REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN (DRAFT)

BENNING ROAD FACILITY

3400 BENNING ROAD, N.E.

WASHINGTON, DC 20019

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List of Acronyms

ANS	Academy of Natural Sciences
ASTM	American Society for Testing and Materials
AST	Aboveground Storage Tank
AVS	Acid Volatile Sulfide
AWTA	Anacostia Watershed Toxics Alliance
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIP	Community Involvement Plan
cm/yr	Centimeter per Year
COC	Constituent of Concern
CLP	Contract Laboratory Program
COPC	Constituent of Potential Concern
CSF	Complete Sample Delivery Group File
CSM	Conceptual Site Model
CSO	Combined Sewer Overflow
DC	District of Columbia
DCRA	Department of Consumer and Regulatory Affairs
DCWASA	District of Columbia Water and Sewer Authority
DDOE	District Department of the Environment
DGPS	Differential GPS
DNAPL	Dense Non-Aqueous Phase Liquid
DO	Dissolved Oxygen
DOD	Department of Defense
DQO	Data Quality Objectives
DPT	Direct Push Technolgy
EDD	Electronic Data Deliverables
EDR	Environmental Data Resources
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ERI	Electrical Resistivity Imaging
ESA	Environmental Site Assessment
ESTCP	Environmental Security Technology Certification Program
FS	Feasibility Study
FSP	Field Sampling Plan
ft bgs	Feet Below Ground Surface
GC/MS	Gas Chromatography/Mass Spectrometry
GIS	Geographic Information System
GPS	Global Positioning System
GSA	General Services Administration
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HSA	Hollow Stem Auger
ICP	Inductively Coupled Plasma
ICPMS	Inductively Coupled Plasma-Mass Spectrometry
IDW	Investigation Derived Waste

KPN	Kenilworth Park North
KPS	Kenilworth Park South
LNAPL	Light Non-Aqueous Phase Liquid
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MLLW	Mean Low Low Water
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MW	Megawatt
MWCOG	Metropolitan Washington Council of Governments
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priority List
NPS	National Park Service
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
NTU	Nephelometric Turbidity Units
NWP	Nationwide Permit
OSWER	U.S. EPA Office of Solid Waste and Emergency Response
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PES	Pepco Energy Services
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	Parts per Million
PRG	Preliminary Remediation Goal
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/ Quality Control
RAO	Remedial Action Objectives
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasbility Study
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
SDG	Sample Data Group
SEM	Simultaneously Extractable Metals
SEFC	Southeast Federal Center
SI	Site Inspection
SOP	Standard Operating Procedure
SOW	Scope of Work
SPT	Standard Penetration Test
SQG	Sediment Quality Guidelines
SVOC	Semi-Volatile Organic Compound
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Values
TSCA	Toxic Substances Control Act
µg/kg	Microgram per Kilogram
µmhos/cm	Micromhos per Centimeter

USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound
WGL	Washington Gas Light
WMATA	Washington Metropolitan Area Transit Authority
WNY	Washington Navy Yard
XRF	X-Ray Fluorescence

1 Introduction

AECOM has prepared this Remedial Investigation and Feasibility Study (RI/FS) Work Plan on behalf of Potomac Electric Power Company (Pepco) and Pepco Energy Services, Inc. (collectively "Pepco") to describe the overall technical approach of the RI/FS at Pepco's Benning Road facility (the Site), located at 3400 Benning Road NE, Washington, DC, and a segment of the Anacostia River (the River) adjacent to the Site. The general site location is shown on **Figure 1**. Together, the Site and the adjacent segment of the River are referred to herein as the "Study Area". Pepco has agreed to perform the RI/FS pursuant to a consent decree that was entered by the U.S. District Court for the District of Columbia on December 1, 2011 (the Consent Decree). The Consent Decree documents an agreement between Pepco and the District of Columbia (District) which is part of the District's larger effort to address contamination in and along the lower Anacostia River.

The purpose of the RI/FS described herein is to (a) characterize environmental conditions within the Study Area, (b) investigate whether and to what extent past or current conditions at the Site have caused or contributed to contamination of the River, (c) assess current and potential risk to human health and the environment posed by conditions within the Study Area, and (d) develop and evaluate potential remedial actions. As described later in this document, the Study Area consists of a "landside" component that will focus on the Site itself, and a "waterside" component that will focus on the shoreline and sediments in the segment of the river adjacent to and immediately downstream of the Site. The landside and waterside areas of investigation are depicted in **Figure 2**. The areas of investigation may be further adjusted or expanded during the course of the RI as warranted based on the findings of the investigation.

The RI/FS will be performed in accordance with the United States Environmental Protection Agency's (USEPA) *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Office of Solid Waste and Emergency Response (OWSER)* Directive 9355.3-01, dated October 1988, and other applicable USEPA and District Department of the Environment (DDOE) guidance documents. A generalized RI/FS process is shown in **Figure 3**. Pepco previously submitted the RI/FS Scope of Work (SOW) to DDOE and revised it to address comments from DDOE and the public. Final approval for the SOW was provided by DDOE on April 18, 2012. The approved SOW serves as a blue print for this Work Plan. Pepco also prepared a separate Community Involvement Plan (CIP), which was revised to address DDOE and public comments, and was approved by DDOE on June 18, 2012, to describe Pepco's community outreach activities during the RI/FS process.

1.1 Work Plan Purpose and Scope

The purpose of this Work Plan is to review existing data, develop a Conceptual Site Model (CSM), identify data gaps, design a data collection program to address the identified data gaps, and document the planned RI/FS activities in accordance with the previously-approved SOW. The Work Plan also presents information on project organization and schedule.

Field work activities described in this Work Plan will be performed in accordance with a Health and Safety Plan (HASP) and a Sampling and Analysis Plan (SAP) prepared in conjunction with the Work Plan. The HASP will specify necessary procedures to ensure safety of Site workers during the investigation activities for both the landside and waterside investigations. The SAP consists of two parts: (a) a Field Sampling Plan (FSP) that provides detailed guidance for all field work by defining in detail the sampling locations and the sampling and data gathering methods to be used; and (b) a Quality Assurance Project Plan (QAPP) that describes quality assurance and quality control protocols necessary to achieve Data Quality Objectives (DQOs) dictated by the intended use of the data. The HASP and SAP documents are being provided under separate cover.

DDOE will make the Work Plan (including CSM), HASP and SAP available for public review for at least 30 days by posting on the DDOE website prior to granting its approval. Upon approval of this Work Plan by DDOE (after consideration of public comments), Pepco will implement the activities outlined in this document. The areas of investigation and sampling locations may be adjusted or expanded (with DDOE approval) during the course of the RI as warranted based on the findings of the investigation.

1.2 Work Plan Organization

This RI/FS Work Plan is organized into the following eight sections:

- Section 1 - Introduction
- Section 2 - Site Background and Setting
- Section 3 - Conceptual Site Model
- Section 4 - Work Plan Rationale
- Section 5 - RI/FS Tasks
- Section 6 - Project Orgainzation

- Section 7 - Schedule
- Section 8 - References

Figures, tables, and appendices are provided as stand-alone sections following **Section 8**.

2 Site Background and Setting

The 77-acre Site is bordered by a District of Columbia Solid Waste Transfer Station to the north, Kenilworth Maintenance Yard (owned by the National Park Service, NPS) to the northwest, the Anacostia River to the west, Benning Road to the south and residential areas to the east and south (across Benning Road). Most of the Site is comprised of the Benning Service Center, which involves activities related to construction, operation and maintenance of Pepco's electric power transmission and distribution system serving the Washington, DC area. The Service Center accommodates more than 700 Pepco employees responsible for maintenance and construction of Pepco's electric transmission and distribution system; system engineering; vehicle fleet maintenance and refueling; and central warehousing for materials, supplies and equipment. The Site is also the location of the Benning Road Power Plant, which is scheduled to be shut down in 2012.

The Site is one of several properties along the River that are suspected sources of contamination (**Figure 4**). There have been five instances between 1985 and 2003 in which materials containing polychlorinated biphenyls (PCBs) were released at the Site. In each case, Pepco promptly cleaned up the releases in accordance with applicable legal requirements. A summary of historical environmental investigations and response actions conducted on the Site by Pepco and the USEPA is presented in **Table 1**. Nonetheless, it is suspected that these releases, and possibly other historical operations or activities at the Site, may have contributed to contamination in the river. In particular, a Site Inspection (SI) conducted for the USEPA in 2008 linked PCBs and inorganic constituents detected in Anacostia River sediments to potential historical discharges from the Site. (The results of this Site Inspection are referred to herein as USEPA 2009 SI Report.) The USEPA SI Report also stated that currently the Site is properly managed and that any spills or leaks of hazardous substances are quickly addressed and, if necessary, properly remediated (USEPA, 2009).

2.1 Site Description

The geographic coordinates for the approximate center of the Site are 38.898 north Latitude and 76.959 west Longitude. A Site Plan is provided as **Figure 5**. As of June 1, 2012, operations at the Benning Power Plant have ceased as announced by Pepco Energy Services (PES) which has owned and operated the power plant since 2000. The power plant is located on the westernmost portion of the Benning Service Center site, where it occupies approximately 25 percent of the facility's 77 acres. Preparations for closing the power plant have been underway since 2007. Following the closure, the plant area will be cleaned, secured, and maintained in accordance with District of Columbia and Federal environmental regulations.

The power plant was built in 1906, and provided Pepco's first system-wide electricity supply to the District of Columbia and nearby Maryland suburbs. Over the years, the power plant has operated and subsequently retired several different generating units, reflecting advances in technology and operating on different types of fuel. Only two oil-fired steam turbine units operated at the power plant in the recent past. Installed in 1968 and 1972, together they provide 550 megawatts (MW) of electricity - enough to meet the needs of around 180,000 homes - during periods of peak electricity demand. Designed to operate a limited number of days each year, these units have operated an average of 10 to 15 days annually. Structures associated with the power plant include the generating station, cooling towers, three aboveground storage tanks (ASTs) and storage buildings. The three ASTs are surrounded by secondary containment dikes. As of the writing of this work plan, AST #1 was emptied and AST #2 is being pumped down. This will be followed by draining of AST #3. Once the #4 fuel oil contents are removed, all tanks will be cleaned. The power plant closure will include removal of the cooling tower and AST structures.

The Service Center occupies the largest part of the property, and accommodates more than 700 Pepco employees. Service Center employees work in maintenance and construction of Pepco’s electric transmission and distribution system; system engineering; vehicle fleet maintenance and refueling; and central warehouses for all the materials, supplies and equipment needed to operate the Pepco electrical distribution system.

The Site is completely surrounded by a fence with two guarded entrances. The guard shacks are staffed 24 hours a day, 7 days a week. Three active substations are located on the Site, two in the eastern portion (Substation #41 and Substation #7) and one in the western portion (Substation #45). To the south of the substations is a large asphalt-covered Pepco employee parking lot. To the south of this area are railroad tracks and Buildings 56, 57, and the transformer staging area. These areas are used for activities associated with processing used electrical equipment and associated materials brought to the Site for reconditioning, recycling or disposal. The center of the Site is occupied by buildings used for office space, vehicle maintenance, equipment repair shops and storage of hazardous waste and materials. Areas located outside of the buildings are used for new equipment storage and also temporary storage of used electrical equipment prior to disposal.

There are three active underground storage tanks (USTs) at the Site. One is a 15,000-gallon double-walled steel and fiberglass tank installed in 1988 to hold new transformer oil. A 20,000-gallon fiberglass tank, installed in 1975, contains gasoline. A 20,000-gallon double-walled tank, installed in 1991, holds diesel fuel. All tanks have leak detection monitoring devices which test the tanks and aboveground piping for leaks on a monthly basis. These tanks are operated in compliance with the District's UST regulations. A separate 20,000-gallon epoxy-coated steel tank, installed in 1979 and used to store gasoline, was recently taken out of service and is scheduled for removal in August 2012. DDOE has been notified of the tank removal. Please refer to **Table 2** for further details regarding the USTs and **Figure 5** for the locations.

The majority of the Site is covered by impervious material such as concrete or asphalt. Active storage areas not covered in impervious material are covered in gravel. One of the gravel-covered areas is located in the western portion of the site, directly south of the cooling towers. This area was used at one time for the storage of coal when the power plant used coal to generate electricity. Later, this area was used to dewater sludge cleaned out from the basins located underneath the cooling towers. The area is no longer used for either purpose. Railroad tracks enter the site from the south and run to the north. The tracks were formerly used to transport coal to the power plant and are no longer active.

Storm water runoff from the facility is conveyed through a drain system (**Figure 5**) and is discharged to the River and City storm drains at various outfalls under an NPDES permit (DC0000094). Two outfalls (Outfall 013 and Outfall 101) discharge to the River. The majority of the runoff from the facility is conveyed through a 48-inch concrete pipe to the 54-inch pipe to the River via Outfall 013. In addition, Outfall 013 was also permitted to receive cooling tower blow down and cooling tower basin wash water when the cooling towers operated. These towers are no longer operational, as Pepco ceased the operations at Benning Road Power Plant effective June 1, 2012. Outfall 101 includes discharges from storm water runoff, storm water collected in transformer secondary containment basins, and roadways and landscaping in the southwest corner of the property. Other outfalls, capturing primarily roadway runoff, are discharged to the District municipal storm drain system.

Outfalls discharging to the Anacostia River are sampled on a quarterly basis under the National Pollutant Discharge Elimination System (NPDES) permit. The analytical parameters include the following:

- pH;
- Oil and grease;
- Iron;
- Cadmium;
- Copper;
- Lead;
- Nickel;

- Zinc; and
- PCBs (aroclor-1242, aroclor-1254 and aroclor-1260).

Among the discharge locations included in the routine sampling program, are the storm sewers determined potentially at risk for receiving PCB contaminated runoff. According to the USEPA 2009 SI Report, no NPDES violations have been recorded for the Site and USEPA has reported that no PCBs have been detected in the NPDES compliance samples. A review of Discharge Monitoring Reports (DMRs) from the first quarter of 2012 indicates no excursions for PCBs and excursions of copper, zinc and iron. Pepco is implementing a Total Maximum Daily Load (TMDL) Implementation Plan approved by the USEPA to identify and reduce the sources of metals in storm water discharges from the facility. In addition, Pepco also analyzes for PCB congeners as required by the NPDES permit, for monitoring purposes only.

2.2 Area Description

2.2.1 General Land Use and Demography

The Site is located in Ward 7 in the District of Columbia, within the 20019 zip code. Ward 7 is typified by single-family homes and parks. It is home to a number of Civil War fort sites that have since been turned into parkland, including Fort Mahan Park, Fort Davis Park, Fort Chaplin Park and Fort Dupont Park. Ward 7 is also home to green spaces such as Kenilworth Aquatic Gardens, Watts Branch Park, Anacostia River Park and Kingman Island.

Ward 7 also has an extensive waterfront along the Anacostia River with riverfront neighborhoods. River Terrace, Mayfair and Eastland Gardens abut the east side of the river, while Kingman Park sits to the west. The River Terrace, Parkside and Benning neighborhoods are engaged and organized communities. Ward 7 is represented by Councilmember Yvette Alexander and is home to the Mayor of the District of Columbia, Vincent C. Gray.

This area is primarily urban with the Anacostia River bordering the area to the west. The Anacostia Freeway is the main north-south highway and East Capitol Street NE is the main east-west highway. Transportation in the vicinity of the Site takes the form of light rail or motorized vehicles. The Washington Metropolitan Area Transit Authority (WMATA) operates the light rail system in Washington, DC (known as Metrorail). The Minnesota Avenue Metrorail Station is located immediately to the east of the Site. Approximately 19% of the population in the 20019 zip code uses Metrorail to commute to and from work, with an average of 3,274 people using the Minnesota Avenue Station per day. A large percentage of the local residents use automobiles, either singly or in carpools, to commute to and from work.

Minnesota Avenue in the vicinity of the Site is zoned as commercial. In addition, a commercial light manufacturing corridor exists along the Kenilworth Ave/Metrorail tracks. Property along Benning Road is zoned sporadically as commercial. All other surrounding areas are largely residential. Most of the houses in the area were built between 1940 and 1969. The majority of the housing units are either single-family detached or single-family attached units. There are three high schools, 21 public primary/middle schools, and five private primary/middle schools within the boundaries of zip code 20019. Of the schools reported being within the 20019 zip code, four are located within a 0.25-mile radius of the boundary of the Site: Thomas Elementary School, Cesar Chavez Middle and High School, Benning Elementary School, and River Terrace Elementary School (Google Earth).

According to the Final USEPA SI Report dated June 2009, there are no drinking water intakes located within 15 miles of the Site. The District of Columbia Water and Sewer Authority (DCWASA) provides drinking water to the surrounding area by drawing raw water from intakes located at Great Falls and Little Falls on the Potomac River, upstream from the confluence of the Potomac River with the Anacostia River (http://www.dcwater.com/about/facilities.cfm).

Based on a review of the Environmental Data Resources, Inc. (EDR) Report provided by Greenhorne and O'Mara, Inc. dated September 2009, no water supply wells are located within 0.5-mile of the Site. One United States Geological Survey (USGS) monitoring well was identified 500 feet northwest of the Site and adjacent to the Anacostia River. Upon further review, this monitoring well appears to be the USGS Soil Boring DCHP01 discussed in **Section 2.3**.

2.3 Geology

2.3.1 Regional Geology

The facility is located within the Coastal Plain Physiographic Province, which is characterized by eastward thickening sequences of sedimentary deposits. The western limit of the Coastal Plain Province is commonly referred to as the Fall Line, where the older crystalline rocks (bedrock) of the Piedmont Physiographic Province begin to dip to the southeast beneath the relatively younger sediments of the Coastal Plain. The Fall Line is located approximately five miles west of the Site.

