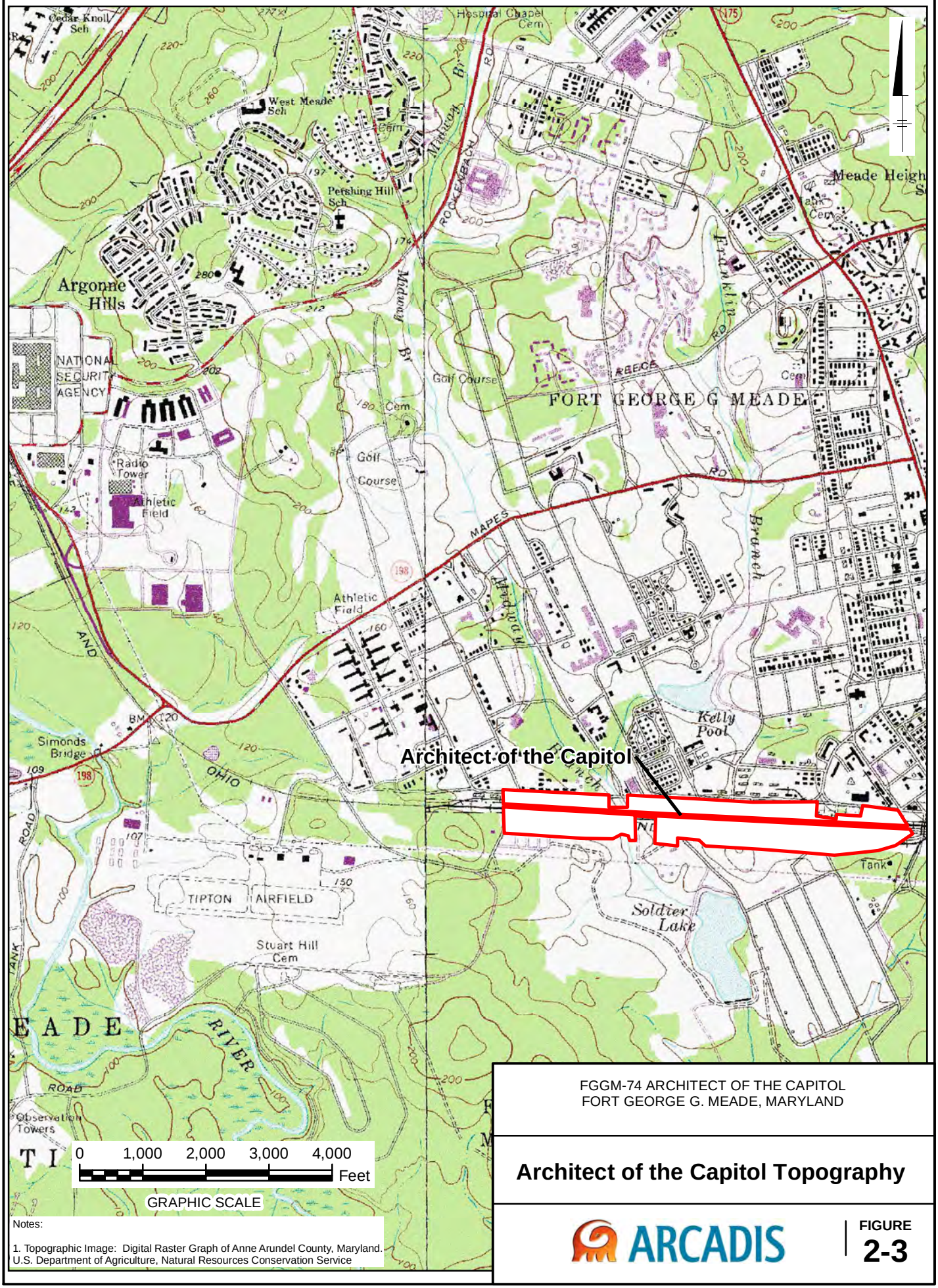

Notes:

1. Topographic Image: Digital Raster Graph of Anne Arundel County, Maryland. U.S. Department of Agriculture, Natural Resources Conservation Service

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Architect of the Capitol Topography

ARCADIS

FIGURE
2-3

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
FORT MEADE
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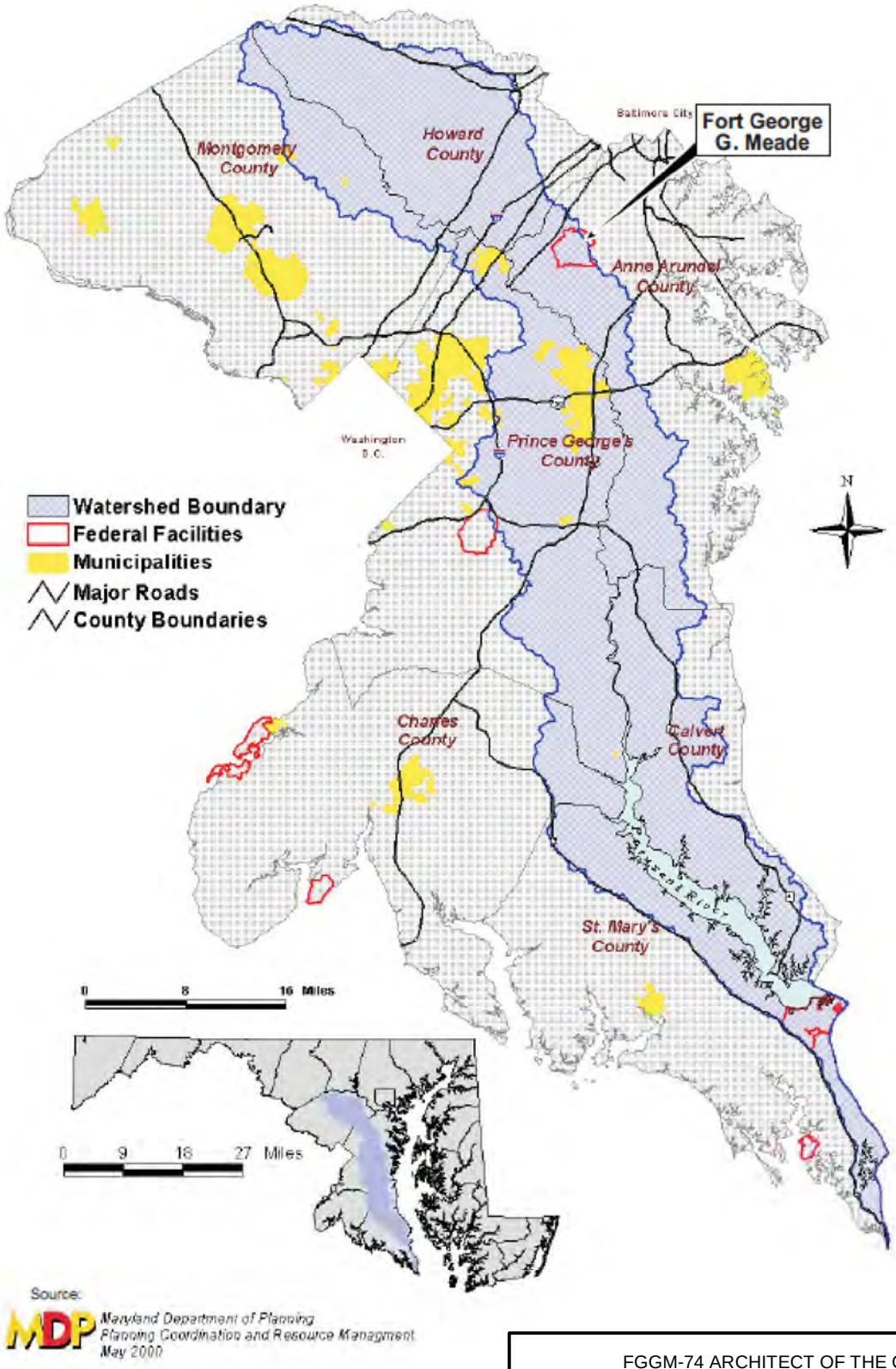