The Coastal Plain consists of an eastward-thickening wedge of unconsolidated sedimentary deposits ranging in geologic age from Cretaceous to Recent. These unconsolidated sediments consist of gravels, sands, silts, and clays that have been deposited upon the consolidated crystalline bedrock which slopes towards the southeast. Many different depositional environments existed during the formation of the Coastal Plain sediments. Glacially influenced periods of erosion and deposition, fluvial (river) processes, and structural deformations of the sedimentary deposits have all played a part in the evolution of the Coastal Plain. As a result of these processes, the presence, thickness, and lateral continuity of these sedimentary deposits in the Coastal Plain are highly variable. A generalized regional geologic profile has been included as **Figure 6**.

2.3.2 Site Specific Geology

Based upon a review of available historical reports (**Section 8**), the soils underneath the Site consist primarily of (from shallowest to deepest): artificial fill material; Patapsco Formation; Arundel Clay unit; and the Patuxent Formation. The Patuxent Formation overlies the crystalline bedrock.

The artificial fill material at the Site primarily consists of infrastructure (utilities and structures), historical fill material used to level the site, process related fill, and relatively impermeable pavement (asphalt and concrete). Fill material thickness at the Site is as much as ten feet in some areas with the exception of the vicinity of the former sludge dewatering area, where fill thicknesses ranged from 14 to 17 feet.

The Patapsco Formation is typically described as a thick maroon clay, with sand and clay of various colors. Underneath the Patapsco Formation is the Arundel Clay which generally consists of thick dark grey clay. Arundel Clay is a distinct regional confining feature with very low permeability. The thickness of the Arundel Clay varies, but has been observed to be as much as 100 feet thick (USGS, 2002). Beneath the Arundel Clay are the unconsolidated gravels, sands, and clays of the Patuxent Formation. The top of the Patuxent Formation has been reported to be located at approximately 125 to 180 feet below ground surface (ft bgs) in nearby environmental assessments (NPS, 2008). The Crystalline bedrock underneath the Patuxent Formation is located at approximately 400 feet beneath the Site.

AECOM has reviewed and compiled information from 32 geotechnical borings completed by Pepco on the Site with the deepest boring (GEO B-9) drilled to a depth of 81 ft bgs. Approximate locations of these historical soil borings are shown on **Figure 7**. Information from these borings was used to generate generalized geologic cross sections, A-A' and B-B' (**Figure 8**). The cross sections indicate an upper and a lower water bearing zone separated by a clay unit within the Patapsco formation. This information appears to be consistent with the findings of United States Geological Survey (USGS), Lithologic Coring Program Boring DCHP01 (**Appendix A**). Based on a review of the borehole logs available for the site, the Arundel Clay is located approximately 42 to 73 feet beneath the Site.

2.4 Hydrogeology

2.4.1 Regional Hydrogeology

Based on the literature reviews and information from adjacent sites, aquifers underneath the Site consist of saturated sand layers within the Patapsco and Patuxent Formation and include (from shallowest to deepest): the Upper Patapsco Aquifer; the Lower Patapsco Aquifer; the Upper Patuxent Aquifer; and the Lower Patuxent Aquifer. The Lower Patapsco and upper Patuxent Aquifers are separated by the thick Arundel Clay unit. The Arundel clay has very low conductivity and acts as a regional aquitard between the Patapsco and Patuxent Formations. The Patuxent Aquifer, located beneath the Arundel Clay, flows under confined conditions towards the east (DC Water Resources, 1993).

2.4.2 Site Specific Hydrogeology

Based on review of the lithologic logs available for the Site, the Arundel Clay is located approximately 42 to 73 ft bgs beneath the Site. The information contained in these logs suggests the water table aquifer beneath the Site is located above the Arundel Clay, in the Patapsco Aquifer, with the first occurrence of groundwater measured at 8 to 21 ft bgs. The general topography, the occurrence of shallow water table and flow patterns from adjacent sites suggest potential for the groundwater to discharge to the River. Any discharge to the River would be influenced by the tidal fluctuations near the Site.

2.5 Surface Water Hydrology and Watershed Characteristics

The Anacostia River watershed encompasses an area of approximately 456 square kilometers (km^2) (176 square miles, mi^2) within the District of Columbia and Maryland, and lies within two physiographic provinces, the Piedmont Plateau and the Coastal Plain. Watershed maps are provided in **Appendix B**. The Anacostia River begins in Bladensburg, MD, at the confluence of its two major tributaries, the Northwest Branch and the Northeast Branch, and flows a distance of approximately 8.4 miles before it discharges into the Potomac River in Washington, DC (Sullivan and Brown, 1988). Because of its location in the Washington metropolitan area, the majority of the watershed is highly urbanized. An analysis of geographic information system (GIS) layers prepared by the Metropolitan Washington Council of Governments (MWCOG) indicates that land use in the watershed is approximately 43% residential, 11% industrial/commercial, and 27% forest or wetlands, with 22.5% of the area of the watershed covered by impervious surfaces.

The Anacostia River is subject to tidal influence. Based on the United States Army Corps of Engineers (USACE) condition survey conducted in June 2007, water depths in the Study Area range from approximately 6.0 ft to 10.0 ft below Mean Low Low Water (MLLW) level. The variation in the river's water surface elevation over a tidal cycle is approximately 0.9 meters (m) (3 feet, ft). The width of the river varies from approximately 60 m (197 ft) in some upstream reaches to approximately 500 m (1640 ft) near the confluence with the Potomac, and average depths across a transect vary from about 1.6 m (5.2 ft) near Bladensburg to about 6.2 m (20.3 ft) just downstream of the South Capitol Street Bridge. During base flow conditions, measured flow velocities during the tidal cycle have been in the range of 0 to 0.3 meters per second (m/sec) (0 to 1 feet per second, ft/sec) (Katz et al., 2001).

Sedimentation has been a problem in the tidal Anacostia River since colonial times (Scatena, 1987). Estimated average annual sediment discharge into the tidal embayment of the river was 134,420 tons for 1963 and 137,600 tons for 1981. Because of the low flow velocities in the tidal portion of the river, the majority of sediment entering the tidal embayment is thought to settle and remain in the tidal river, rather than being discharged to the Potomac. Based on a variety of methods, including analyses of historical bathymetry records, dredging records, and pollen profiles of sediment bed core samples, Scatena (1987) estimated sedimentation rates in the range of 1.2 to 9.1 centimeters per year (cm/yr) (0.5 to 3.6 inches per year, in/yr). More recently, radiometric dating using Cesium-137 on cores collected near the Washington Navy Yard (WNY) and the Southeast Federal Center (SEFC) sites indicated a sedimentation rate of approximately 4.0 to 6.5 cm/yr or 1.6 to 2.6 in/yr (Velinsky et al, 2011). As the sedimentation rates were measured two to three miles downstream of the Benning Road site, the lower end of the sedimentation rates are more appropriate for the Study Area.

Based on a review of NOAA's Office of Coast Survey Navigation Chart #12289 dated October 2010, the Anacostia channel ends before the Pennsylvania Avenue bridge, which is approximately 1.6 miles downstream of the Site. According to information provided by the USACE, the most recent navigational dredging was performed prior to 2002, and included dredging up to Bolling Air Force Base. USACE was not aware of any dredging ever occurring north of the CSX railroad bridge (1.3 miles downstream of the Site) other than the cooling water intake dredging conducted by Pepco in 1996.

2.6 Historical Removal Actions and Investigations

A summary of historical environmental investigations and response actions conducted on the Site by Pepco and the USEPA is presented in **Table 1**. The locations of these activities are shown on **Figure 5**. These activities include five investigation and cleanup efforts in response to PCB material releases, multiple petroleum underground storage tank (UST) removals and closures, due diligence studies (Phase I Environmental Site Assessments or ESAs) and various other soil removals conducted by Pepco since 1985. All of these activities and studies occurred on the Landside portion of the Study Area. In addition, Pepco also conducted three geotechnical studies (CTI, 2009; Geomatrix, 1988; and Hillis-Carnes, 2009) in different areas of the Site as part of its electric system infrastructure improvement projects. These geotechnical studies provide useful information on Site geology and hydrogeology.

In 1996, Pepco performed dredging at the power plant cooling water intake located north of the Benning Road Bridge in the Anacostia River. The dredged spoils were used to construct a wetland in the vicinity of the existing water intake. Dredging and wetland construction activities extended from the Benning Road Bridge for approximately 900 feet north (Pepco, 1996; Pepco, 1997). .

USEPA conducted a multi-media inspection at the Site in 1997 in connection with the renewal of Pepco's NPDES permit (USEPA, 1997). The inspection also included compliance determinations under the Resource Conservation and Recovery Act (RCRA) and the Toxic Substances Control Act (TSCA). (The results of this 1997 multi-media inspection are referred to herein as "USEPA, 1997.") No compliance issues were noted under RCRA. One spill involving PCB oil was noted inside Building #57; however, the release was fully contained in a secondary containment vault and no release into the environment occurred. The cause of the spill was corrected through implementing appropriate management/operating procedures. USEPA also collected two liquid samples and six residue samples from the storm drain system. A liquid sample collected at Outfall 013 failed the acute toxicity test due to presence of chlorine from a leaking relief valve that was discharging chlorine-treated city drinking water. The residue samples collected from the storm drain system indicated PCB and metal concentrations that exceeded USEPA Sediment Quality Guidelines (SQGs).

As previously noted, Tetra Tech EM, Inc. conducted an SI at Pepco's Benning Road Site for the USEPA under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program in 2008 and issued a report in 2009 (USEPA, 2009). Thirteen soil samples were collected from the former sludge dewatering area (located south of the power plant cooling towers) and 16 sediment samples and five surface water samples were collected from the Anacostia River. Several metals, polycyclic aromatic hydrocarbons (PAHs) and PCBs were detected at elevated concentrations in the former sludge dewatering area and the Anacostia River sediments. With the exception of copper, no other compounds were detected in the surface water samples. The USEPA 2009 SI Report concluded that the current management and handling of waste streams, including PCB-containing equipment and material is well organized and supervised, but linked PCBs and inorganic constituents detected in the Anacostia River sediments to possible historical discharges from the Site.

2.6.1 Regional Assessment of Anacostia River and Suspected Area-Wide Sources of Impact

This section provides an overview of sediment quality data from the Anacostia River from a regional perspective and considers data available from the general vicinity of the Benning Road Site. The purpose of this overview is to provide background relative to the current understanding of sediment quality in the Anacostia River basin and suspected off-Site sources to help formulate the work to be performed as part of this RI/FS.

For decades, there has been a broad recognition that the water quality and sediment quality in the Anacostia River is degraded due to a variety of factors, including shoreline habitat degradation, point sources, non-point sources, combined sewer overflows, input from tributaries, atmospheric deposition, storm water runoff, and refuse disposal practices (Anacostia Watershed Toxics Alliance [AWTA], undated). The problems in the river are exacerbated by the tidal nature of the lower Anacostia River; much of the flow in this portion of the river is tidal, freshwater flows into the tidal waters are relatively small (Velinsky et al., 2011), and the slow-moving water tends to allow contaminants that might otherwise be flushed from the system to settle into the sediment column.

A significant number of sediment quality studies have been completed within the Anacostia River, many of these focusing on known or suspected sources of contamination in the river. Fritz and Weiss (2009) summarized six possible sources of sediment contamination in the river, while acknowledging that additional contaminants may exist in sediment or on land abutting the river:

Source	**Ownership/Comments**	**Contaminants linked to sediments**
Washington Navy Yard (WNY)	Department of Defense (DOD), National Priority List (NPL) site.	PCBs and others
Southeast Federal Center (SEFC)	Partly GSA/partly private developer.	PAHs, metals, PCBs, and others
Poplar Point	NPS	PCBs, PAHs
Washington Gas Light (WGL)	WGL and NPS	PAHs, metals
Kenilworth Landfill (former DC dump)	NPS	Fill materials had PCBs, PAHs, metals
Pepco Benning Road	Pepco	PCBs and PAHs
Source: Fritz and Weiss, 2009		

Studies on each of these specific sites, as well as broader literature relative to Anacostia River ecology, were reviewed to assist in understanding prevailing background sediment and water quality conditions and to provide context for development of the work to be performed as part of this RI/FS. Available reports and sampling data reviewed included:

- Sediment concentrations and toxicity information from 35 databases that were compiled by the National Oceanic and Atmospheric Administration (NOAA) (http://mapping.orr.noaa.gov/website/portal/AnacostiaRiver);
- A 2001 report from the Academy of Natural Science (ANS) entitled "Sediment Transport: Additional Chemical Analysis Study Phase II";
- An undated document from the AWTA, entitled "A Toxic Chemical Management Strategy for the Anacostia River";
- A peer-reviewed paper by Velinsky et al. (2011) entitled "Historical Contamination of the Anacostia River, Washington, DC;
- A 2009 document from the AWTA entitled "White Paper on PCB and PAH Contaminated Sediment in the Anacostia River"; and
- The USEPA 2009 SI Report for the Pepco Benning Road Site, Washington DC.
- Results from the Environmental Security Technology Certification Program (ESTCP), Demonstration Program—The Determination of Sediment PAH Bioavailability using Direct Pore Water Analysis by Solid Phase Micro-extraction (http://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Risk-Assessment/ER-200709/ER-200709)

The findings of these studies consistently showed the presence of PCBs, PAHs, organochlorine pesticides, metals and to a lesser degree volatile organic compounds (VOCs) in sediment samples collected from up and down the entire Anacostia River (Velinsky et al, 2011). Velinsky et al. (2011) reported that the surficial sediment concentrations of many contaminants in Anacostia River sediments have decreased during the past few decades due to a combination of factors, including improved environmental practices, restrictions on the manufacture and use of PCBs, and the encapsulation of historic impacted sediment by the more recent deposit of cleaner sediment. For instance, based on the results of six cores collected from the lower Anacostia River, total PCB concentrations in surficial sediment fell from as much as 3000 micrograms per kilogram (µg/kg) in the late 1950's to 100-200 µg/kg in 2011.

The USEPA 2009 SI Report is the most comprehensive for surficial sediments in the vicinity of the Site. According to this report:

- Analytical results obtained during the SI sampling event indicate that the contaminants of potential concern associated with Anacostia River sediments are PAHs, PCBs and inorganic compounds (metals);

- PAHs are essentially ubiquitous in sediments of Anacostia River in the vicinity of the Site (**Appendix C**). The report also notes potential PAH sources located upstream of the Site, including numerous combined sewer outfalls;

- PCBs, specifically, aroclor-1254 and aroclor-1260 were detected in sediment samples above the screening concentrations established by the USEPA Biological Technical Assistance Group (BTAG) and NOAA for aquatic life. Several metals were also reported above these screening concentrations;

- No VOCs, semi-volatile organic compounds (SVOCs), pesticides or PCBs were reported above detection limits in the surface water samples collected during the SI. Of the inorganic constituents, only copper was detected at a concentration slightly above the corresponding USEPA Region III fresh water quality criterion; and

- USEPA concluded that historical releases from the Site contributed to the contamination documented in the Anacostia River sediments in the vicinity of the site based on residue samples USEPA collected from the Benning storm water system during USEPA's 1997 multi-media inspection.

The AWTA (2000) report regarding the Anacostia River indicates that concentrations of PAHs and PCBs in sediments exceeded conservative screening-level ecological benchmarks throughout the entire river with areas of relatively greater contamination primarily oriented to depositional areas of the lower half of the river (below Kingman Lake), plus some additional, isolated locales of the river where sediment is being deposited. The AWTA (2000) report identified the following six areas of interest recommended for further investigation including the vicinity of the Benning Road Site:

- Area 1: Near O Street/SEFC/WNY (PCBs, PAHs, and metals);

- Area 2: Upstream from CSX lift bridge (PCBs and PAHs);

- Area 3: Between the 11th Street and CSX bridges (PAHs);
- Area 4: Off Poplar Point (PAHs and some PCBs);
- Area 5: Upstream from the Pepco Benning Road facility (PCBs); and
- Area 6: the area in between the "hot-spots" identified in Areas 1-5 above, and within the depositional zone of the lower river extending roughly between the South Capitol and 12th Street Bridges.

The AWTA (2000) report identified approximately 60 acres of PAH or PCB contaminated "hot spots" recommended for capping (hot spots were identified as areas with concentrations exceeding the mean plus two standard deviations; 879 µg/kg for PCBs and 35,440 µg/kg for PAHs). One relatively small hot spot was identified in the vicinity of the Site.

A review of NOAA's 35 databases (accessed through NOAA Query Manager Program) indicates that several hundred Anacostia River surficial sediment samples have been collected from the mouth of the Anacostia River to points upstream of the Benning Road Site. Relative concentrations of total PCBs and total PAHs in surficial sediment samples within four miles of the Site are illustrated on GIS plots provided in **Figures 1** and **2** of **Appendix C**. The tabular summary below presents summary statistics for these compounds in Anacostia River sediment:

Study Area	PCBs				PAHs			
	Number of Samples	Concentration (µg/kg)			Number of Samples	Concentration (µg/kg)		
		Minimum	Mean	Maximum		Minimum	Mean	Maximum
Benning Road Study Area (a)	16	40	Not available	2,510	16	2,020	Not available	14,920
Anacostia White Paper (ANS 2000 data only) (b)	124	2	181	1,643	125	495	11,742	56,330
Anacostia White Paper (All studies) (b)	295	Not detected	579	12,000	314	100	16,619	211,300

(a) Source: USEPA, 2009. Sum of aroclors and total PAHs
(b) Source: Anacostia Sediment Capping White Paper, undated. This paper evaluates total PCBs and total PAHs from (1) an Academy of Natural Sciences (ANS) Study (ANS, 2000), which was "relatively comprehensive", and (2) from 12 specific studies (plus the ANS study) conducted between 1990 and 2003 on the river using a variety of sampling methods and protocols.

A review of these data suggests that USEPA 2009 SI data, while clearly containing PCBs and PAHs, must be reviewed within the overall construct of the urbanized Anacostia River corridor. USEPA in their 1997 Multi-media Inspection Report notes that PCB concentrations in storm sewer residue at the Site were above the SQG, but less than concentrations found in similar samples collected at WNY and SEFC. With regard to PAHs, the USEPA (2009) SI report indicates that contaminated sediments are located upstream and downstream of the Site, and that "PAHs are essentially ubiquitous in sediments of the Anacostia River in the vicinity of the site" and that "…sources of PAHs are located upstream of the Benning Road facility. These potential sources included numerous combined sewer storm water outfalls located upstream of the site."

Although many stakeholders are engaged in concerted efforts to prevent contaminant loading into the Anacostia River, one of the more substantial challenges is related to the combined sewer overflow (CSO) systems that serve approximately one third of the District of Columbia (AWTA, undated; http://www.dcwasa.com/wastewater_collection/css/default.cfm). The District's CSOs are antiquated systems (many of which date from the 1880's) that allow urban runoff and raw sewage to bypass treatment systems during rain events. During dry periods, sanitary wastes collected in the CSO system are treated at the Blue Plains Advanced Wastewater Treatment Plant; however, during periods of significant rainfall, the capacity of the CSO system is exceeded, and a mixture of storm water and sanitary wastes is directly discharged into the District's water bodies, including the Anacostia River. There are currently 53 permitted CSO outfalls in the District operated by DCWASA.

According to AWTA (undated), an average of 82 releases of combined stormwater and sanitary wastes occur per year due to this outdated system. At the time of AWTA report publication, these releases were reported to allow a discharge volume of approximately 2.14 billion gallons of contaminated waste-water from 11 major CSOs to enter the river system on an annual basis. DCWASA recently developed a model that predicted that in excess of 93% of CSO flow volume was contributed by two CSO systems, at Main and O Street (CSO 010, the O Street Pumping Station) approximately 3.4 miles downstream from the Site, and at the Northeast Boundary (CSO 019), approximately 1.2 miles downstream from the Site. A map showing the CSO Outfalls and drainage areas is provided in **Appendix B**.

More recent data from the DCWSA website highlights the CSO concern on the Anacostia River (http://www.dcwater.com/wastewater_collection/css/CSO%20Predictions.pdf). During the first 3 months of calendar year 2012, approximately 44.7 million gallons (MG) of CSO overflow were released into the river. Approximately 66% (29.48 MG) were attributable to CSO 19 (the Northeast Boundary CSO), whereas an additional 18.6% (8.33 MG) were attributable to CSO 10 (the O Street Pumping Station).

Potential sources of contamination to the river in the immediate vicinity of the Site include the Kenilworth Landfill and the Langston Golf Course. The following paragraphs describe these studies.

Kenilworth Park Landfill is one of several properties along the Anacostia River that are suspected sources of contamination. Kenilworth Park landfill is separated into two areas: the Kenilworth Park North (KPN) landfill and Kenilworth Park South (KPS) landfill separated by Watts Branch, a tributary to the Anacostia River (**Figure 4**), with the southern portion of the KPS being immediately adjacent to the Study Area. KPS and KPN are part of the 700-acre, Kenilworth Park and Aquatic Gardens, which is part of the National Park System. KPN operated from 1942 to 1968 and in 1968 the operations moved to KPS. By the 1970s, the entire landfill was closed and capped (with a vegetative cap), and the land was converted for use as a park (NPS, 2008). Wastes deposited in the landfills included municipal waste, incinerator ash, and sewage sludge. During its operation between 1950s and 70s, the landfill extended into the Anacostia River and no barriers were constructed to prevent migration of wastes mixed with soil into the water (AWTA, 2009). Ecology and Environment, Inc. completed remedial investigations (RIs) at KPN and KPS separately in 2007 and 2008, respectively for NPS (NPS, 2007; NPS, 2008). COPCs identified by the two RIs included: PCBs, PAHs, dieldrin, arsenic, lead and methane. The KPN RI concluded that groundwater probably is impacting some sediments adjacent to the Site (NPS, 2007). Feasibility Studies have been recommended for both landfills.

Ecology & Environment, Inc. also performed a Preliminary Assessment/Site Inspection (PA/SI) of Langston Golf Course for NPS in 2001. Langston Golf Course is located along the west bank of the River across from the Site. It is one of a number of sites along the Anacostia River that were used by the District as open burning/open dumps for municipal waste disposal from approximately 1910 to 1970 (NPS, 2001). An open dump with open burning existed on the west bank of the River until the early 1950s. The former District landfill was placed directly into the Kingman Lake without any barrier, and landfill wastes mixed with soil extended into the water. The PA/SI identified the presence of chemicals (PAHs, antimony, arsenic, iron, and lead) exceeding action levels in the fill material under the site. Lead showed elevated levels and was identified as the greatest concern among the identified chemicals. The PA/SI concluded that there are no current exposure pathways by which the landfill wastes buried under the golf course can affect public. The study also concluded that groundwater impacts on adjoining surface water are extremely slight. The study recommended that the site be maintained in its current use as a golf course and be reevaluated if site use changes.

AECOM incorporated the findings from various studies discussed above, and response actions conducted by Pepco (discussed under **Section 2.6**) into the CSM and Work Plan development. The CSM development is discussed in **Section 3.0**.

3 Conceptual Site Model

Information obtained from reviewing the data described in **Section 2** regarding contaminant sources, pathways, and receptors has been used to develop a preliminary CSM of the Study Area to evaluate potential risks to human health and the environment. The CSM identifies sources of contamination, affected media, routes of migration, human and environmental receptors, and potential routes of exposure after accounting for existing institutional, administrative and engineering controls at the Site (e.g., 24-hour controlled Site access, paved surfaces and employee hazard communication training program) that may eliminate or control exposures to on-site and off-site receptors. The CSM is useful in identifying data gaps and further sampling needs, and potential remedial technologies to mitigate any identified risks. It is also important for understanding the effects of both anthropogenic and natural factors on chemical concentration patterns. This preliminary CSM is a "living document", and will be refined in an iterative manner as new information becomes available as the RI/FS process progresses. A pictorial representation of the preliminary CSM is presented as **Figure 9** and described further in the following paragraphs.

3.1 Landside

Current understanding of potential sources and impacted media on Landside of the Study Area are discussed in **Section 2**, and summarized in **Tables 1** and **2**, and shown on **Figure 5**. A brief summary of this information as it pertains to the CSM development is provided below.

- Six petroleum USTs were either removed or closed in place in accordance with the regulations in force at the time of their closure. A potential exists for residual petroleum hydrocarbons at these UST sites.
- PCB cleanups were conducted at the Site as noted in **Table 1**. Residual concentrations of PCBs in subsurface soils in these areas may range from 1-25 parts per million (ppm).
- Elevated concentrations of PAHs, PCBs and heavy metals (lead, copper, nickel, vanadium and zinc) have been detected in the former sludge dewatering area immediately south of the cooling towers. Certain PAHs and PCBs exceeded the USEPA soil screening levels. This area measures approximately 14,400 square feet. No removal actions have been performed in this area; however,

this area was graded and covered with gravel to prevent erosion and migration of impacted material.

- Several areas on the site (as noted in **Table 2** and discussed in **Section 4.2.1** below) have the potential to contain petroleum hydrocarbons, PAHs, PCBs, and heavy metals given the 100-year industrial history of the site. The site history includes former coal use and current #4 fuel oil use.
- There is a significant amount of site-specific subsurface geological information available from Pepco's previous geotechnical activities and activities on adjacent sites. The data indicates the site is underlain by the Patapsco Formation potentially containing two water bearing zones separated by a clay unit. The Patapsco Formation is underlain by Arundel Clay regional confining unit at depths ranging from 42 to 73 feet beneath the Site. Because the borings and observations were made by different consultants over a long period of time, this information should be confirmed with a limited set of new borings.
- There is limited chemical data for subsurface soil in many areas of the Site, and there are no existing groundwater monitoring wells, so current groundwater conditions are not known. In addition, the potential impacts from the KPS landfill site on Site groundwater are not well understood.
- Currently, little is known about the volumetric flux of ground water to the Anacostia River in the area of the Site. Based on the limited information available, it is possible that the shallow groundwater zones beneath the Site could discharge to the Anacostia River during the low tide conditions. As part of this RI/FS Work Plan, monitoring well installation and aquifer testing are proposed to characterize the potential for groundwater discharge. The hydraulic data will be used, along with precipitation and aquifer recharge calculations, to develop a water budget including an estimate groundwater flux from the Site.
- At the Site, the Patapsco Formation and Arundel Clay has also been identified at relatively shallow depths. Rainfall recharge to the water table is limited by impermeable surface cover, which covers the majority of the Site. The low rates of recharge to the water table would, therefore, limit discharge of groundwater to surface water from the Site. The hydraulic data collected in the RI/FS will document inflows to (e.g., precipitation) and outflows (e.g., storm water runoff, groundwater recharge, etc.) from the Site.
- The 2008 SI report indicated that historical releases via storm drains may have contributed partially to the impacts noted in the Anacostia sediments. This potential pathway will be investigated further during the RI/FS.

- The nature and extent of potential constituents of potential concern (COPC)-impacted sediment are only partially characterized or delineated along most of the Site.
- Direct and indirect human health exposure pathways on the Landside portion of the Site have been found to be incomplete or insignificant because:

1. Access to the Landside portions of the Study Area is limited by perimeter fencing and 24-hours per day, 7 days per week security;
2. The presence of impervious surfaces/gravel cover prevents contact with surface soil;
3. Contact with subsurface soil is restricted by health and safety procedures and an employee hazard communication program to prevent or manage worker's exposure during excavation activities; and
4. Groundwater is not used as a local source of drinking water.

These elements will be evaluated as institutional controls during the finalization of a remedial action plan, if warranted by the findings of the investigation.

3.2 Waterside

The Waterside CSM explores the potential past and present mechanisms of constituent movement from the Site into the Anacostia River as well as the distribution of various sediment environments/habitats in the river as they might affect constituent distribution. The CSM summary presented in this section describes the origin (sources) of COPCs, as well as potential transport pathways, exposure pathways, and receptors. The CSM will be updated as more data becomes available through the implementation of RI/FS activities. Several sources of COPCs in sediment in the vicinity of the Site may exist, including:

- Historic discharges through Outfall 013 and overland flow from the Landside portion of the facility;
- Groundwater which may discharge to the surface water of the River;
- Storm sewers from other facilities, combined sewer outfalls, and sites such as the Kenilworth Landfill and Langston Golf Course former landfill; and
- Industrial activities in the upper anthropogenically-impacted Anacostia River and its main branches and tributaries.

Additional CSM elements include the following:

- COPCs in sediments associated with the Site may include PCBs, PAHs, and metals resulting from operation and maintenance of the power plant and equipment associated with Pepco's electrical transmission and distribution system, as well as chemicals which may have been released from other site- or non-site-related activities;
- Sedimentation rates in the river may have resulted in sediment deposition of COPCs on top of sediments adjacent to the Site from sources not related to the discharges from the Site;
- Likewise, sedimentation of the river has the potential to encapsulate historical discharges from the Site into sub-surficial horizons beneath the bio-active zone (the bio-active zone is the upper 4 to 6 inches of sediment that contains the benthic organisms);
- On-going sources associated with storm water discharge are controlled at this Site;
- Potential transport pathways for COPCs from the Benning Road facility to adjacent sediments are sheet flow from the Site to the water column and sediments, as well as historic storm water discharges to the water column and sediments.
- The tidal influence of the river is unknown with regards to COPC distribution adjacent to the Site; and
- Human health exposure pathways are most likely associated with consumption of contaminated fish, although the Anacostia River and Potomac River are currently under a fish consumption advisory imposed by the DDOE. This advisory provides the following advice to the public relative to consumption of fish from DC waters and indicates that the advisory is due to the presence of PCBs and other chemical contaminants:

  Do Not Eat: channel catfish (*Ictalarus punctatus*), carp (*Cyprinus carpio*), or American eel (*Anguilla rostrata*)

  May Eat: One-half pound per month of largemouth bass *(Micropterus salmoides)* or one half-pound per week of sunfish or other fish

  Choose to Eat: Younger and smaller fish of legal size

  The practice of catch and release is encouraged.

  In addition, the DDOE advisory provides limited guidance regarding skinning of fish, trimming fat, and cooking of fish.

- Ecological exposure pathways are most likely associated with benthic macroinvertebrates, fish, and piscivorous birds and mammals.

4 Work Plan Rationale

This section describes the data quality objectives (DQOs) development process and presents an overall approach for completing the RI/FS.

4.1 Data Quality Objectives

The DQOs for the Landside and Waterside areas were developed using the USEPA's DQO process, a multi-step, iterative process that ensures that the type, quantity, and quality of environmental data used in the decision making process are appropriate for its intended application. The Landside and Waterside DQO development process is presented in **Tables 3** and **4,** respectively.

The DQOs for this investigation are:

- To characterize environmental conditions within the Study Area and refine the CSM
- To collect additional data to update existing Landside and Waterside datasets from previous investigations so that nature and extent of impacts can be defined
- To collect data to determine whether and to what extent past or current conditions at the Site have caused or contributed to contamination of the Anacostia River
- To collect data within the Anacostia River to identify potential Site-related, near-Site and far-Site sources of COPCs in sediment and surface water
- To collect hydraulic data to better understand the site-specific hydrogeology and evaluate the volumetric flux of groundwater to the Anacostia River
- To collect data to better understand the Site storm drain system and associated discharge to the Anacostia River at various outfalls
- To collect data to support performance of Human Health and Ecological Risk Assessments
- To collect data to support a Natural Resources Damage Assessment (NRDA) evaluation
- To collect data to support development and evaluation of remedial alternatives

There are several analytical levels of data quality available to achieve the DQOs. These levels are typically designated as follows:

- **Level I** – Field screening or analysis using portable instruments, calibrated to non-compound specific standards;

- **Level II** – Field analysis using portable instruments, calibrated to specific compounds;
- **Level III** – USEPA recommended performance based methodologies such as those outlined in USEPA SW-846;
- **Level IV** – USEPA Contract Laboratory Program (CLP) Routine Analytical Services (RAS) methods; and
- **Level V** – Other internationally-recognized and/or non-standard analytical methods.

Field-screening data will be used in the Landside investigation to interpret lithologic units and aid in the identification of the presence or absence of a release in an area. In addition, field screening data will be used in the Waterside investigation to understand the depth of the water column, configuration of the river bottom and identification of utilities in the proposed investigation area.

Field screening data will be used as part of a weight-of-evidence approach in conjunction with laboratory data and geologic information to delineate impacts in the context of the CSM. Additionally, field screening and observations will be used by the field team to evaluate and adjust sampling depths and locations as needed. This approach to the field investigation is a key component of this dynamic work plan.

Landside and Waterside field screening activities will be conducted under Level I data quality protocol. Both Landside and Waterside field measurements [i.e., pH, temperature, turbidity, photoionization detector (PID), x-ray fluorescence (XRF)] will be completed under Level II data quality protocol. Samples submitted for fixed laboratory analysis and accredited on-site mobile laboratory will be analyzed, at a minimum, under Level III data quality protocol. Level IV or V could be used for specialty methods such as high resolution PCB analysis or forensic analysis.

4.2 Work Plan Approach

In order to meet the RI/FS project schedule expeditiously, the planned investigation will incorporate an iterative, dynamic approach to the investigation using field screening techniques, field-based decision-making and real-time evaluation of data while crews are still in the field, as necessary. In consultation with DDOE and the Pepco Project Manager, the AECOM Field Team Leader will be given authority to adjust sampling locations, as appropriate based on field conditions. The sampling program will incorporate an adaptive management approach that allows the use of screening parameters to screen larger areas to help focus resources on potential problem areas.Field and laboratory data will be rapidly uploaded to the project database to allow a timely evaluation of results, and thereby allowing near real-time adjustments to the field investigation, as necessary, to complete the delineation of impacts encountered. Pepco will use an accredited mobile laboratory to facilitate rapid characterization.

4.2.1 Landside Investigation

The Landside investigation program will include three phases of work, each phase providing necessary information for the planning of the successive phase of work. Landside data collection program is summarized in **Table 5**. Phase I activities will involve sampling of surface soils and storm drains. In addition, Phase I will first involve the screening of the Site using electrical resistivity imaging (ERI) to identify potential anomalies,followed by soil borings to calibrate the electrical signals with lithologic and chemical sampling.

ERI also provides useful information on soil and groundwater zones impacted by light non-aqueous phase liquids (LNAPLs) and/or dense non-aqueous phase liquids (DNAPLs). These zones will be targeted during Phase II using the direct push technology (DPT) (Geoprobe®) borings to delineate potential zones of impact and identify any continuing sources of contamination. Additional direct push borings will be conducted during Phase II to collect soil and groundwater samples and characterize horizontal and vertical extent of any impacts found using PID and XRF field instruments, and total petroleum hydrocarbon (TPH) and PCB aroclor analysis using an on-site mobile lab.

Phase III will involve a detailed hydrogeologic investigation involving the installation of monitoring wells, water level gauging, aquifer testing and groundwater monitoring. The locations of the monitoring wells will be based on results from ERI and DPT data collected in Phases I and II.

To help guide all of these Landside investigation activities, AECOM identified several “Target Areas” on the Site based on historical investigations and remediation, UST closures, former and current operations that could have a potential for Site impacts. These Target Areas are presented in **Table 2** and depicted on **Figure 5**. It should be noted that Pepco completed investigations and/or cleanups in Target Areas with PCB and petroleum releases in accordance with the District regulations. Some target areas have been identified based on PCB handling operations, which are in compliance with applicable regulations, and current fuel storage. Therefore, the purpose for these Target Areas is to serve as a guide to steer the RI field activities. Target Areas may be grouped together during the initial phases of investigations. As investigation activities proceed in an iterative fashion, they will focus on any impacts observed in or around the Target Areas.