Source:
MDP Maryland Department of Planning
Planning Coordination and Resource Managment
May 2000

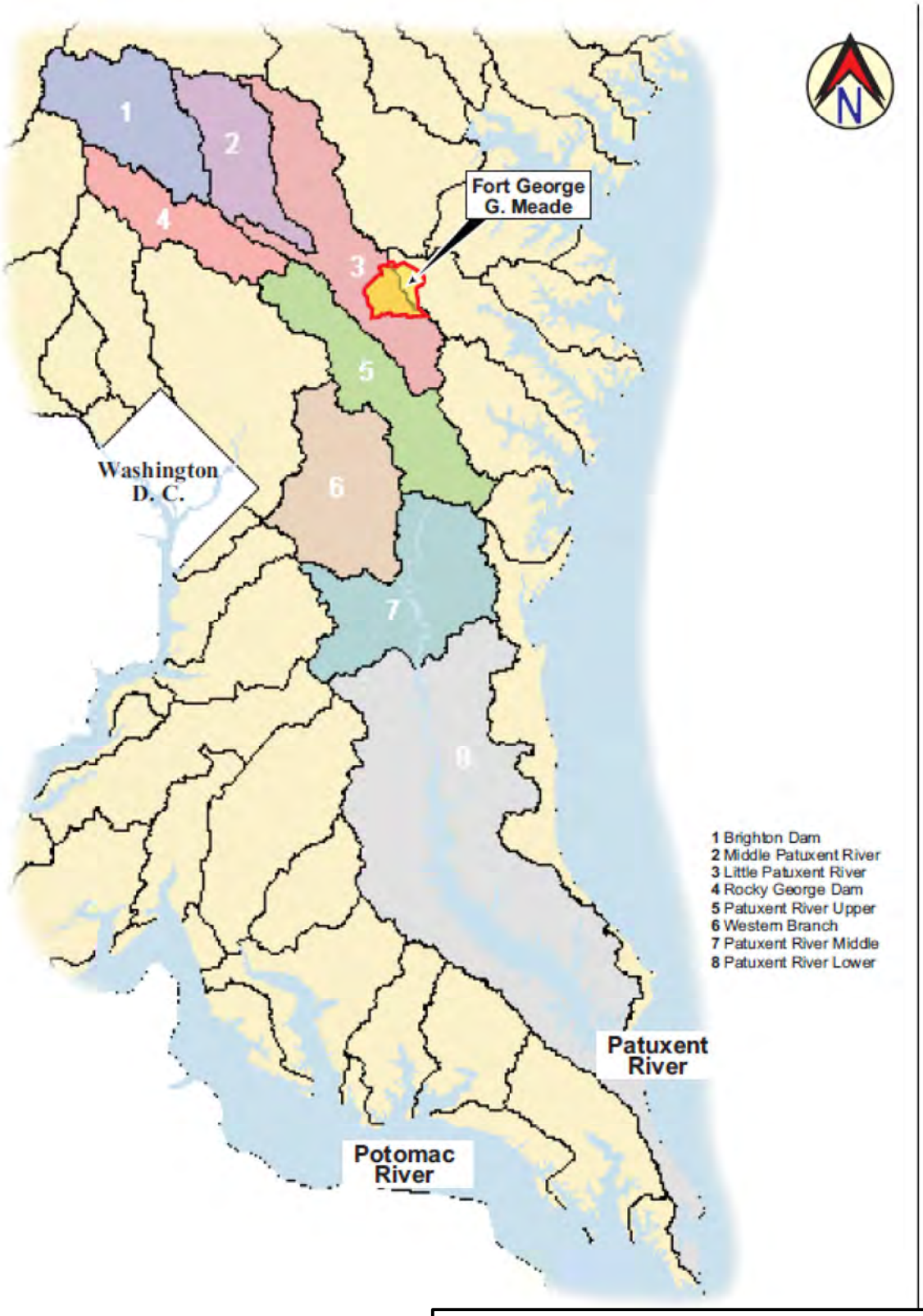
FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Patuxent River Watershed

ARCADIS

FIGURE
2-4

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
Path: G:\GIS\Projects\Fort_Meade\ArcMap\AOC\AOC_FFS\Patuxent_River_Watershed_20130405.mxd



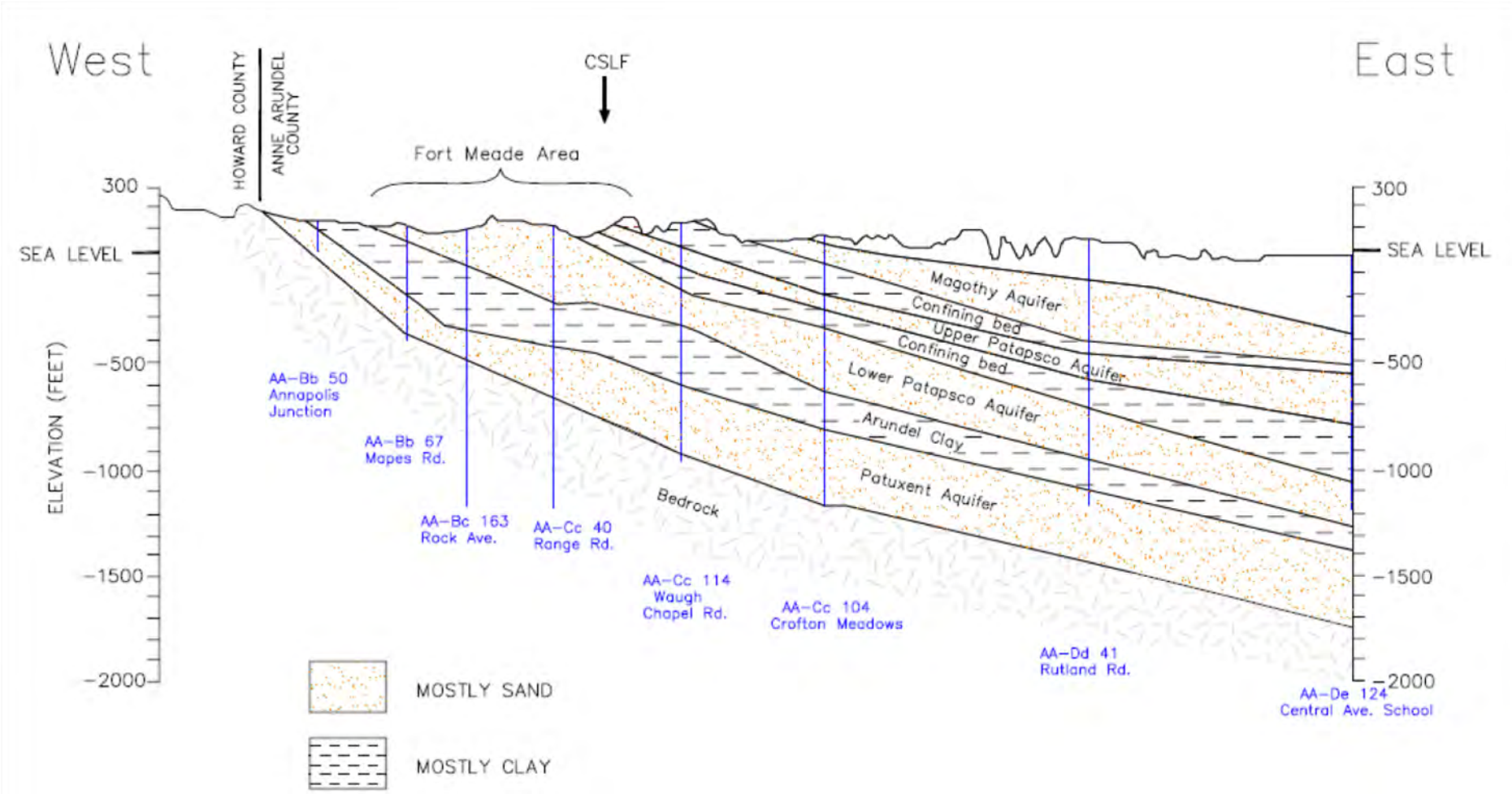
FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Patuxent River Watershed Sub-Basins