4.2.2 Waterside Investigation

The Waterside investigation will focus on defining the nature and extent of COPCs in sediments adjacent to the Site and at selected background locations. There is a high degree of uncertainty associated with sediment COPCs originating from the Site, due to potential contributions from other sources, the nature of the tidal river system, and sediment deposition. After a review of Site-related documents, the following potential data gaps were identified:

- The horizontal and vertical extent of COPC-impacted sediment proximate to the Site requires further delineation;

- The potential contribution of groundwater that discharges from the Site to the river is not well understood;

- The source(s) of any COPCs in sediments proximate to the Site have not been adequately determined. Given the high potential for other sources of these compounds, it is unlikely that all COPCs identified within the sediment would be attributable solely to the operations at the Site. Developing an understanding of Site-related impacts to surface water and sediment in this urban river system requires information such as PAH and PCB fingerprinting/pattern matching (referred to as forensic analysis).

- The effects associated with potential exposure to Site-related sediment COPCs on Anacostia River human and ecological receptors have not been adequately assessed and the potential role of non-COPC stressors such as grain size, CSOs, seasonal fluctuation in dissolved oxygen (DO) is not adequately understood. It is possible that these non-chemical stressors also play a role in posing a potential risk to ecological health in the vicinity of the Site.

This Work Plan has been designed to address these data gaps, as well as other topics, through the collection of additional data and further review of existing information.

Data for the Waterside area will be collected in two phases. Phase I will involve bathymetric and utility surveys at on-site and background locations. Surface water and sediment sampling will be conducted under Phase II. Sediment samples will be collected using barge-mounted Vibracore™ equipment. An on-site mobile lab will be used to characterize the extent of sediment impacts using PCBs aroclor analysis.

5 RI/FS Tasks

This section provides a brief discussion of the various RI/FS tasks. Detailed sampling procedures, operating procedures, calibration and analytical procedures will be discussed under the SAP.

5.1 Project Planning

The project planning task involves preparing necessary project plans (Work Plan, SAP and HASP), obtaining all required permits, clearances, and site access. In addition to obtaining utility clearances as needed, the following permits requirements have been identified:

- Approval of the Work Plan, SAP and HASP by DDOE.
- Drilling permits for the landside and waterside sampling activities from the District Department of Consumer and Regulatory Affairs (DCRA).
- Permit from USACE, Baltimore District, for working in the Anacostia River. It is expected that the sampling would be covered under the Nationwide Permit (NWP) #5 or #6. An individual Water Quality Certification must be obtained from DDOE to authorize the use of these NWPs.
- A permit would be required from the NPS to access the River and conduct sampling in the River.

5.2 Field Investigation Activities

The field investigation activities are designed to characterize conditions in soil, groundwater, surface water and sediment; further refine the CSM; and collect data to support risk assessment and NRDA. Data gaps identified during the review of existing data were used to guide the scope of this investigation. Field investigation activities are divided into Landside and Waterside activities and are described below. All field investigation activities will be conducted in accordance with the approved SAP and HASP.

5.2.1 Landside Investigation

<u>Phase I, Task 1: Utility Clearance</u>

Various forms of underground/overhead utility lines or pipes may be encountered during site activities. Utility plans will be obtained and reviewed while selecting sampling locations. Prior to the start of intrusive operations, utility clearance will be conducted by public and private utility locators in proposed investigation areas. Miss Utility will be contacted for the identification of all recorded public utilities servicing the Site. Following public utility identification, a private utility locating contractor will be utilized to identify and locate any utilities that Pepco is unable to clear. A review of available as-built drawings will be conducted to locate any additional subsurface structures prior to intrusive activities. If insufficient data is available to accurately determine the location of the utility lines within the proposed investigation area, AECOM will hand clear or use soft dig techniques to a depth of at least five ft bgs in the proposed areas of subsurface investigation.

Phase I, Task 2: Surface Soil Sampling

The purpose of surface soil sampling is to evaluate surface soil quality and to help plan the DPT investigation. The analytical data will also be used to develop correlations with field instruments to be used for screening during Phase II activities. Surface soil samples will be collected from within the top 12 inches of the subsurface after coring through existing pavement or ground cover. Each sample will be screened with a field PID and XRF instrument and the results will be recorded. As shown in **Table 5**, a total of 25 surface samples will be collected from various portions of the Site. The surface soil samples locations will be distributed to get a good coverage of the entire facility, while using some biased samples to address the Target Areas presented (**Figure 10**).

Phase I, Task 3: Storm Drain Sampling

AECOM will identify the storm drains in locations that would be impacted by potential releases, based on evaluation of data from prior sampling events, site inspections, and discussions with Pepco personnel. The purpose of storm drain sampling is to determine, if current or historical discharges from the storm drain system contributed to contamination in the River. A total of five sediment/residue and five water samples will be collected from Site storm drains. Up to two of these locations will be selected for forensic analysis.

Phase I, Task 4: Electrical Resistivity Imaging (ERI)

ERI techniques are commonly used in environmental site characterization and involve the measurement of electrical conductivity/resistivity of the ground. A variation of the ERI technology known as GeoTrax™ is offered by Aestus, LLC. Each GeoTrax Survey™ will be performed by installing specialized 3/8-inch diameter stainless steel electrodes into the ground along a straight line or transect that could run hundreds of feet long depending on the target depth of investigation. The electrodes are hammered into the ground just far enough to get electrical contact with the earth, typically 6 to 15 inches. The resulting data is processed using proprietary algorithms to produce a color-coded, high-resolution, 2-dimensional or 3-dimensional image that can be used to identify anomalies that represent changes in subsurface lithology, buried objects, and LNAPL/DNAPL plumes, and chlorinated compounds such as PCBs. GeoTrax™ imaging can be used as a screening tool and when calibrated with actual lithologic and chemical data collected from a direct push boring, it provides a rapid site characterization tool. Up to eight GeoTrax™ transects will be run along cross section A-A', in the former sludge dewatering area, and other Target Areas to the top of the Arundel Clay unit as identified in **Figure 10**. Calibration borings will be performed using a combination of soil borings in Phase I and direct-push borings under Phase II.

Phase I, Task 5: Soil Borings

A geotechnical investigation will be conducted to aid in the verification of the existing data and design of monitoring wells. Five soil borings (SB-1 through SB-5) will be installed at the approximate locations shown on **Figure 7**. The soil borings will be advanced approximately 10 feet into the confining layer (Arundel Clay) using a Hollow Stem Auger (HSA) Drill rig to obtain split-spoon and Shelby tube samples. Split-spoon samples will be obtained using the standard penetration test (SPT) in accordance with the American Society for Testing and Materials (ASTM) Standard D1586. The blow counts (hammer strikes) required to advance the sampler a total of 18 inches or 24 inches will be counted and reported. Soils will be logged in accordance with the Unified Soil Classification System (USCS). Split spoon samples will be collected continuously from the surface to the water table and then every five feet from the water table to the terminal depth of the boring. Soil samples will be field screened for VOCs using a calibrated PID. Up to five Shelby tube or disturbed samples (from drill cuttings) will be collected from each boring in accordance with ASTM Standard D1587 and analyzed for ASTM Permeability, Grain size and Atterberg limits. To aid in the identification of the Arundel Clay, three Shelby tube samples will be collected from the bottom (approximately 10 feet into the confining unit) from three selected soil borings and analyzed for ASTM Permeability, Grain size and Atterberg limits. One split-spoon soil sample from each soil boring will be collected from the middle of the water table aquifer and analyzed for ASTM Grain size and Atterberg limits.

Groundwater levels will be collected during installation of the geotechnical borings and 24 hours following completion of the borings. Dedicated investigative tooling and materials will be properly decontaminated in accordance with the SAP. Disposable materials and supplies (e.g. tubing, personal protective equipment (PPE), etc.) will be disposed of with the municipal waste. Soil cuttings generated during boring installation will be temporarily staged on-site in 55-gallon drums while awaiting characterization.

Upon completion of soil boring activities, soil borings will either be converted to monitoring wells (if determined feasible) or properly abandoned with grout using a tremie pipe to the maximum extent possible. The ground surface will be restored to match the existing surface cover. Soil boring locations will be surveyed (x, y and z-planes) into existing site datum by a licensed surveyor.

Phase II, Task 1: DPT Subsurface Investigation

Following the completion of Phase I, DPT borings will be advanced in and around Target Areas identified on **Figure 5** as well as any anomalies identified by the ERI activities. As described in **Section 2.0**, Target Areas identified on **Figure 5** are for guidance purposes only. Several of the Target Areas that are geographically close may be grouped together and investigated as one area based on field logistics. A total of 40 DPT soil borings are planned. Soil borings will be advanced to approximately 5 ft below the first water table or refusal, whichever is encountered first. Soil cores will be screened continuously using a PID. A field geologist will continuously log the cores in accordance with the USCS to the terminal depth of the boring.

Soil samples will be collected from three depths and subjected to screening using an XRF field instrument, and total petroleum hydrocarbon (TPH) and PCB aroclor analysis using an on-site mobile laboratory. Boring locations and characterization parameters will be adjusted based on the screening data. Investigation activities will focus on any Target Areas where impacts are observed. Groundwater samples will be collected in-situ from the within the top five feet of the water table using a discrete sampling DPT tool. It should be noted that groundwater sample intervals may be adjusted based on the results of the ERI screening. Groundwater and soil samples will be submitted for laboratory analysis as noted in **Table 5**. A subset (approximately 20%) of the samples will be subjected to metals analysis for confirmation of the field XRF data.

Reusable investigative tools and materials will be properly decontaminated in accordance with the SAP. Disposable materials and supplies (e.g. direct push liners, tubing, PPE, etc.) will be rinsed and disposed of as ordinary solid waste. Soil cuttings and purge water generated during boring installation will be temporarily staged on-site in 55-gallon drums while awaiting characterization.

Upon completion of soil boring activities, soil borings will be properly abandoned with grout following the DDOE guidance. The ground surface will be restored to match the existing surface cover. Soil boring locations will be surveyed (x, y and z-planes) into existing site datum by a licensed surveyor.

Phase III, Task 1: Monitoring Well Installation

Following the completion of Phase II, monitoring wells will be designed and installed based on the results of ERI, DPT, and geotechnical investigative activities. The number or location of the wells cannot be determined at this time. Upon review of results from Phase I and Phase II, Pepco will prepare and submit a Work Plan addendum to DDOE to describe the selection of monitoring well locations. Upon DDOE approval of the Addendum, monitoring wells will be installed using a drill rig equipped with 12.25-inch outer diameter hollow stem augers (8.25-inch inner diameter). Split-spoon samples will be obtained in accordance with the ASTM Standard D1586.Soils will be logged in accordance with the USCS. Split-spoon samples will be collected continuously from the surface to the water table and then every five feet from the water table to the terminal depth of the boring. Soil samples collected from the vadose zone will be field screened using a PID for VOCs.

The monitoring wells will be constructed using two-inch diameter Schedule 40 polyvinyl chloride (PVC) well casing and slotted PVC well screen. If two water-bearing zones within the Patapsco formation are confirmed, the wells will be constructed of 2-inch diameter PVC casing as nested wells with two discrete screened intervals. A certified clean sand filter pack will be installed in the annular space between the borehole and the well screen and casing from the bottom of the boring to approximately one foot above the screened interval. Approximately two feet of bentonite clay will then be placed on top of the sand pack and hydrated to form a seal above the sand. After allowing the bentonite to set, the remaining portion of the annular space will be tremmie grouted with a bentonite-portland cement mixture to grade. Each monitoring well will be completed inside a traffic-rated 18-inch road box/well vault. Upon completion of monitoring well installation, construction logs will be completed providing the details of the well construction and depth.

Following installation, the wells will be developed using a surge block and submersible pump. The surge block will beused inside the well to flush fine sediments from the sand filter, grade formational sediments, and remove the sediment lining on the borehole that is inherent in most drilling methods. After the well is surged, a submersible pump will be lowered into the well and groundwater will be withdrawn. Temperature, pH, specific conductance and turbidity readings will be monitored and pumping will proceed until the readings have stabilized or five well volumes have been removed.

Drill cutting and development water will be managed as described in **Section 5.2.3** below. Top of casing elevations and locations for each groundwater monitoring well will be surveyed into existing Site datum by a licensed surveyor. In addition, one or more river gauging stations will be established in the Anacostia River and surveyed as well.

Phase III, Task 2: Monitoring Well Gauging and Sampling

All groundwater monitoring wells will be allowed to equilibrate for a minimum of 7 days after development prior to groundwater sample collection. Prior to thegroundwater sampling, a site-wide water level measurement event will be performed during the period of slack tide in order to determine groundwater elevations at the Site and accurately characterize local groundwater flow conditions. In addition, the Anacostia River elevations will be determined concurrently by collection of water levels at gauging stations with referenced elevations surveyed to the same control datum as the monitoring wells. The surface water elevations will also be measured during the period of slack tide to determine the elevation relationship between the site groundwater and the Anacostia River. Two such gauging events will be conducted.

Groundwater samples will be collected from monitoring wells with portable bladder pumps using disposable bladders and low-flow sampling techniques. Groundwater samples will be collected and analyzed as noted in **Table 5**. Disposable sampling materials, decontamination water and purge water will be containerized and managed as described in **Section 5.2.3** below.

Phase 3, Task 3: Aquifer Testing

Aquifer testing will be conducted using slug testing techniques. Approximately two weeks following pump test activities, slug testing will be conducted on select monitoring wells to characterize hydraulic properties of the water table aquifer. The tests will consist of falling-head and rising-head slug tests to determine the hydraulic conductivity of the material in the vicinity of each well. The tests will proceed until the water levels have recovered to within 10% of the static pretest levels or 24 hours have elapsed. Slug testing data will be interpreted using the Bouwer-Rice solution for an unconfined aquifer on Aqtesolv™ or similar aquifer test analysis software.

5.2.2 Waterside Investigation

The Waterside investigation is designed to evaluate potential sources of constituents in the sediment of the Anacostia River in the vicinity of the Site, provide horizontal and vertical delineation of constituents in the sediment, and determine the potential effects associated with exposure to sediment constituents on Anacostia River receptors (i.e., human and ecological receptors). Based on the results of prior sampling, the investigation will focus on PAHs, PCBs, and metals, with limited screening samples for VOCs, SVOCs, pesticides, and dioxins/furans. This information will be used to support the risk assessments and the NRDA.

This investigation will primarily address sediment conditions within the Waterside Investigation Area, an area of the Anacostia River approximately 10 to15 acres in size including approximately 1,500 linear feet to the south (approximately 1,000 feet south of the Benning Road Bridge) and 1,000 linear feet to the north of the Site's main storm water outfall area (**Figure 10**). The proposed study area is based on its proximity to the Site and results from the USEPA 2009 SI Report.

The Waterside investigation will focus on defining the nature and extent of constituents of potential concern in sediments adjacent to the Site and at selected background locations. A progressive elimination approach will be incorporated into the Waterside sampling program to allow the use of screening parameters to screen larger areas and help focus resources on potential problem areas. Following the evaluation of these findings, additional investigation may be recommended to refine the delineation of chemical data or provide additional site-specific information from selected portions of the study area.

The Waterside investigation will use a systematic sampling grid to determine sediment and surface water sampling locations during the Waterside investigation (**Figure 11**). This grid will consist of 45 sampling locations on ten (10) sampling transects positioned perpendicular to the shoreline. Three to five sampling locations will be positioned evenly spaced along each transect. Additional sampling locations will be positioned between each transect and close to Outfall 013 and two sampling locations will be placed in the wetland area for a total of 45 sampling locations within the Waterside Investigation Area. The exact locations of the sampling locations may vary according to the conditions of the substrate, the nature of depositional processes observed in the geophysical survey, and agency consultation prior to the field effort.

At each of the 45 sample locations, field measurements will be taken, surface sediment will be collected and inspected, and sediment cores collected. Surface water samples will be collected at a sub-set of the locations within the grid. The locations will be sampled using a motorized boat. While collecting the sediments at each station, the boat will be anchored. The vessel will be mobilized in such a way as to minimize the potential for disturbance of the sediment and surface water via wave or propeller action. A differential global positioning system (DGPS) unit will be used to record all sample station coordinates to sub-meter accuracy. The sampling program will include surface sediment samples and subsurface Vibracore™ samples. While this sampling plan provides a framework for the proposed sampling approach, field observations will determine the final sample selection and which samples are chosen for laboratory analysis.

Ten (10) additional surface sediment and surface water sampling locations will be chosen up river, down river, and across river from the site to provide additional background and baseline area-wide data. An effort will be made to obtain background samples from locations with similar ecological parameters (e.g., sediment grain size, water depth, flow regime, tidal influence, etc.) as those adjacent to the site.

As described in more detail below, the field activities for the Waterside investigation are as follows:

- Bathymetric and utility survey;
- Surface sediment sampling;
- Subsurface sediment sampling using Vibracore™;
- Surface water sampling; and

- Laboratory testing including forensics evaluations.

A summary of the data types, quantities, analytes and methodologies, and data uses is presented in **Table 6**. Permits or access agreements that may be required from the District of Columbia, United States Coast Guard (USCG), the USACE and the National Park Service (NPS) will be obtained prior to initiation of the field program.

The following sections describe the field activities that will be performed during the Waterside investigation. All of the sampling locations within the Waterside Investigation Area are presented in **Figure 11**. Additional samples will be collected from the background sampling areas to be identified based on information in **Appendix C**. Specific procedures for the field work are described in the SAP.

Phase I, Task 1: Bathymetric and Utility Surveys

Prior to initiation of any intrusive sediment sampling, a bathymetric and utility survey will be conducted in the Waterside Investigation Area. The bathymetric survey will provide a basis for understanding the depth of the water column and the configuration of the river bottom and will be used to prepare a contour map of the top of the sediment surface in and around the investigation areas. The utility survey will be conducted to identify river bottom pipelines, cables and lines that may be located in the planned area of investigation. Their presence and global positioning system (GPS) benchmarked locations will be noted on a base map of the area.

A specialty subcontractor will perform the utility survey within the Waterside Investigation Area identified in **Figure 11**. A limited bathymetric survey will also be performed at background sampling locations to assure the similarity of river bottom morphology with that at the site and to confirm the lack of utility crossings at these locations. Side scan sonar and/or magnetometer surveys will be used to identify any utilities or large pieces of debris that might interfere with the proposed sampling activities.

It is anticipated that parallel survey lines will be run at 50-foot intervals throughout the survey area. Additional tie lines will be run perpendicular to these lines. The contractor will use a survey-grade precision fathometer (Odom Hydrotrack Fathometer or equivalent) to collect continuous water depth data along the track lines. The contractor will continuously log each geographic position (X-Y location) using DGPS. Depth and geographic location will be sent to the survey computer using the Integrated Survey Software package. Time will be continuously recorded; therefore, tidal correction will be available for post-processing using data from a tide gage that will be installed and surveyed prior to the bathymetric survey. Survey accuracy will follow the USACE Manual No. 1110-2-1003 for hydrographic surveying (USACE, 2002).

Phase II, Task 1: Surface Water Sampling

Surface water sampling will be conducted prior to sediment sampling to assure the integrity and representative nature of the sample. A total of twenty (20) water samples will be collected from immediately above the sediment-water interface in order to capture potential impacts of groundwater discharge. Ten (10) samples will be collected from within the Waterside Investigation Area and ten (10) samples will be collected from background sampling locations.

The sampling boat will be located above the selected sampling location using GPS coordinates. Upon arrival at each sampling station, a depth-to-sediment measurement will be collected to record the water depth. The water depth will be recorded with an accuracy of ±0.1 feet. Two sets of field measurements of water quality will be taken at each station. One measurement will be taken near the water surface, approximately one foot below the water surface, and a second measurement within one foot from the top of the sediment surface. Only one water quality measurement will be taken at mid-water depth and at stations where the water depth is less than three feet. The water quality parameters to be measured in the field include the following:

- Temperature (degrees Celsius, °C);
- Dissolved Oxygen (milligrams per liter, mg/L);
- pH (standard units, S.U.);
- Turbidity (Nephelometric Turbidity Units NTU); and
- Conductivity (micromhos per centimeter, µmhos/cm).

The surface water sample for chemical analysis will be obtained from approximately one foot above the sediment-water interface using a depth specific sampling device. The water samples will immediately be packaged for shipment to the laboratory following preservation and management protocols described in the accompanying SAP.

Surface water samples will be analyzed for the following parameters:

- In all samples – Total and dissolved phase metals, PCB aroclors, PAH16, and hardness.
- In a sub-set of up to 10 samples - VOCs, SVOC, pesticides, dioxins/furans.

A summary of the analytes and methodologies is presented in **Table 6** and details on chemical analyses are provided in the SAP.

Phase II, Task 3: Surface Sediment Samples

The sediment sampling activities outlined below will conform to U.S. USEPA and ASTM standard methods where appropriate (ASTM, 2000a; ASTM, 2000b; U.S. USEPA, 2001).

A surface sediment grab sample will be collected at all 45 of the sampling locations shown in **Figure 11**, in addition to 10 background locations (total of 55 surface sediment samples). If obstructions such as boulders or cobbles are encountered at a specific station, the location of the station may be changed to collect sediment samples as required. In the case that boulders or debris are encountered, samples will be collected as close as possible to the specified sample location.

All surface sediment samples will be collected from a depth of 0 to 6 inches below sediment surface with a Petite Ponar grab sampler or the equivalent. During this phase of work, the surface samples will be logged for visual and physical observations. A portion of the sample will be placed in a pan, inspected for sediment type, color, odor, obvious signs of biota and other notable features, and then returned to the river. The remainder of the sample will then be prepared for shipment to the laboratory.

Field personnel will record field observations of the physical characteristics of the sediment encountered at each sampling station and also important observations regarding the physical characteristics of the study area. Information recorded will include:

- Sample station designation;
- Presence of fill material, coal or coke, or asphalt- or tar-like materials;
- Presence or absence of aquatic vegetation;
- Sediment color, texture, and particle size; and
- Odor and presence of sheens or LNAPL and/or DNAPL.

The 55 surface sediment samples used for chemical testing will be processed by personnel in the field. The samples will be screened using a PID and oversized material such as twigs, shells, leaves, stones, pieces of wood, and vegetation will be removed by hand. The grab sample will be removed from the sampling device using a stainless steel spoon/scoop and placed in a decontaminated 1-gallon stainless steel or Pyrex glass mixing bowl. Each sample will be visually examined for physical characteristics such as composition, layering, odor, and discoloration. Samples for VOC, Simultaneously Extracted Metals (SEM), and acid volatile sulfide (AVS) analyses will be collected prior to sediment homogenization. The remaining sample will be homogenized in the mixing bowl and placed in appropriate sample containers. Sediment sampling equipment such as bowls, spoons, augers, and dredges will be decontaminated prior to and following sample collection as described in the accompanying SAP. Each jar will be properly labeled with the name of the study site, the station location designation, the time of collection, the date of collection, and name of collector. Following sample preparation, glass jars will be kept at 4ºC. Surface sediment samples will be analyzed for the following parameters:

- In all samples – Total Organic Carbon (TOC), grain size, metals, SEM and AVS, PCB aroclors, and PAH16.
- In a sub-set of up to 20 samples - VOCs, SVOC, pesticides, dioxins/furans.

A summary of the analytes and methodologies is presented in **Table 6** and details on chemical analyses are provided in the SAP.

Phase II, Task 4: Subsurface Sediment Samples/Vibracore™ Borings

Forty-five Vibracore™ sediment borings will be completed at the sediment sampling locations shown on **Figure 11** (i.e., co-located with the surface sediment sampling locations). The sediment cores will be collected using a small boat equipped to advance a 3-inch diameter Vibracore™ sampler to a maximum depth of 10 feet below the sediment surface, or to refusal, whichever is encountered first. The ten foot target depth is based on published average sedimentation rates for the Anacostia River (approximately 4 to 6.5 cm/yr) and should provide a sediment column that includes sedimentation which generally predates the operation of the facility. A second consideration is the general limits of the Vibracore™ sampling tool which vary depending on sediment type and compaction history.

To meet the objectives for this task, the sampling will be performed as follows:

- The core sampler, equipped with a plastic liner, will be driven and extracted at each of the designated sample locations;
- The core liner will be extracted from the core barrel and split open;
- The sediment sample will be screened for organic vapors with a PID and logged for physical characteristics; and
- Samples from up to three horizons within each core will be collected.

It is estimated that up to 165 discrete interval subsurface sediment samples will be collected for laboratory analysis from the 45 sampling locations in the Waterside Investigation Area and the 10 background locations (3 horizons at 55 locations). Subsurface sediment samples will be analyzed for the following parameters:

- In all samples - PCB aroclors (performed using an on-site lab), and PAH16;
- In a sub-set of up to 20 samples – TOC and grain size; and
- In a sub-set of up to 7 samples – forensic testing to evaluate PCB and PAH origins and contributions.

These data will establish a database from which to further evaluate the horizontal and vertical extent of PCB and PAH constituents in river sediments adjacent to the Benning Road facility. Visually-impacted zones will be logged and the PCB data will help to define impacted areas of concern, concentration gradients, and sediment quality data gaps, if they exist. These data will serve as the basis from which to refine potential future sampling events.

A summary of the analytes and methodologies is presented in **Table 6** and details on chemical analyses are provided in the SAP. The Waterside sampling program will include the collection of up to seven (7) sediment samples for submittal to a specialty forensics laboratory for fingerprinting purposes. Testing will be performed to identify PCBs and PAH contributors to the total PCB and PAH load identified in the samples. Testing may also include upstream (i.e., background) samples, if field observations indicate an alternative potential source of PCBs and PAHs that warrants further consideration. This forensic analysis will be used to differentiate between Benning Road sources and other potential sources of PCBs and PAHs in the Anacostia River sediments.

5.2.3 Investigation-Derived Waste (IDW) Management

IDW generated during the Landside and Waterside investigations include the following:

- Disposable material such as Geoprobe®/Vibracore™ liners, personal protective equipment (PPE), plastic sheeting, etc.
- Drill cuttings
- Excess soil/sediment leftover from sampling activities
- Well development water
- Purge water
- Decontamination water

Minimally-contaminated disposable sampling materials and PPE will be rinsed and disposed of as ordinary solid waste. Drill cuttings, soil and sediment will be containerized and sampled for RCRA waste characteristics and PCBs. These wastes will be managed as dictated by the waste characterization results and disposed of at properly permitted off-site disposal facilities. All water will be containerized, sampled and disposed of at a permitted off-site facility.

5.3 Data Evaluation and Validation

All laboratory analytical data will be provided by the supporting laboratories in electronic formats, both Portable Document Format (PDF) and electronic data deliverables (EDD). The PDF format deliverable will include both sample results and all quality control (QC) results in standardized CLP-like format, as well as all supporting raw data. The PDF report will be searchable (embedded text) and bookmarked to facilitate data review. The associated EDD will be provided in an EQuIS four-file format. AECOM's requirements and clarifying definitions and valid values file for the EQuIS four-file format will be provided to all supporting laboratories. Complete paginated data packages will contain the following minimum information:

- A narrative specific to the sample data group (SDG) addressing any difficulties encountered during sample analysis and a discussion of any exceedances in the laboratory quality control sample results;
- A cross-referenced table of field and laboratory identification numbers;
- Analytical and preparatory method references;
- Definition of any data flags or qualifiers used; a list of valid data flags and qualifiers for use in the EQuIS reporting format will be provided;
- A table of contents for the data package similar to the USEPA Complete Sample Delivery Group File (CSF) Audit Checklist;
- A chain-of-custody signed and dated by the laboratory to indicate sample receipt. The temperature of the cooler will be noted on the chain-of-custody. Copies of shipping air bills will also be provided;
- Results for each field sample, blank and QC sample in units appropriate to the method presented on Form 1s or equivalent; reporting limits will also be provided and any analyte which is not detected will be reported as less than the reporting limit.
- Dilution factors for each sample or analyte;
- Calibration data including raw data; initial calibration curve data such as linear regression statistics or average relative response factors and percent relative standard deviation; continuing calibration data such as relative response factors and percent difference data;

- Gas chromatography/mass spectrometry (GC/MS) and Inductively Coupled Plasma-Mass Spectrometry (ICPMS) tuning data;
- Internal standard data;
- Surrogate (system monitoring) data;
- Inductively Coupled Plasma (ICP) inter-element correction factors, linear range data, serial dilution data, and interference check sample results;
- Copies of laboratory notebook pages or preparation logs showing sample preparation documentation;
- Field sample results and raw data (chromatograms, ICP printouts, etc.) including dilution data;
- Laboratory QC data including method blank data, laboratory duplicate data reported as relative percent difference (RPD), laboratory control spike data, reported as percent recovery; MS/MSD data reported as percent recovery with RPD calculated; all associated raw data will also be provided;
- Copies of phone logs, faxes and e-mails associated with the sample set; and
- Any other data necessary to conclusively confirm the analytical results reported and the overall quality of the data.

The laboratory will retain a copy of the completed data package and all copies of laboratory results, laboratory notes, quality assurance/quality control (QA/QC) data, and chain-of-custody record for a period of 10 years unless a shorter retention period is agreed upon in writing. All raw data on magnetic media along with identifying information will be retained for the duration of the Consent Decree and for a minimum period of 6 years after its termination.

Upon receipt from the laboratory, hard copy data and EDDs will be checked for completeness. During the data analysis process, a variety of quality checks are performed to ensure data integrity. These checks include:

- Audits to ensure that laboratories reported all requested analyses;
- Checks that all analytes are consistently and correctly identified;

- Reviews to ensure that units of measurement are provided and are consistent;
- Reports to review sample definitions (depths, dates, locations); and
- Proofing manually entered data against the hard-copy original.

All data generated from activities under this workplan will be subjected to assessment of data quality and usability per methodology provided in the QAPP. This assessment will include limited or full validation in accordance with USEPA National Functional Guidelines. Data qualifiers consistent with USEPA guidelines will be applied to results in the database. Reconciliation with the project data quality objectives will be performed and results of this assessment will be included in the RI report. Factors to be considered in this assessment of field and laboratory data will include, but not necessarily be limited to, the following:

- Conformance to the field methodologies and standard operating procedures (SOPs) proposed in the Work Plan and QAPP;
- Conformance to the analytical methodologies provided in the QAPP;
- Adherence to proposed sampling strategy;
- Presence of elevated detection limits due to matrix interferences or contaminants present at high concentrations;
- Unusable data sets (qualified as “R”) based on data validation;
- Data sets identified as usable for limited purposes (qualified as “J”) based on data validation;
- Effect of qualifiers applied as a result of data review on the ability to implement the project decision rules; and
- Status of all issues requiring corrective action, as presented in the QA reports to management.

The effect of nonconformance (procedures or requirements) or noncompliant data on project objectives will be evaluated. Minor deviations from approved field and laboratory procedures and sampling approach will likely not affect the adequacy of the data as a whole in meeting the project objectives. The assessment will also entail the identification of any remaining data gaps and an assessment of the need to re-evaluate project decision rules. This assessment will be performed by the AECOM technical team, in conjunction with the AECOM Project QA Officer, and the results presented and discussed in detail in the final report.

5.3.1 Data Management

Due to the dynamic nature of this investigation, data management will be critical to the success of the assessment.Automation of data collection, transmission, and processing will be integral to the performance of the project.

5.3.2 Field Data Collection and Transmission

Each investigation point will be located using a global positioning system receiver with sub-two-meter accuracy.These data will be uploaded on a daily basis to the project database that is discussed below in **Section 5.3.4**. Based on accessibility, exterior locations will also be surveyed by a licensed surveyor, while locations in building interiors will be field-measured from known landmarks.

Field notes will be transmitted to the project team in a timely manner. Laboratory deliverables will be provided in a format ready for upload into the project database.

5.3.3 Data Review

Field notes will be reviewed against the laboratory chains-of-custody.Field notes and field forms will be reviewed by the field team leader for accuracy and completeness.

At the beginning of each day of field work, a summary of anticipated laboratory deliverables for the day will be prepared. At the end of each day, the project team will review the list of daily deliverables for completeness and evaluate analytical data against applicable regulatory criteria. Analytical data will be reviewed and validated as described in the QAPP.

5.3.4 Project Database

Field data, laboratory data, and geospatial data will be uploaded to and stored in the project database. Laboratory deliverables will be received in an AECOM-specified electronic format ready for upload to the EQuIS database, and the database will be used with a GIS to prepare figures for evaluation of impacts and data gaps, while the field program is ongoing.

5.4 Risk Analysis

The RI will include performance of a Human Health and Ecological Risk Assessments (ERA) using validated data obtained during the RI field investigation. The approaches for both the Human Health and the Ecological Risk Assessments are summarized in the following sections and presented in detail in **Appendices D** and **E,** respectively.

5.4.1 Human Health Risk Assessment

A baseline Human Health Risk Assessment (HHRA) will be conducted to evaluate potential human health risks at the Siteusing the four step paradigm as identified by the USEPA in the *Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual* (USEPA, 1989a). The steps are:

- Data Evaluation and Hazard Identification;
- Dose-Response Assessment;
- Exposure Assessment; and
- Risk Characterization.

As discussed in **Section 3.1** above, direct or indirect exposure pathways on the Landside portion of the Site are determined to be incomplete or insignificant because:

- Access to the Landside portions of the Site is limited by perimeter fencing and tight 7 day/24 hour security;
- The presence of impervious surfaces preventing contact with surface soil;
- Contact with subsurface soil is restricted by HASP procedures to prevent or manage worker's exposure during excavation activities; and
- Groundwater is not used as a local source of drinking water.

The HHRA therefore will focus on potential human health exposures to Anacostia River surface water, sediments, and fish. Because contaminant migration pathways via overland flow through storm drains and groundwater discharges to the Anacostia River may be of concern, the HHRA also will include evaluation of groundwater (as it discharges to the surface water of the Anacostia River).

The HHRA work plan is organized into the following sections:

- Data Evaluation and Hazard Identification – presents the methods to be used in the data evaluation and hazard identification, including selection of COPCs that will be evaluated quantitatively in the risk assessment;
- Dose-Response Assessment – presents a discussion of the dose-response assessment process. The dose-response assessment evaluates the relationship between the magnitude of exposure (dose) and the potential for occurrence of specific health effects (response) for each COPC. Both potential carcinogenic and non-carcinogenic effects will be considered. The most current USEPA-verified dose-response values will be used when available;

- Exposure Assessment - presents a discussion of the exposure assessment process. The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to COPCs by a receptor. Potentially exposed individuals, and the pathways through which those individuals may be exposed to COPCs are identified based on the physical characteristics of the Study Area, as well as the current and reasonably foreseeable future uses of the Study Area. The extent of a receptor's exposure is estimated by constructing exposure scenarios that describe the potential pathways of exposure to COPCs and the activities and behaviors of individuals that might lead to contact with COPCs in the environment. For the Waterside, thefollowing potentially complete exposure scenarios are identified as warranting evaluation:

  - Worker – potential direct exposure to site-related COPCs in surface water and sediment while working along the banks of the Anacostia River adjacent to the Site;
  - Recreational Receptor – potential direct exposure to site-related COPCs in surface water and sediment while wading or swimming in the Anacostia River adjacent to the Site;
  - Recreational Angler -potential indirect (consumption) exposure to site-related COPCs that may have bio-accumulated into fish in the Anacostia River, and to COPCs in surface water and sediment while fishing in the river.