ARCADIS

FIGURE
2-5

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
Path: G:\GIS\Projects\Fort_Meade\ArcMap\AOC\AOC_FFS\Patuxent_River_SubBasins_20130405.mxd



Source: Mack and Achmad (1986)

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Hydrogeologic Section B-B'

ARCADIS

FIGURE
2-6

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
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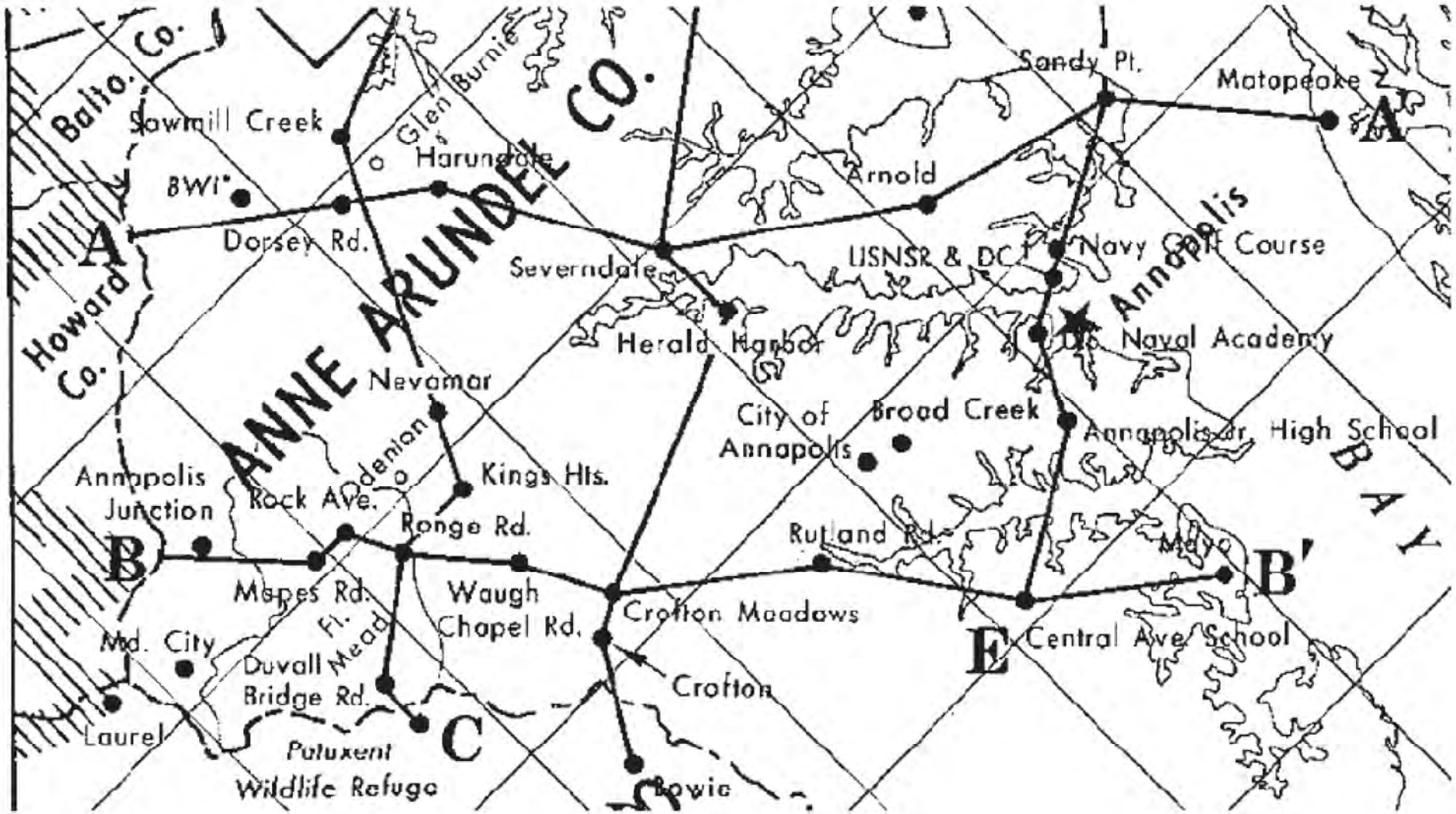

Source: Mack and Achmad (1986)

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

Location of Geologic Section B - B'

ARCADIS

FIGURE
2-7

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
FORT MEADE
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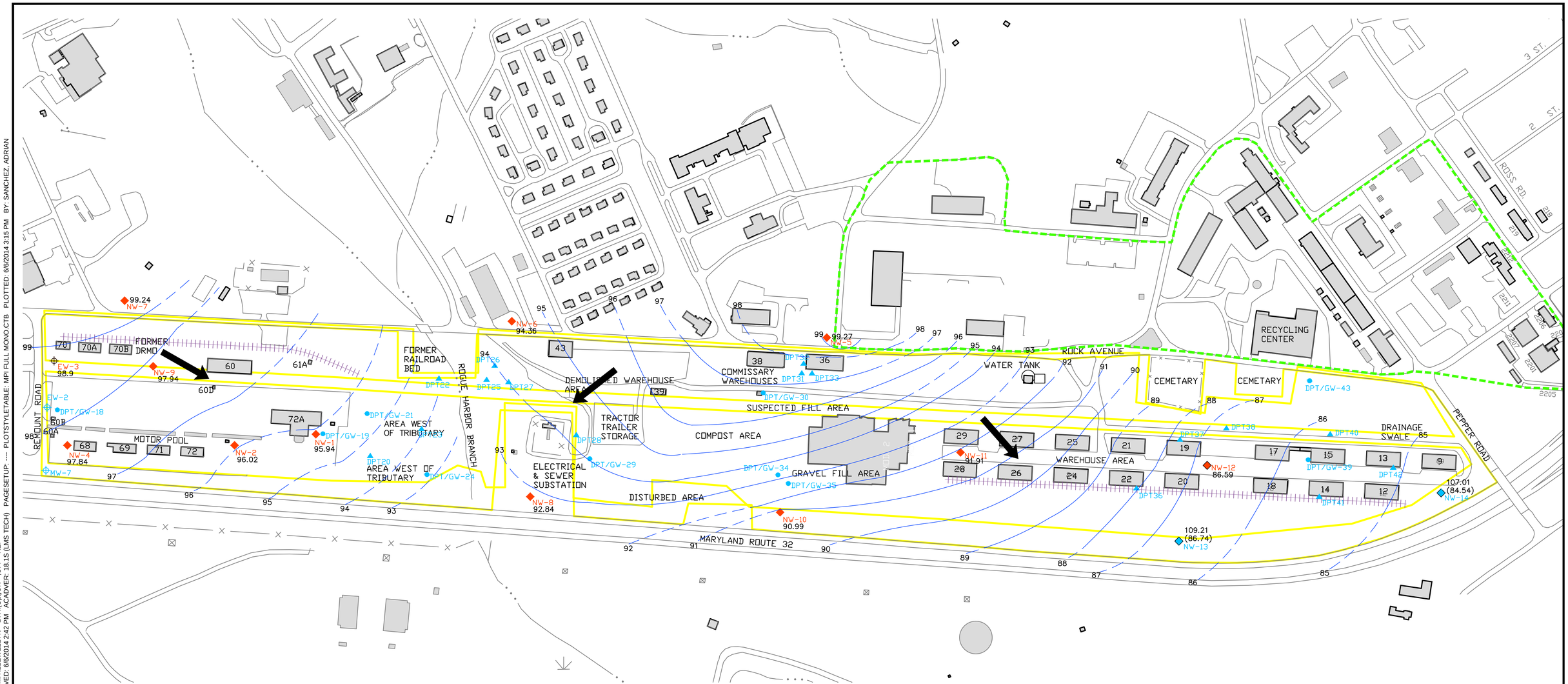
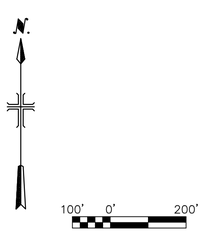