  Despite the presence of an advisory warning against the consumption of certain species of fish from the Anacostia and Potomac Rivers, it will be assumed that a recreational angler visits the Anacostia River to fish and consumes his/her catch;

  - Risk Characterization – presents a discussion of the risk characterization process and uncertainties associated with the risk assessment process. Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive site-specific estimates of potentially carcinogenic and non-carcinogenic risks resulting from both current and reasonably foreseeable future potential human exposures to COPCs. The results of the risk characterization will be used to identify constituents of concern (COCs), which are the subset of those COPCs whose risks result in an exceedance of the target risk of 10^{-6} for potential carcinogens and a target Hazard Index of 1 for non-carcinogens (that act on the same target organ) (USEPA, 1990; 1991b);
  - Uncertainty Evaluation - Within any of the steps of the risk assessment process described above, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less

support. The assumptions that introduce the greatest amount of uncertainty in this risk evaluation will be discussed in the Risk Characterization section of the HHRA report. The potential contribution of background to Site-related risks will also be discussed; and

- Summary and Conclusions - discusses the summary and conclusions section of the baseline HHRA report.

5.4.2 Ecological Risk Assessment

The ecological risk assessment (ERA) will be conducted according to the general tiered approach and methodology provided by the USEPA (1997, 1998, and 2001) based on the validated results of the Waterside field investigation to evaluate the potential for ecological risks associated with exposure to environmental media within or along the Anacostia River adjacent to the Site. The results of the ERA will be used to help inform the need for any additional evaluation and/or remedial action at the Site, and the NRDA. The ERA will focus on the Waterside portion of the Site, and will include evaluation of groundwater (as it discharges to the surface water of the Anacostia River), surface water, and sediment.

The general tiered approach of the ERA includes three main components: Problem Formulation, Risk Analysis, and Risk Characterization. Problem Formulation involves defining the objectives of the ERA and formulating the plan for characterizing and analyzing risks based on available site-specific information on stressors. Through this process, the CSM (**Section 3**) is better defined and potential exposure pathways, ecological receptors, and risk assessment endpoints are identified.

The Risk Analysis phase involves the evaluation of data to characterize potential ecological exposures and effects. Exposure point concentrations (EPCs) will be estimated for each COPC for each medium (e.g., sediment, surface water) to represent the concentrations that ecological receptors such as fish and benthic invertebrates may encounter. EPCs will be compared to literature-derived toxicity thresholds for each receptor to evaluate potential risks of COPC exposure in each type of media. Potential exposure of higher trophic level wildlife receptors includes direct or indirect ingestion of surface water, sediment, and ingestion of food items containing COPCs. Dietary doses of COPCs will be estimated for each wildlife receptor using food web exposure models based on exposure assumption values (e.g., body weights, food and water ingestion rates, relative consumption of food items, foraging range, exposure duration, etc.) and evaluated by comparing to daily dietary dose toxicity reference values (TRVs).

For the Risk Characterization, the results of the risk analysis are interpreted to determine the significance of any risks predicted for each assessment endpoint. This evaluation is based on the nature and magnitude and spatial and temporal patterns of predicted effects. Comparisons to background or reference sites and evaluation of the potential for recovery are also included in this analysis. The Risk Characterization concludes with a summary of uncertainties associated with the risk assessment.

5.5 Remedial Investigation Report

Upon completion of field activities and receipt of the analytical data, a draft RI Report will be prepared for submittal to DDOE. The draft report will be submitted to DDOE within 120 days of the completion of field work as required by the Consent Decree. The report will include the following elements:

- Site description;
- Site history and previous investigations/remedial actions;
- Description of field activities;
- Results of field activities to determine physical characteristics (e.g., surface water hydrology, geology/hydrogeology, ecology, etc.);
- Nature and extent of contamination;
- Contaminant fate and transport;
- Results of the HHRA and ERA ;
- Findings and conclusions; and
- Recommendations.

A more detailed report outline is provided as **Appendix F**. Geologic logs, cross sections, aquifer test results, laboratory data, validation reports, and pertinent field data logs will be included as appendices.

The draft RI Report is subject to review and approval by DDOE. DDOE also may solicit comments from other regional and federal agencies. In addition, DDOE will make the draft RI Report available for public review by posting on DDOE’s website for at least 30 days prior to approving the RI. Pepco will revise the draft RI Report as appropriate to address comments from DDOE, other regulatory agencies, and the public.Pepco will submit a final RI Report following regulatory review.

5.6 Feasibility Study

An FS will be conducted for the Study Area based on the results of the RI. The objectives of the FS are to (a) identify remediation requirements and establish cleanup levels as necessary to eliminate or prevent unacceptable risks to human health and the environment, and (b) identify, screen and evaluate potential remedial alternatives. Various steps involved in the FS process are described in the following paragraphs. An FS Work Plan Addendum will be submitted upon the evaluation of data obtained from the RI field activities.

5.6.1 Identification of Remediation Requirements and Establishment of RAOs

The FS will identify areas and volumes of media for which remediation is required either (a) to eliminate or control conditions in the Anacostia River posing an unacceptable risk to human health and the environment or (b) to prevent the migration of contaminant from the Site to the river that would cause or contribute to an unacceptable risk to human health or the environment. All calculations related to area and volume estimates will be documented in the FS Report. For the areas where a remediation requirement is identified, remedial action objectives (RAOs) and preliminary remedial goals (PRGs) will be developed in consultation with DDOE. The PRGs will be developed based on Site-specific risk factors. The FS Report will describe the rationale for any cleanup levels established.

5.6.2 Development and Screening of Remedial Alternatives

The FS will identify and screen a focused set of technologies that have the potential to achieve the RAOs. This step will follow USEPA presumptive remedy guidance and USEPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (2005). The FS will develop general response actions (such as containment, treatment, excavation, pumping, institutional controls (e.g., deed restrictions), engineering controls (e.g., encapsulation), or other actions, singly or in combination) for each medium of interest (e.g., soil, sediment, surface water, groundwater) to achieve RAOs, and will identify and evaluate technologies applicable to each general response action to eliminate those that cannot be implemented at the Site. Consistent with USEPA guidance, the range of remedial options to be considered will include, at a minimum (a) alternatives in which treatment is used to reduce the toxicity, mobility or volume of contaminants, (b) alternatives that involve containment with little or no treatment, and (c) a no-action alternative. Screening of technologies will be based on effectiveness, implementability, and relative cost. Technologies retained after the screening process will be assembled into alternatives for each remediation area.

5.6.3 Treatability Studies

Treatability studies will be performed as necessary to assist in the detailed analysis of alternatives. Treatability studies are generally performed to determine the effectiveness of a technology in achieving the targeted cleanup levels, to obtain design parameters for a full-scale process, or to screen multiple process options of a particular technology. Treatability studies are important when technologies have not been sufficiently demonstrated or characterization data alone is insufficient to predict treatment performance or to estimate the size and cost of treatment units. Treatability studies can be conducted on a bench-scale in the laboratory or on a pilot-scale at the Site depending on the study objectives. The need for treatability studies will be determined once the initial screening of technologies is completed and sufficient data from the RI are available.

5.6.4 Detailed Analysis of Alternatives

A detailed analysis will be conducted for the alternatives that are retained after the screening analysis. This detailed analysis will consist of an individual evaluation of each alternative against the following evaluation criteria and a comparative evaluation of all options against the evaluation criteria with respect to one another:

- Overall protection of human health and the environment;
- Compliance with applicable regulations;
- Long-term effectiveness;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- DDOE acceptance; and
- Community acceptance.

5.6.5 Feasibility Study Report

Upon completion of the detailed evaluation of alternatives, a draft FS Report will be prepared for submittal to DDOE. The report will (a) document the location and extent of media requiring remediation and describe the associated cleanup levels and RAOs, (b) describe the results of the identification and screening of alternatives, and the detailed evaluation of alternatives, and (c) identify a preferred alternative for remedial action.

5.6.6 Regulatory Review and Public Comment

The FS Report is subject to review and approval by DDOE. DDOE also may solicit comments from other regional and federal agencies. In addition, DDOE will make the draft FS Report available for public review by posting on DDOE's website for at least 30 days prior to approving the FS Report. The FS Report will be revised as appropriate to address comments from DDOE, other regulatory agencies, and the public.

Pepco will submit a final FS Report following regulatory review and public comment.

6 Project Organization

The RI/FS activities will be performed principally by AECOM (or its subcontractors) on behalf of Pepco. The project will be overseen by the DDOE to ensure compliance with the Consent Decree requirements. The Pepco Project Manager will maintain regulatory interface with DDOE and the AECOM Project Manager will support the Pepco Project Manager as needed. The AECOM Project Manager may interface directly with DDOE on technical matters related to the project. Roles and contacts for various project personnel are summarized in **Table 7**. Responsibilities for key project personnel are described in the following paragraphs:

Pepco Project Manager

Ms. Fariba Mahvi will serve as the Pepco Project Manager. Ms. Mahvi's responsibilities include:

- Representing Pepco management,
- Reviewing AECOM's work;
- Primary interface with DDOE,
- Securing project funding,
- Working with Pepco Community Involvement Coordinator (Donna Cooper) to implement CIP, and
- Reviewing all project documents before submission to DDOE.

AECOM Project Manager

The AECOM Project Manager, Mr. Ravi Damera, has responsibility for day-to-day management of technical and scheduling matters related to the project. Other duties, as necessary, of the AECOM Project Manager include:

- Subcontractor procurement,
- Assignment of duties to project staff and orientation of the staff to the specific needs and requirements of the project,
- Ensuring that data assessment activities are conducted in accordance with the QAPP,
- Approval of project-specific procedures and internally prepared plans, drawings, and reports,

- Serving as the focus for coordination of all field and laboratory task activities, communications, reports, and technical reviews, and other support functions, and facilitating site activities with the technical requirements of the project, and
- Maintenance of the project files.

AECOM Technical Leaders

The AECOM Project Manager will be assisted by Technical Leads, whose duties will include:

- Ensuring data assessment activities are conducted in accordance with the QAPP,
- Serving as the focus for coordination of all field and laboratory task activities, communications, reports, and technical reviews, and other support functions, and facilitating site activities with the technical requirements of the project,
- Technical review and/or approval of project-specific procedures and internally prepared plans, drawings, and reports,
- Serving as the focus for coordination of all field and laboratory task activities, communications, reports, and technical reviews, and other support functions, and facilitating site activities with the technical requirements of the project, and
- Maintenance of the project files.

AECOM Project QA officer

The AECOM Project QA Officer, Mr. Gary Grinstead, has overall responsibility for quality assurance oversight. The AECOM Project QA Officer communicates directly to the AECOM Project Manager. Specific responsibilities of the AECOM Project QA Officer include:

- Preparing the QAPP,
- Reviewing and approving QA procedures, including any modifications to existing approved procedures,
- Ensuring that QA audits of the various phases of the project are conducted as required,
- Providing QA technical assistance to project staff, and
- Ensuring that data validation/data assessment is conducted in accordance with the QAPP.

AECOM Analytical Task Manager

The AECOM Project Chemist/Laboratory Coordinator, Mr. Robert Kennedy, will be responsible for managing the subcontractor laboratories, serving as the liaison between field, laboratory personnel, data validation and database teams and assessing the quality of the analytical data.

AECOM Health and Safety Officer

The AECOM Project Health and Safety Officer, Mr. Sean Liddy, will serve as a health and safety advisor to the Project Manager and AECOM staff including:

- Reviewing and approving Health and Safety Plans,
- Reviewing subcontractor safety records,
- Conducting safety audits,
- Recommending appropriate PPE to protect AECOM personnel from potential hazards, and
- Conducting accident investigations.

AECOM Field Team leader

The AECOM Field Team Leader, Mr. Scott Beatson, has overall responsibility for completion of all field activities in accordance with the QAPP and is the communication link between AECOM project management and the field team. Specific responsibilities of the AECOM Field Team Leader include:

- Coordinating activities at the site,
- Assigning specific duties to field team members,
- Mobilizing and demobilizing of the field team and subcontractors to and from the site,
- Directing the activities of subcontractors on site,
- Resolving any logistical problems that could potentially hinder field activities, such as equipment malfunctions or availability, personnel conflicts, or weather dependent working conditions,
- Implementing field QC including issuance and tracking of measurement and test equipment; the proper labeling, handling, storage, shipping, and chain-of-custody procedures used at the time of sampling; and control and collection of all field documentation, and

- Communicating any nonconformances or potential data quality issues to AECOM project management.

AECOM Field Staff

The field staff reports directly to the AECOM Field Team Leader, although the Field Team Leader in some cases will be conducting the duties of the field staff listed below. The responsibilities of the field team include:

- Collecting samples, conducting field measurements, and decontaminating equipment according to documented procedures stated in the QAPP,
- Ensuring that field instruments are properly operated, calibrated, and maintained, and that adequate documentation is kept for all instruments,
- Collecting the required QC samples and thoroughly documenting QC sample collection,
- Ensuring that field documentation and data are complete and accurate, and
- Documenting and communicating any nonconformance or potential data quality issues to the AECOM Field Team Leader.

AECOM Subcontractors

AECOM specialty subcontractors may include, but are not limited to, drilling, surveying, analytical laboratories, waste management, and equipment rentals. These subcontractors will work under the direct supervision of AECOM field staff to carry out specific scope requirements.

7 Schedule

A tentative project schedule has been prepared (**Figure 12**) showing the duration of various tasks that will be triggered by the approval of this work plan and associated SAP and HASP. The task durations correspond to the deadlines specified in the Consent Decree. This schedule will be revised with actual calendar dates upon the final approval of the work plans.

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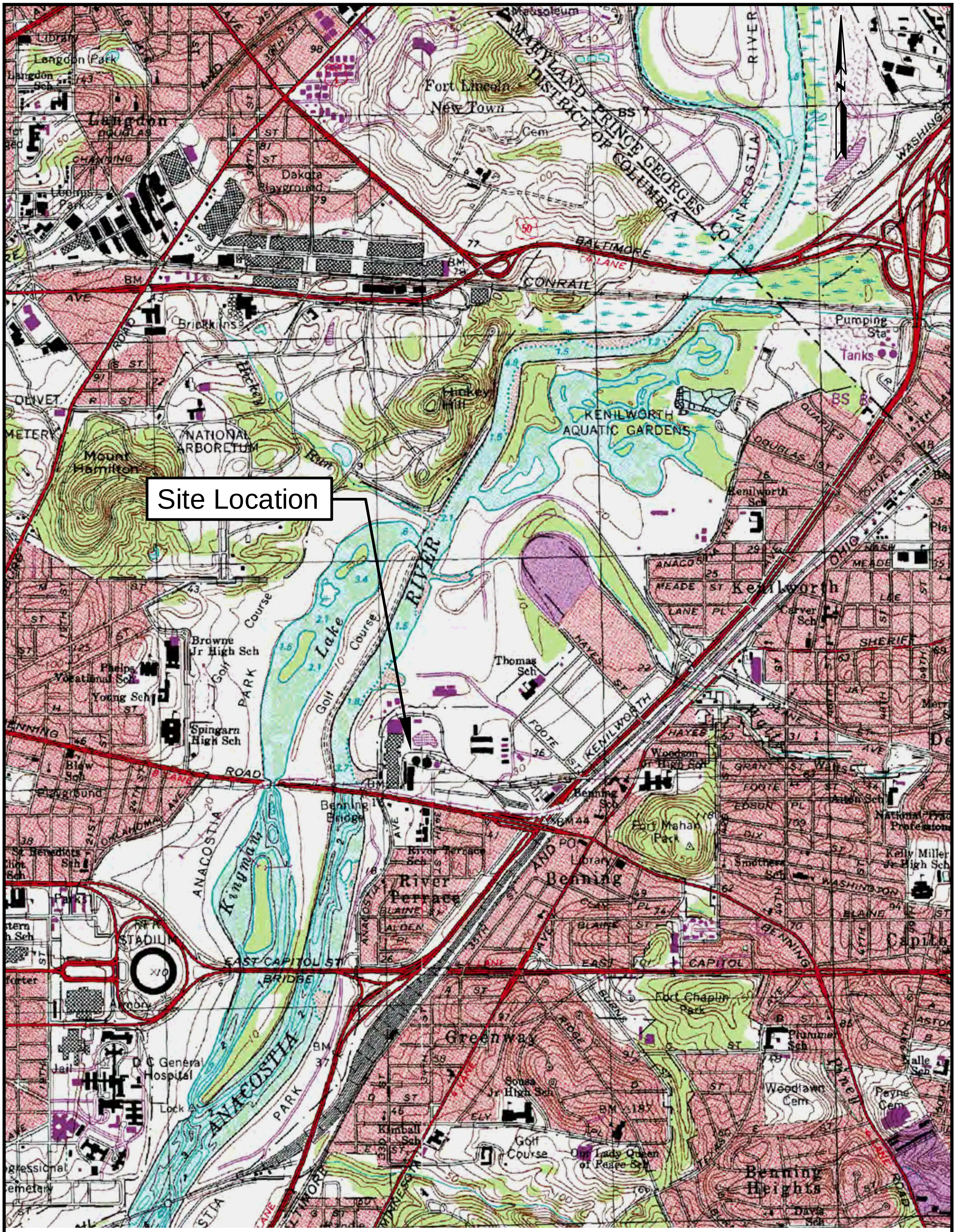
Figures



Source:
USGS 7.5 Minute Topographic Map
Washington East Quadrangle

0 1000 2000 4000
SCALE IN FEET

Benning Road Facility RI/FS Project 3400 Benning Rd., NE Washington, DC 20019	Site Location Map
DATE: 07/09/2012 DRAWN BY: LAD CHECKED BY: RD	FIGURE 1

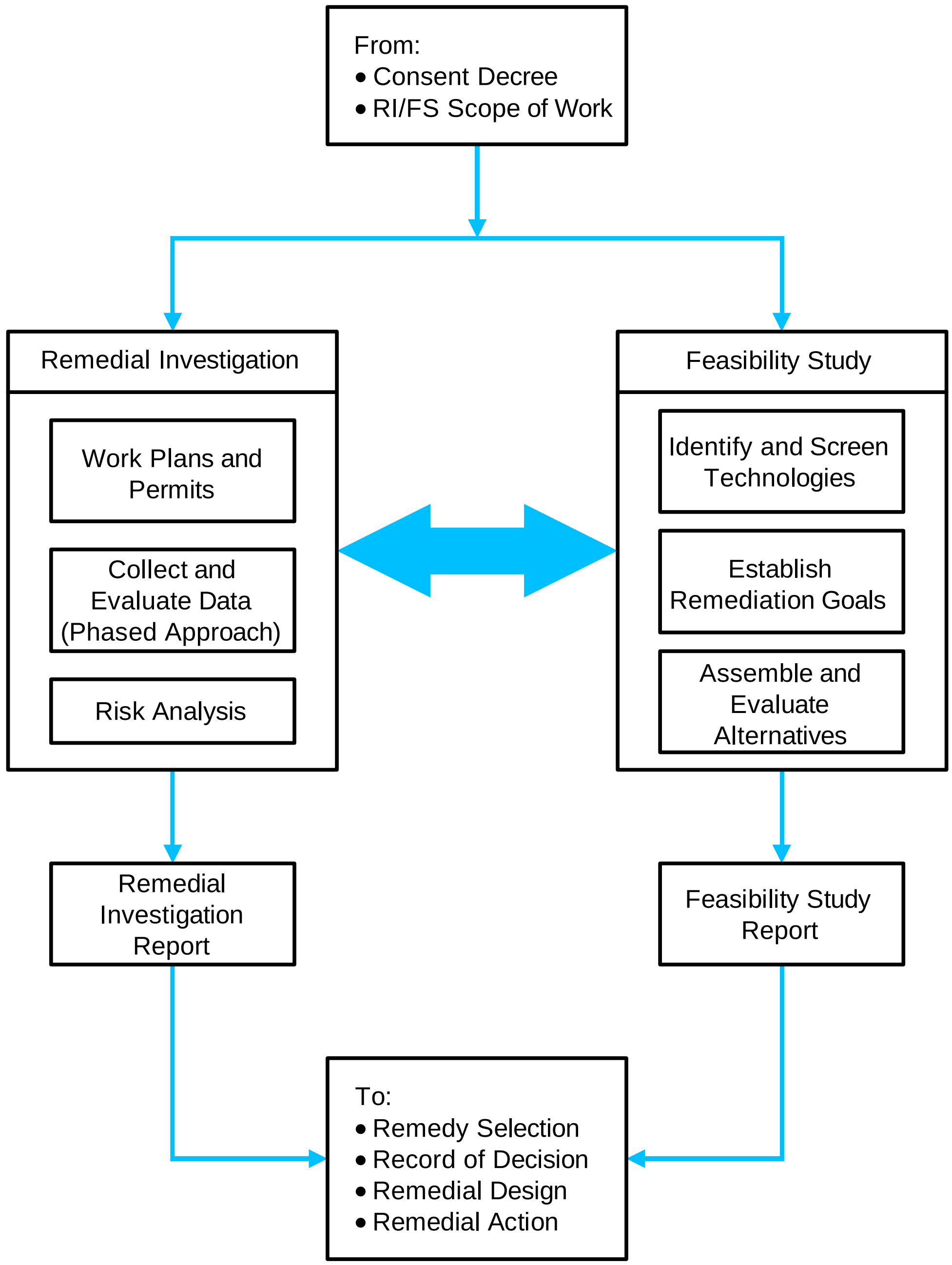
LEGEND:

- PROPOSED INVESTIGATION AREA
- BENNING ROAD FACILITY PROPERTY BOUNDARY
- PROPERTY BOUNDARY

0 100 200 400
SCALE IN FEET

AECOM

Benning Road Facility RI/FS Project 3400 Benning Rd., NE Washington, DC 20019			Site Plan And Investigation Areas
DATE: 06/20/2012	DRAWN BY: LAD	CHECKED BY: RD	FIGURE 2



AECOM

Benning Road Facility RI/FS Project
3400 Benning Rd., NE
Washington, DC 20019

RI/FS Process

DATE: 07/09/2012 | DRAWN BY: LAD | CHECKED BY: RD

FIGURE 3

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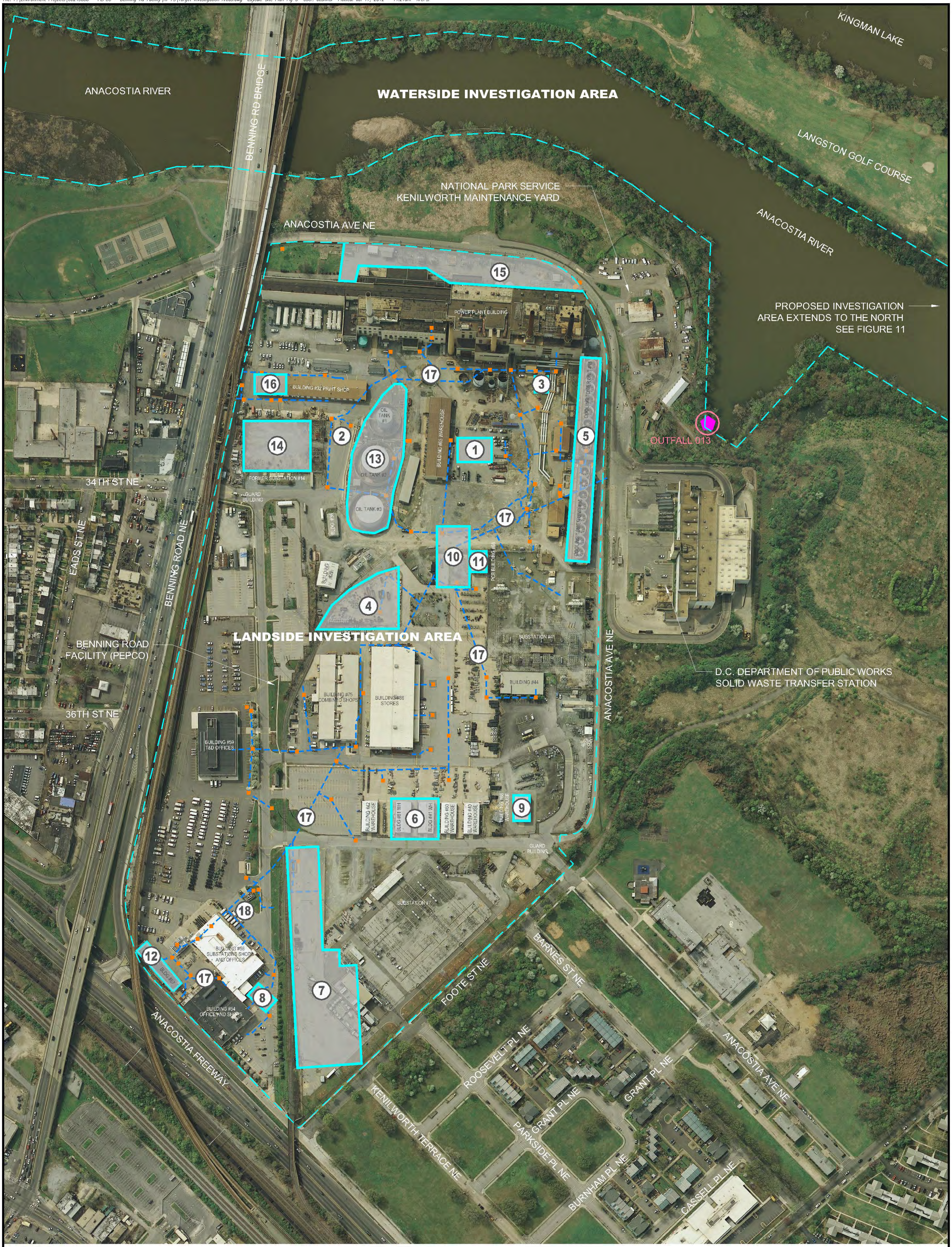
AECOM

0 500 1000 2000
SCALE IN FEET

Benning Road Facility RI/FS Project 3400 Benning Rd., NE Washington, DC 20019		Site Vicinity Map
DATE: 07/16/2012	DRAWN BY: LAD	CHECKED BY: RD	FIGURE 4

File: P:\Environment Projects\60249055 - PEPCO - Benning Rd Facility\RI-FS\Target Investigation Areas.dwg Layout: Site Plan Fig 5 User: deskinsl Plotted: Jul 17, 2012 - 11:21am Xref's:



LEGEND:

- (18) TARGET AREA # - CORRESPONDS TO DESCRIPTION IN TABLE 2
- TARGET AREA
- OUTFALL 013
- INVESTIGATION AREA
- STORM WATER UTILITY

TARGET AREA KEY:

1. FORMER SLUDGE DEWATERING AREA
2. BENNING FUELING ISLAND
3. FORMER 15,000 GALLON No. 2 FUEL OIL UST
4. 2003 SALVAGE YARD INVESTIGATION
5. 1995 CLEANUP AREA
6. 1991 CLEANUP AREA
7. 1988 PARKING LOT CLEANUP AREA
8. 1985 EXCAVATION AREA
9. GREEN TAG STORAGE AREA
10. RED TAG STORAGE AREA
11. BUILDING #68 (PCB BUILDING)
12. BUILDING #57
13. BULK STORAGE ASTs AND LOADING RACK
14. FORMER RAILROAD SWITCHYARD
15. GENERATING STATION TRANSFORMERS
16. PRINT SHOP
17. STORM DRAIN SYSTEM
18. KENILWORTH FUELING ISLAND

0 75 150 300
SCALE IN FEET

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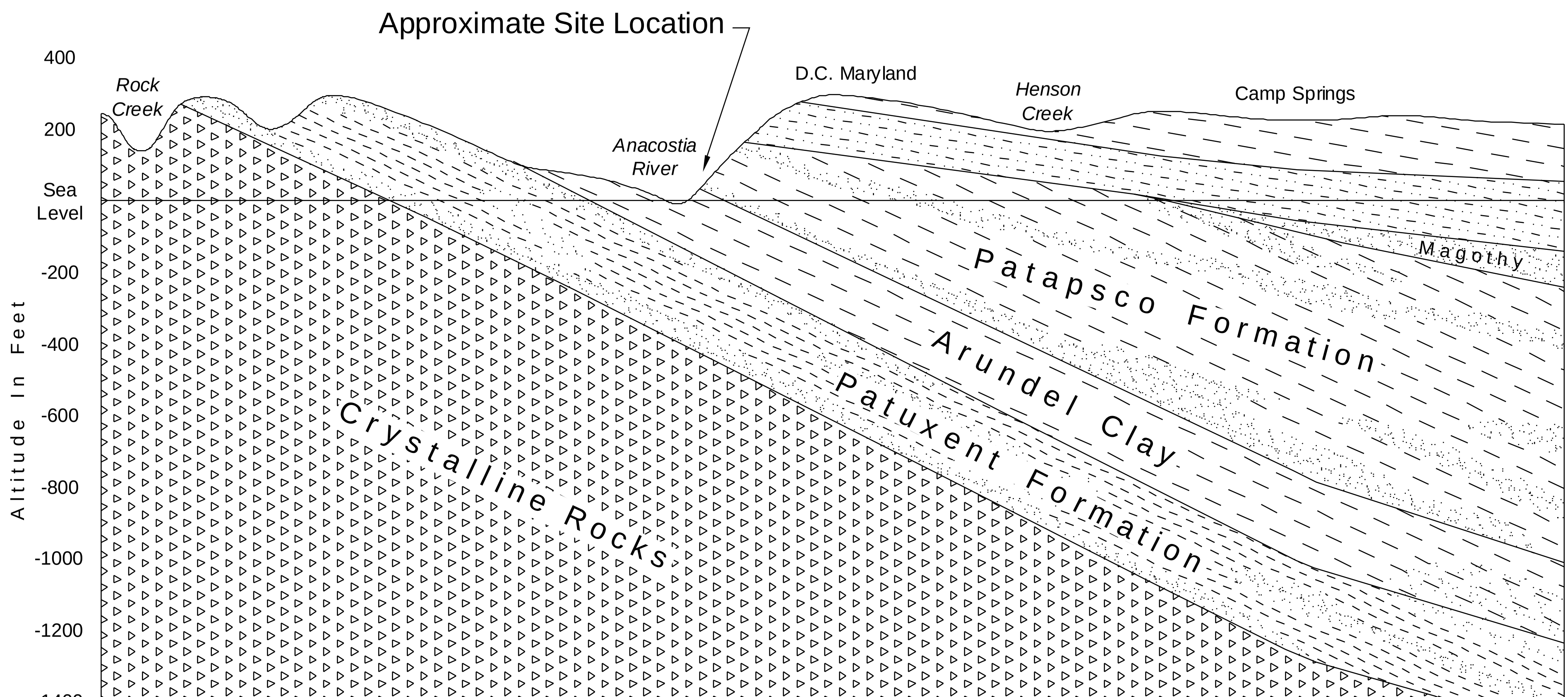
Benning Road Facility RI/FS Project
3400 Benning Rd., NE
Washington, DC 20019

Target Investigation Areas

DATE: 07/17/2012 | DRAWN BY: LAD | CHECKED BY: RD

FIGURE 5



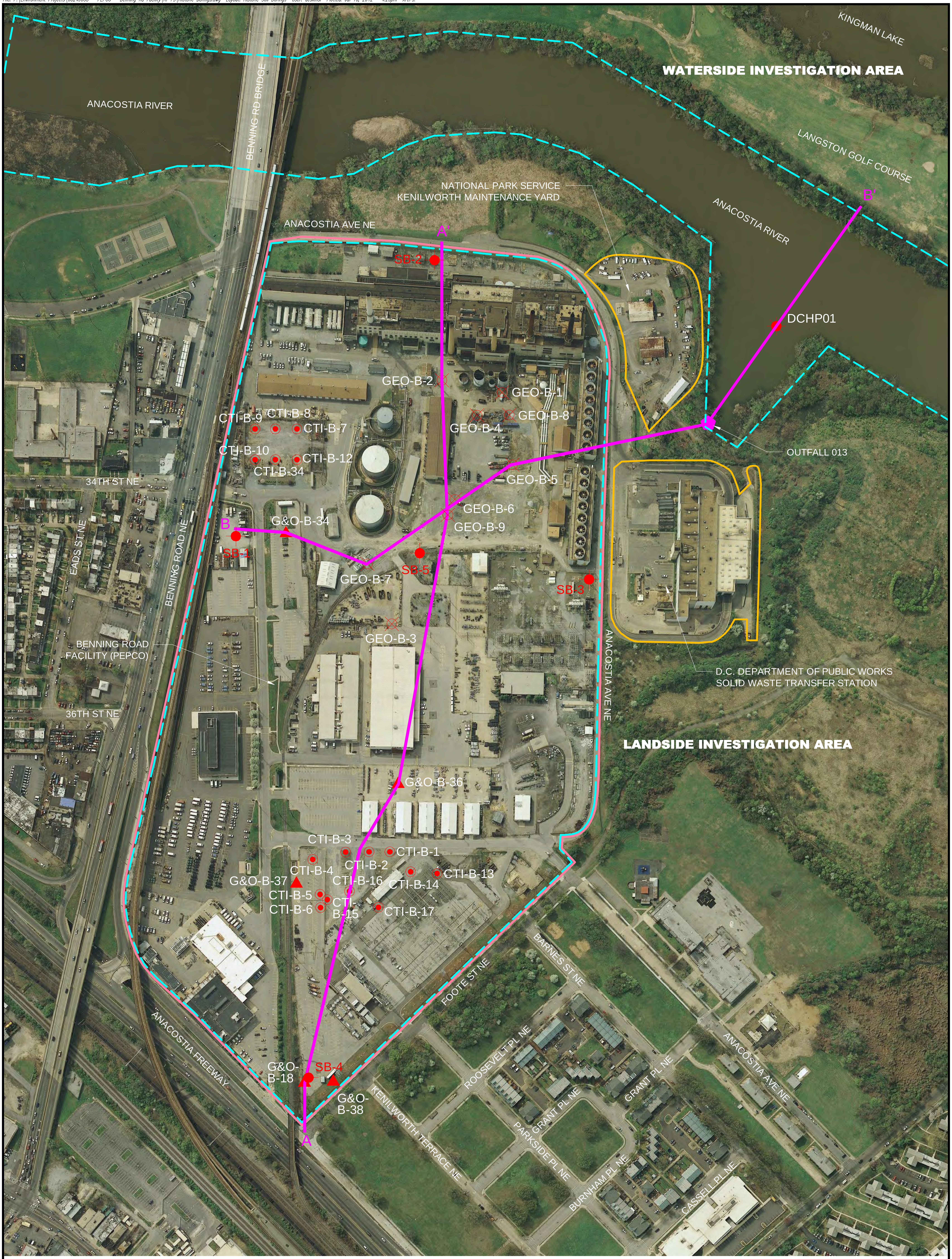
*Horizontal Scale Exaggerated

Source: Mack, KM. 1966.
Groundwater in Prince Georges County,
Bulletin 29: Maryland Geological Survey

AECOM

Benning Road Facility RI/FS Project 3400 Benning Rd., NE Washington, DC 20019			Regional Geologic Profile
DATE: 07/16/2012	DRAWN BY: LAD	CHECKED BY: RD	FIGURE 6

File: P:\Environment Projects\60249055 - PEPCO - Benning Rd Facility\RI-FS\Historic Borings.dwg Layout: Historic Soil Borings User: deskinsl Plotted: Jul 16, 2012 - 4:25pm Xref's:



LEGEND:

- APPROXIMATE LOCATION OF SOIL BORING INSTALLED BY GEOMATRIX, INC. IN 1988
- APPROXIMATE LOCATION OF SOIL BORING INSTALLED BY CTI CONSULTANTS, INC. IN 2009
- APPROXIMATE LOCATION OF SOIL BORING INSTALLED BY GREENHOUSE & O'MARA, INC. IN 2009
- USGS SOIL BORING DCHP01 INSTALLED IN 2002
- PROPOSED SOIL BORING
- PROPOSED INVESTIGATION AREA
- BENNING ROAD FACILITY PROPERTY BOUNDARY
- PROPERTY BOUNDARY
- A — A' LINE OF CROSS-SECTION