LEGEND

- RI PROJECT AREA
- DEMOLISHED BUILDINGS
- EXISTING BUILDINGS
- STREAM
- FENCE
- RAILROAD TRACKS
- AOC BOUNDARY
- OPERABLE UNIT 4

91.91 GROUNDWATER ELEVATION (FT ABOVE MSL)

90 GROUNDWATER ELEVATION CONTOUR (FT ABOVE MSL) (DASHED WHERE INFERRED)

NOTES:

1. GROUNDWATER ELEVATIONS SHOWN IN BRACKETS REPRESENT CORRECTED ELEVATIONS REVISED TO CORRELATE WITH ORIGINAL SITE MONITORING WELL SURVEY DATA.
2. → = APPROXIMATE DIRECTION OF GROUNDWATER FLOW
3. DUE TO THE LACK OF SURFACE WATER ELEVATION DATA FOR ROGUE HARBOR BRANCH, GROUNDWATER ELEVATION CONTOURS BETWEEN NW-1 AND ROGUE HARBOR BRANCH ARE SHOWN AS INFERRED (DASHED) CONTOUR LINES.

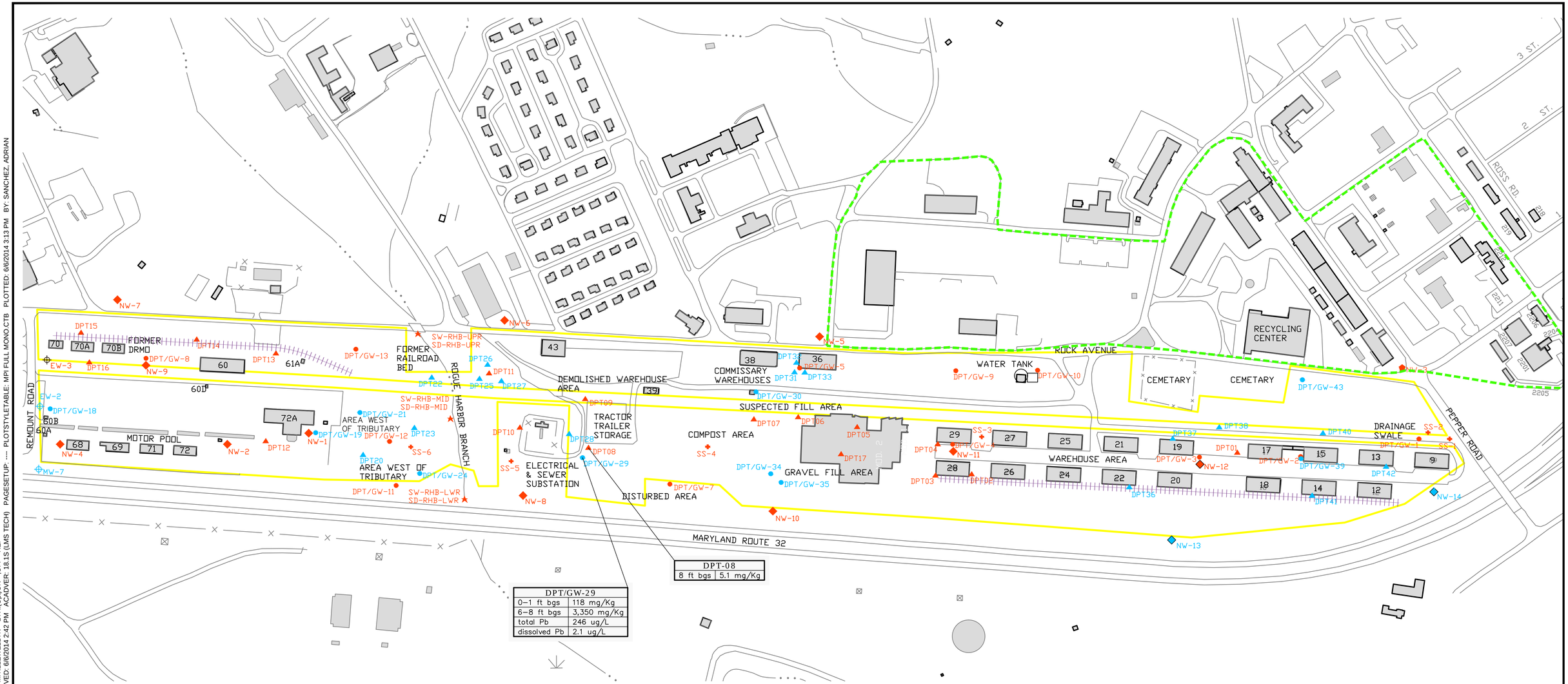
FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

GROUNDWATER POTENTIOMETRIC SURFACE MAP - JULY 2006

ARCADIS

FIGURE
2-8

CITY:SYR DIV/GROUP:ENVCAD DB:AS LD:(Opt) PIC:T.E.TALELE PM:T. LLEWELLYN TM:T.LLEWELLYN LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\GP09MEAD\AOC0\EA001\GP09MEAD F2-8.dwg LAYOUT: 2-8 SAVED: 6/6/2014 2:42 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: MPI FULL MONO.CTB PLOTTED: 6/6/2014 3:15 PM BY: SANCHEZ, ADRIAN
XREFS: IMAGES: PROJECTNAME: ----
Xref_Base_FtMeade



LEGEND

2000/2001 SAMPLING EVENT

- NEW FLUSH MOUNTED WELL (NW)
- DPT SOIL & GROUNDWATER – SAMPLED (DPT/GW)
- DPT SOIL (DPT)
- EXISTING WELL – SAMPLED (EW)
- SURFACE SOIL (SS)
- SURFACE WATER & SEDIMENT (SW/SD)
- HSA SOIL
- DPT SOILS & GROUNDWATER – NOT SAMPLED (DPT/GW)

2004/2005 SAMPLING EVENT

- GROUNDWATER MONITORING WELL LOCATION (NW)
- DPT SOIL & GROUNDWATER SAMPLING LOCATION (DPT/GW)
- DPT SOIL SAMPLING LOCATION (DPT)
- EXISTING WELL (EW)
- DPT GROUNDWATER SAMPLING LOCATION (DPT/GW)

OTHER

- RI PROJECT AREA
- DEMOLISHED BUILDINGS
- EXISTING BUILDINGS
- STREAM
- FENCE
- RAILROAD TRACKS
- AOC BOUNDARY
- OPERABLE UNIT 4

N

100' 0' 200'

NOTES:

1. RESULTS SHOWN ARE FOR LEADS IN SOIL AND GROUNDWATER.
2. SOIL RESULTS EXPRESSED IN MILLIGRAM PER KILOGRAM (mg/Kg).
3. GROUNDWATER RESULTS EXPRESSED IN MICROGRAMS PER LITER (ug/L).
4. DEPTH REPRESENTED IN FEET BELOW GROUND SURFACE (ft bgs).

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

SAMPLING LOCATIONS - REMEDIAL INVESTIGATION

ARCADIS

FIGURE
3-1

CITY:SYR DIV/GROUP:ENVCAD DB:AS LD:(Opt) PIC:T.E.TALELE PM:T.LLEWELLYN TM:T.LLEWELLYN LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\GP09MEAD\AOC0\EA001\GP09MEAD F3-1.dwg LAYOUT: 3-1 SAVED: 6/6/2014 2:42 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: MPI FULL MONO.CTB PLOTTED: 6/6/2014 3:13 PM BY: SANCHEZ, ADRIAN
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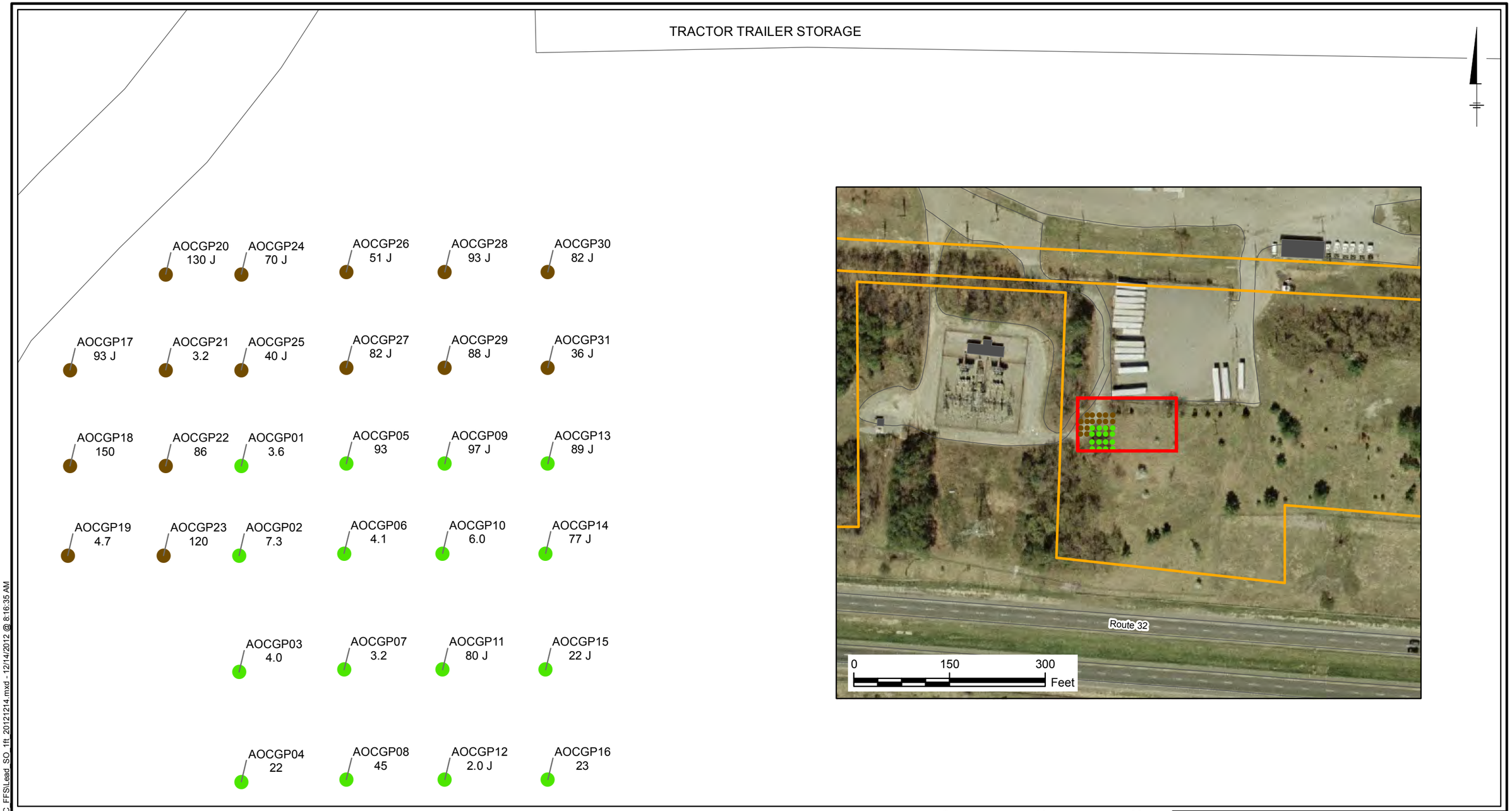
Xref_Base_FtMeade



LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)

0 10 20 Feet
GRAPHIC SCALE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
3. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
4. J = ESTIMATED CONCENTRATION
5. U = NON-DETECT
6. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
7. 1.7 J - DETECTION CONCENTRATION

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD RESULTS IN SOIL
1 FOOT BELOW GROUND SURFACE

ARCADIS

FIGURE
3-2

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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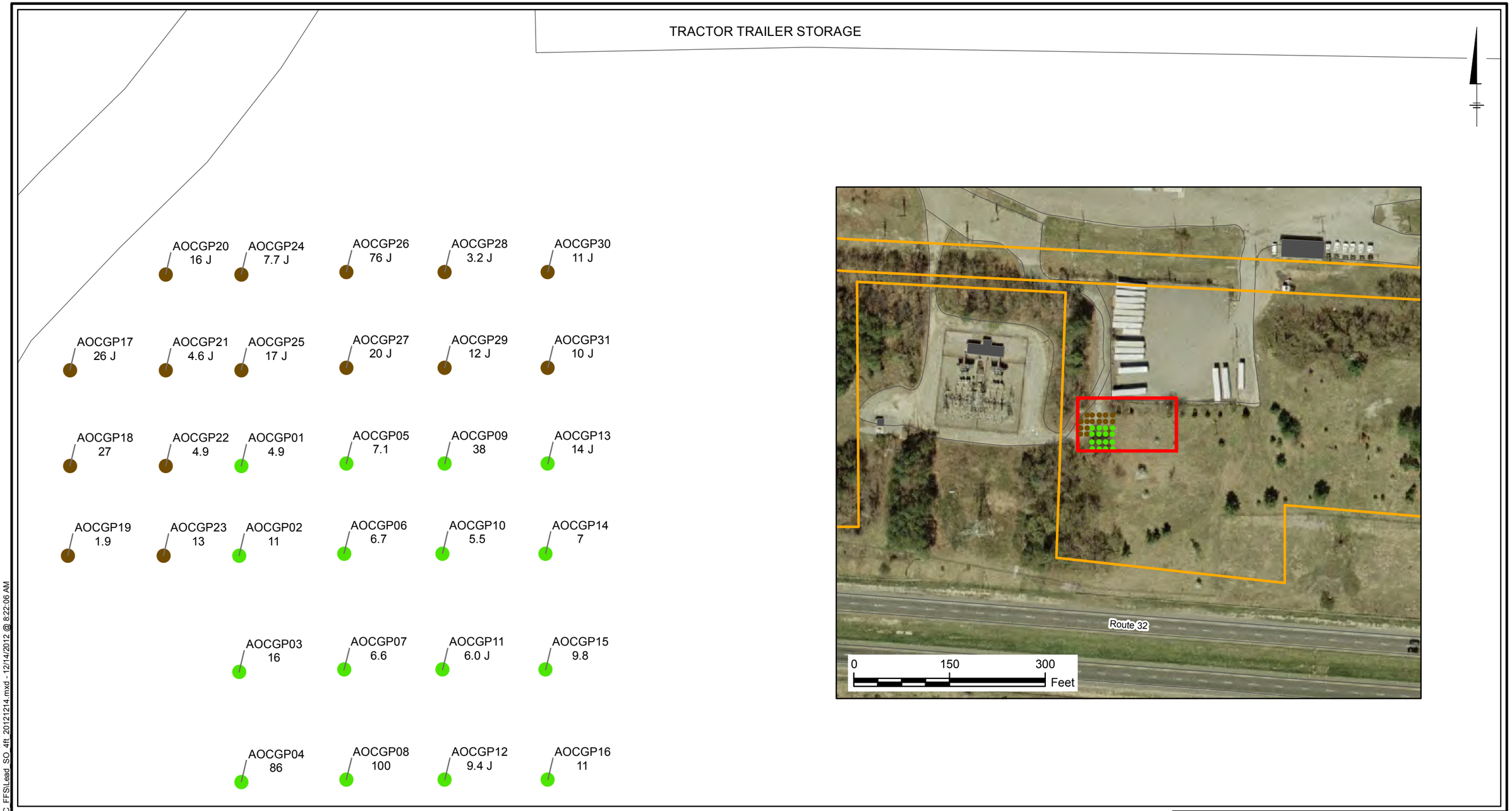

LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)

0 10 20 Feet
GRAPHIC SCALE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
3. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
4. J = ESTIMATED CONCENTRATION
5. U = NON-DETECT
6. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
7. 1.7 J - DETECTION CONCENTRATION

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD RESULTS IN SOIL
4 FEET BELOW GROUND SURFACE

ARCADIS

FIGURE
3-3

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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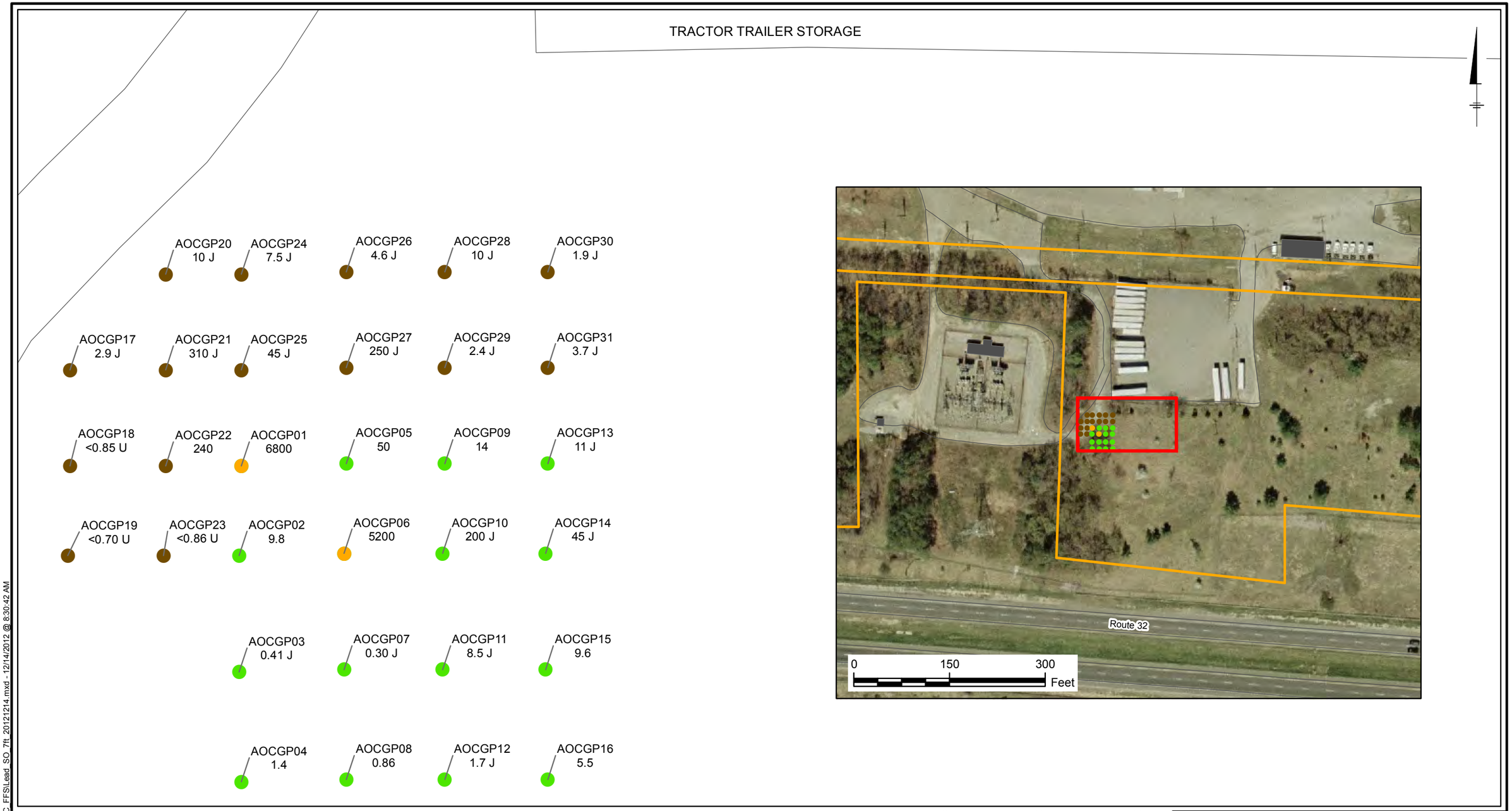

LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)

0 10 20 Feet
GRAPHIC SCALE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
3. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
4. J = ESTIMATED CONCENTRATION
5. U = NON-DETECT
6. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
7. 1.7 J - DETECTION CONCENTRATION

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD RESULTS IN SOIL
7 FEET BELOW GROUND SURFACE

ARCADIS

FIGURE
3-4

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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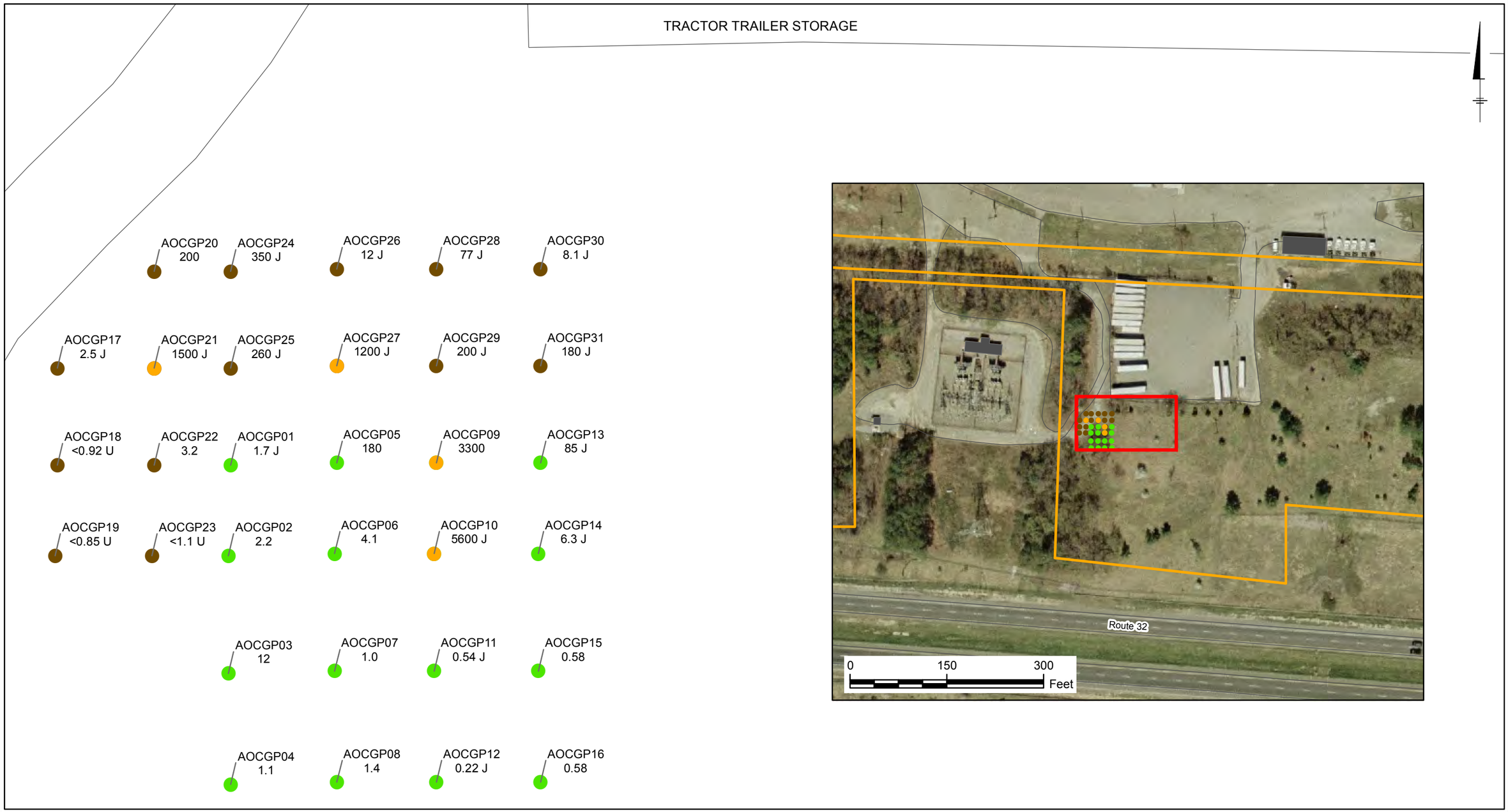

LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)

0 10 20 Feet
GRAPHIC SCALE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
3. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
4. J = ESTIMATED CONCENTRATION
5. U = NON-DETECT
6. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
7. 1.7 J - DETECTION CONCENTRATION

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD RESULTS IN SOIL
10 FEET BELOW GROUND SURFACE

ARCADIS

FIGURE
3-5

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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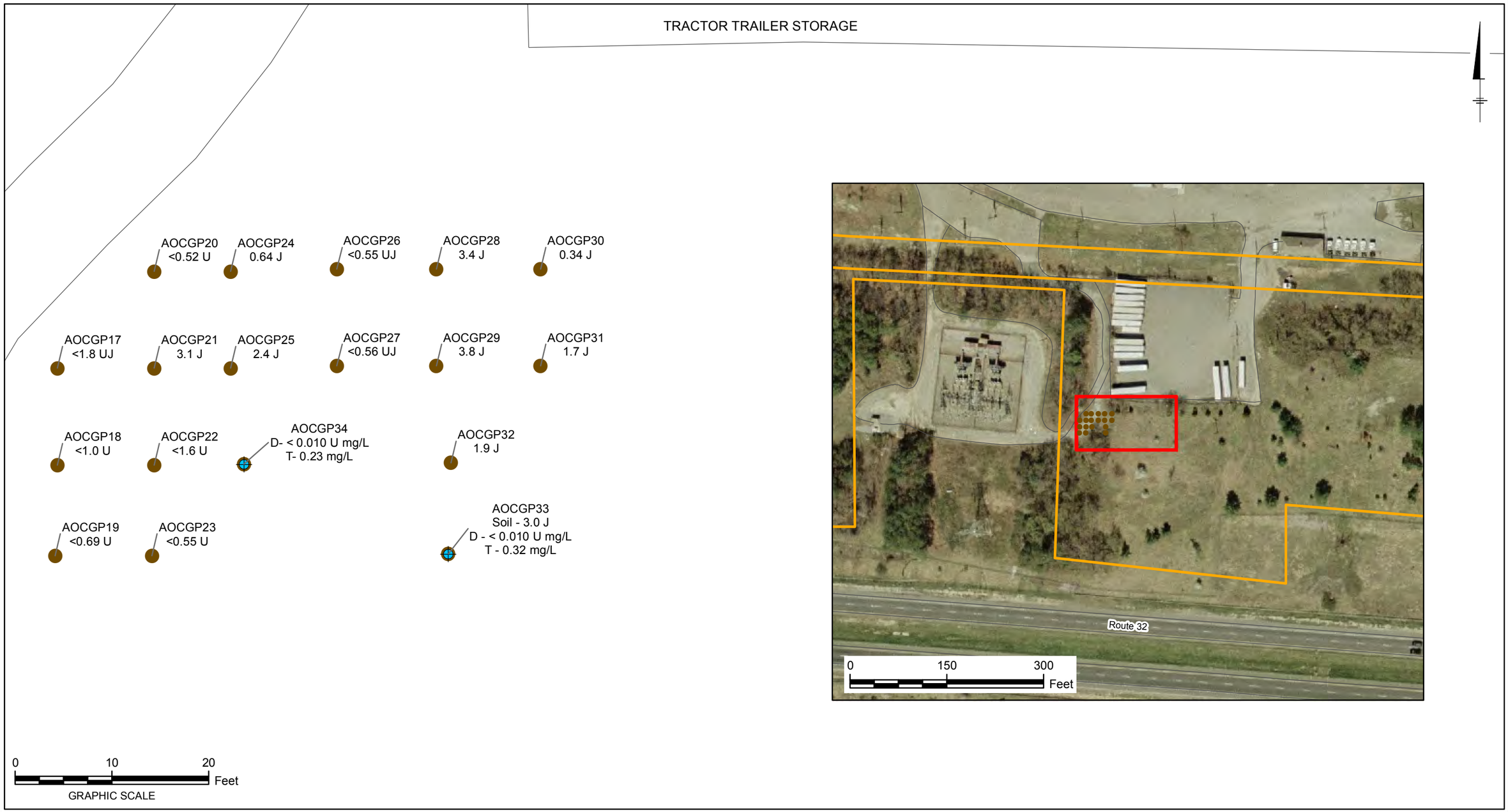

LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)
- GROUNDWATER SAMPLE COLLECTED AT 11-15 FEET BELOW GROUND SURFACE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. NO SOIL SAMPLES WERE COLLECTED AT 14 FEET BELOW GROUND SURFACE DURING ROUND 1
3. GROUNDWATER SAMPLES WERE ANALYZED FOR TOTAL AND DISSOLVED LEAD VIA UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
4. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
5. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
6. J = ESTIMATED CONCENTRATION
7. U = NON-DETECT
8. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
9. 1.7 J - DETECTION CONCENTRATION
10. MG/L - MILLIGRAMS PER LITER

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD RESULTS IN SOIL AND GROUNDWATER 14 FEET BELOW GROUND SURFACE

ARCADIS

FIGURE
3-6

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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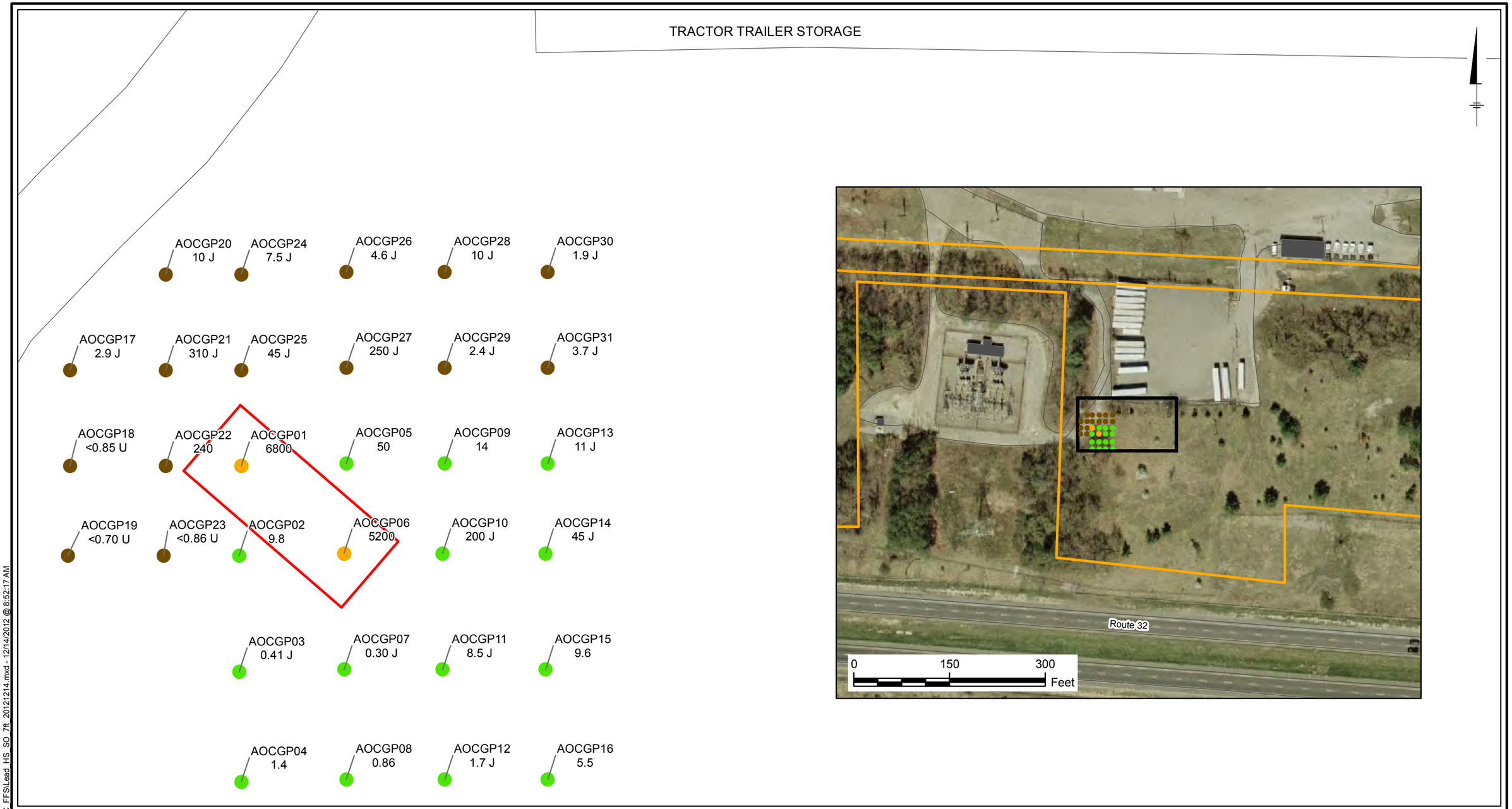

LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)
- INDICATES HOT SPOT FOR LEAD REPRESENTING THE GREATEST POTENTIAL RISK TO A POTENTIALLY EXPOSED POPULATION

0 10 20 Feet
GRAPHIC SCALE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
3. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
4. J = ESTIMATED CONCENTRATION
5. U = NON-DETECT
6. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
7. 1.7 J - DETECTION CONCENTRATION

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD HOTSPOT REMOVAL AREA AT 7 FEET BELOW GROUND SURFACE

ARCADIS

FIGURE
6-1

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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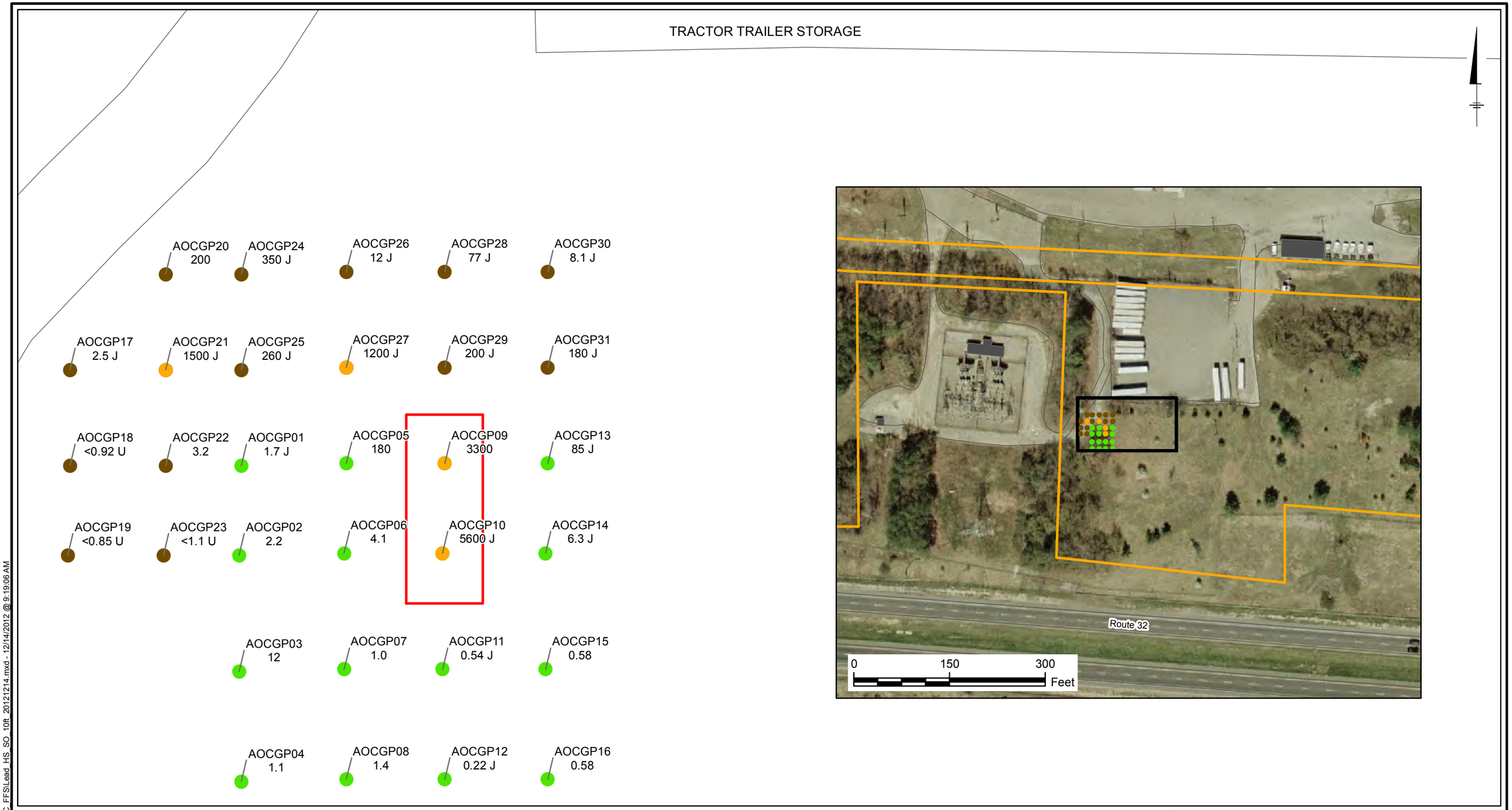

LEGEND:

- SOIL BORING LOCATION - ROUND 1
- SOIL BORING LOCATION - ROUND 2
- DETECTION ABOVE CRITERIA
- ARCHITECT OF THE CAPITOL (AOC) BOUNDARY (APPROXIMATE)
- INDICATES HOT SPOT FOR LEAD REPRESENTING THE GREATEST POTENTIAL RISK TO A POTENTIALLY EXPOSED POPULATION

0 10 20 Feet
GRAPHIC SCALE

NOTES:

1. THE COMPARISON CRITERIA USED DURING THE LEAD INVESTIGATION WAS 400 MILLIGRAMS PER KILOGRAM (RESIDENTIAL VALUE)
2. LABORATORY ANALYSIS FOR LEAD CONDUCTED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY METHOD 6010C
3. LEAD RESULTS REPORTED IN MILLIGRAMS PER KILOGRAM (MG/KG)
4. J = ESTIMATED CONCENTRATION
5. U = NON-DETECT
6. AOCGP01 - SAMPLE LOCATION IDENTIFICATION
7. 1.7 J - DETECTION CONCENTRATION

FGGM-74 ARCHITECT OF THE CAPITOL
FORT GEORGE G. MEADE, MARYLAND

LEAD HOTSPOT REMOVAL AREA AT 10 FEET BELOW GROUND SURFACE

ARCADIS

FIGURE
6-2

CITY: MPLS DIV/GROUP: 40 DB: MG LD: BE PM: TL
FT. MEADE (GP09MEAD.C000)
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Appendix A

Remedial Alternatives Cost Estimates

Appendix B

Response to Comments