0 75 150 300
SCALE IN FEET

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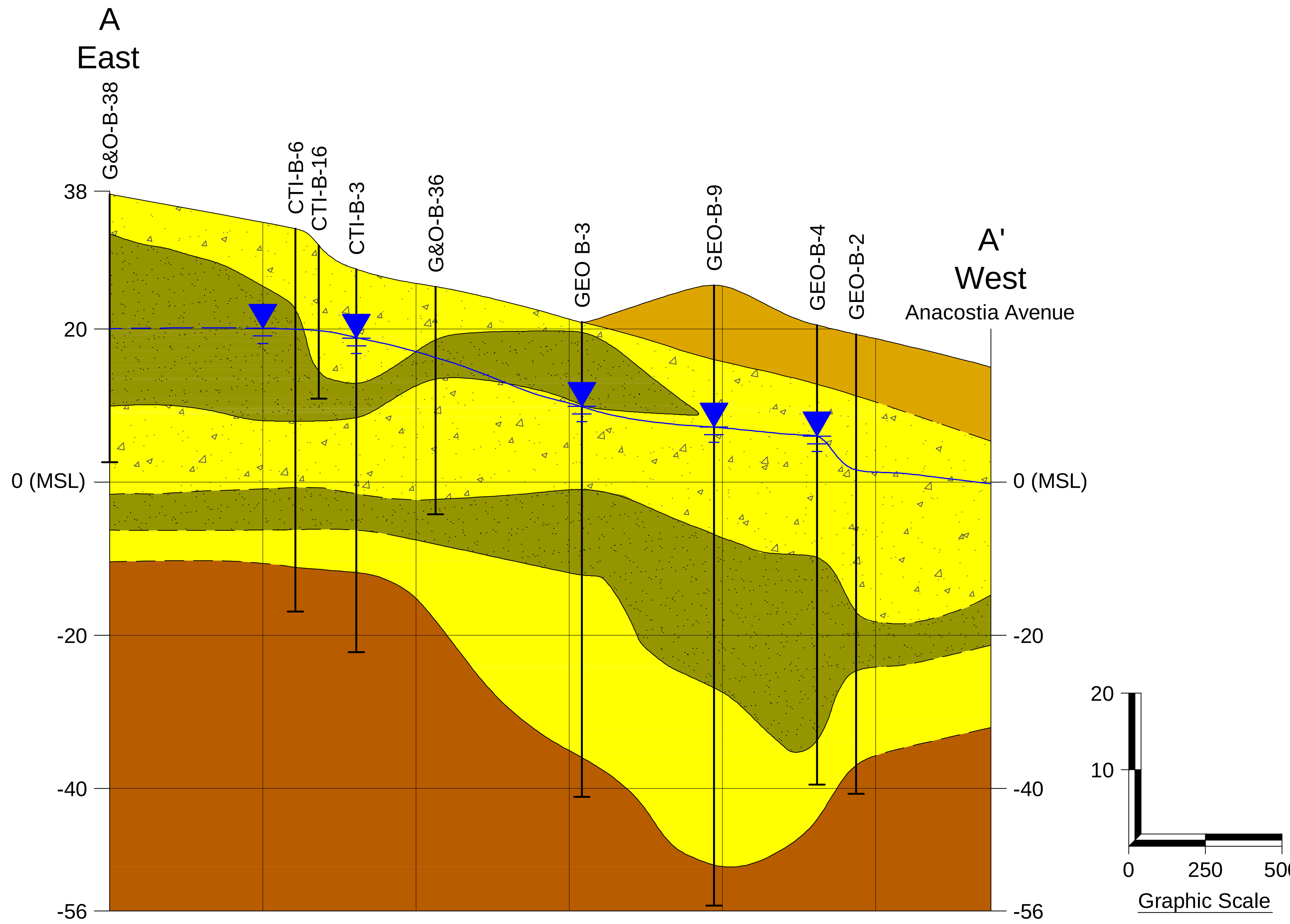
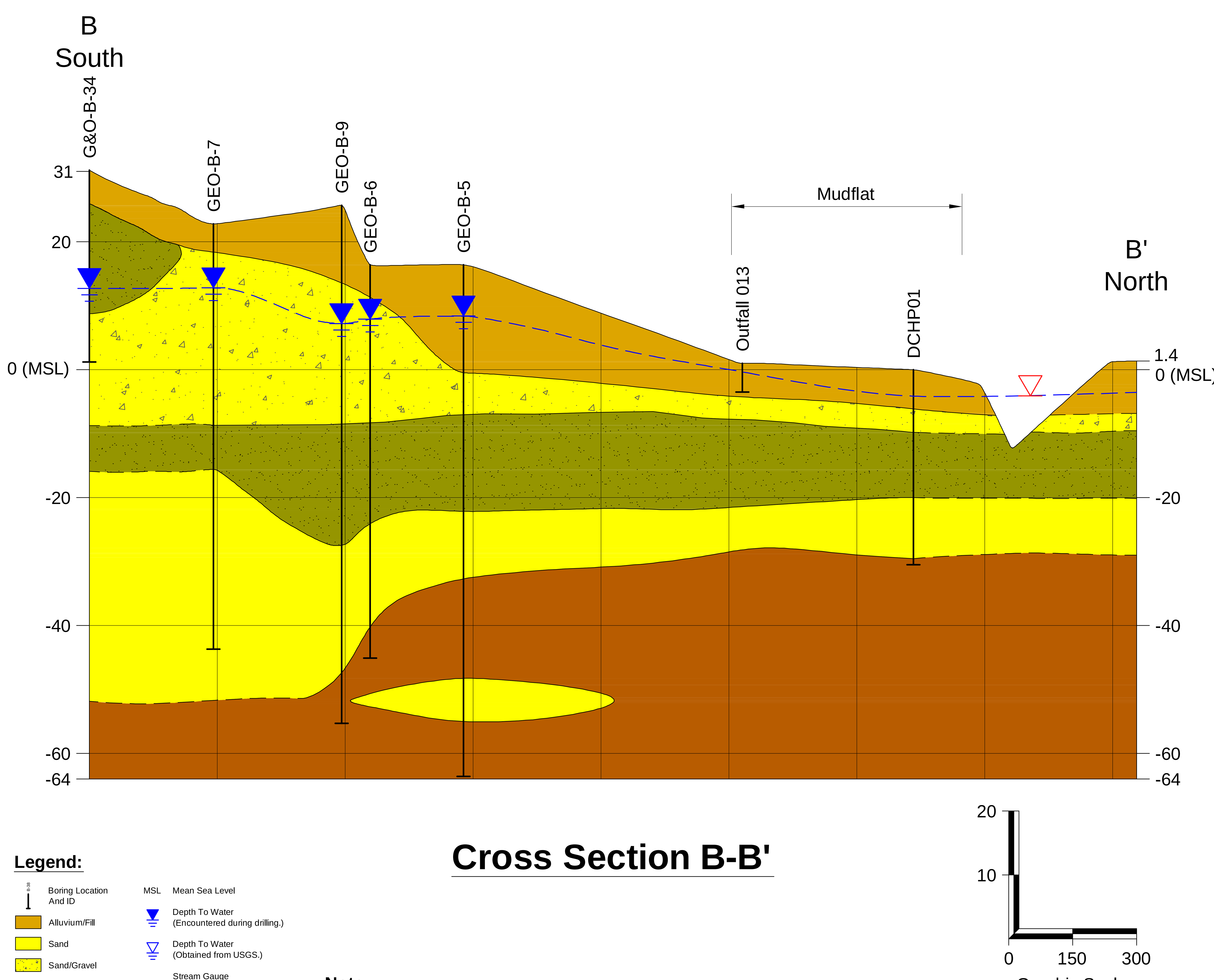
Benning Road Facility RI/FS Project 3400 Benning Rd., NE Washington, DC 20019			HISTORICAL AND PROPOSED SOIL BORINGS
DATE: 07/16/2012	DRAWN BY: LAD	CHECKED BY: RD	FIGURE 7



Cross Section A-A'



Cross Section B-B'

Legend:

- Boring Location And ID
- Alluvium/Fill
- Sand
- Sand/Gravel
- Clay, Silt, and Sand Intermixed
- Arundel Clay
- Inferred Lithology
- MSL Mean Sea Level
- Depth To Water (Encountered during drilling.)
- Depth To Water (Obtained from USGS.)
- Stream Gauge (Taken at low tide from USGS Station 01651750)
- Approximate Water Table

Note:

Depth to water of G&O-B-34 taken 24 hours after drilling.

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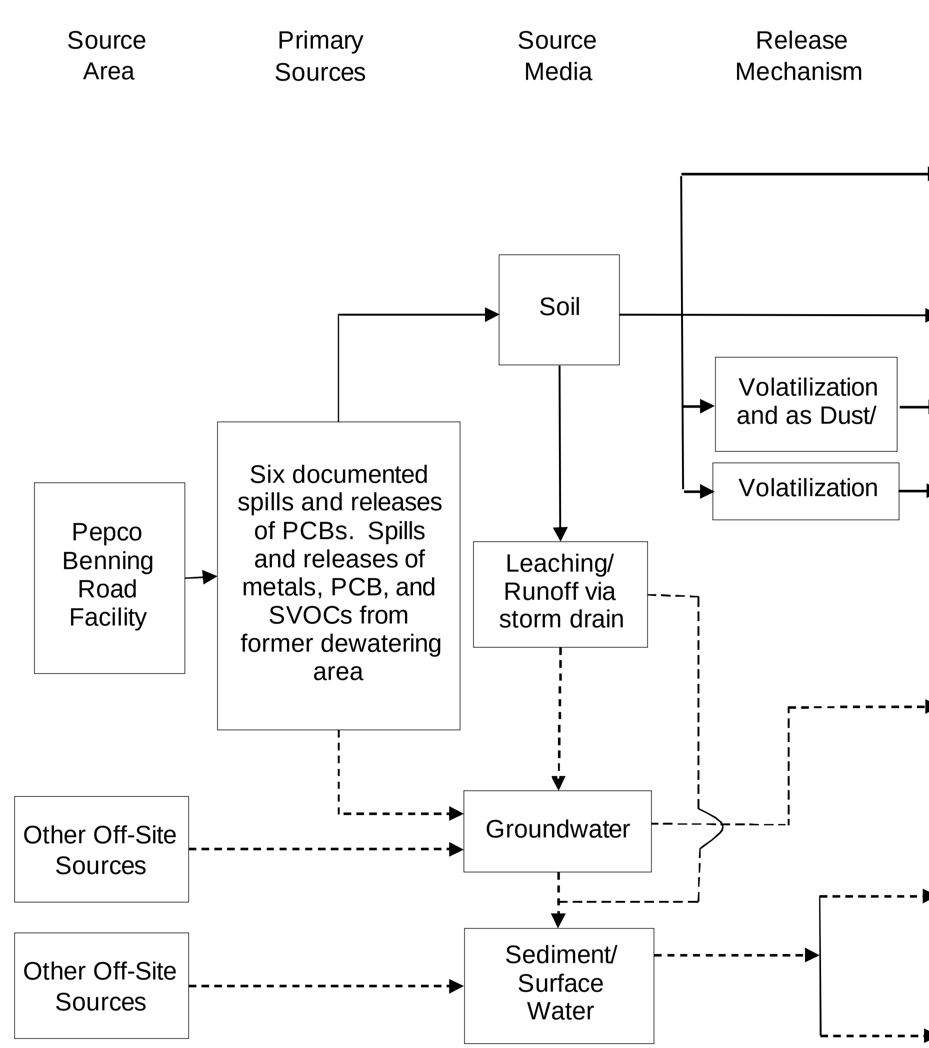
Benning Road Facility RI/FS Project 3400 Benning Rd., NE Washington, DC 20019			Geologic Cross Sections
DATE: 06/20/2012	DRAWN BY: LAD	CHECKED BY: RD	FIGURE 8



Exposure Media	Potential Exposure Route	Current/ Future On-Site Worker	Current/ Future Construction Worker	Current/ Future River Recreator	Current/ Future Recreational Angler	Terrestrial Plant Community	Soil Invertebrate Community	Benthic Invertebrate Community	Avian and Mammalian Communities
		Potential Human Receptors/Exposure Pathways				Potential Ecological Receptors/Exposure Pathways			
Surface Soil (0-2 ft bgs)	Incidental Ingestion	○	○	○	○	○	○	○	○
	Dermal / Direct Contact	○	○	○	○	○	○	○	○
Subsurface Soil (2-15 ft bgs)	Incidental Ingestion	○	○	○	○	○	○	○	○
	Dermal / Direct Contact	○	○	○	○	○	○	○	○
Outdoor Air	Inhalation	○	○	○	○	○	○	○	○
Indoor Air (via soil vapor)	Inhalation	○	○	○	○	○	○	○	○
Groundwater	Ingestion as Drinking Water	○	○	○	○	○	○	○	○
	Dermal / Direct Contact	○	○	○	○	○	○	○	○
	Incidental Ingestion	○	○	○	○	○	○	○	○
Trench Air	Inhalation	○	○	○	○	○	○	○	○
Sediment in Anacostia	Incidental Ingestion	●	○	●	●	○	○	●	●
	Dermal / Direct Contact	●	○	●	●	○	○	●	○
Surface Water	Incidental Ingestion	●	○	●	●	○	○	●	●
	Dermal / Direct Contact	●	○	●	●	○	○	●	○
Fish Tissue	Ingestion	○	○	○	●	○	○	○	●

Notes:
● Potentially complete pathway.
○ Pathway considered to be incomplete or insignificant.
ft bgs - feet below ground surface.

Preliminary Conceptual Site Model

FIGURE 9

Benning Road Facility RI/FS Project
3400 Benning Rd., NE
Washington, DC 20019

DATE: 07/10/2012 | DRAWN BY: LAD | CHECKED BY: RD

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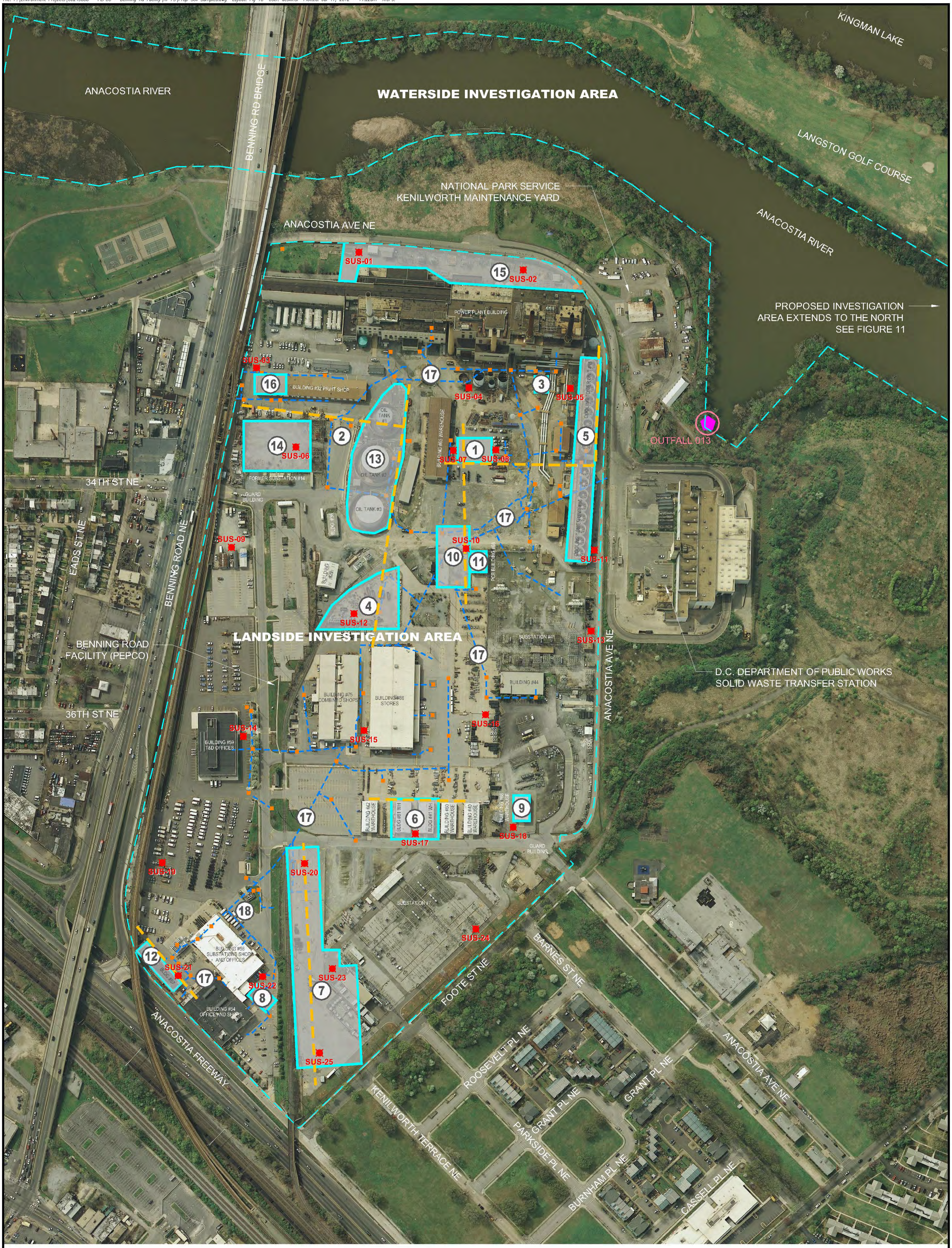
File: P:\Environment Projects\60249055 - PEPCO - Benning Rd Facility\RI-FS\Conceptual Site Model.dwg Layout: Layout1 User: dealand Plotted: Jul 10, 2012 - 10:33am Xref's:

File: P:\Environment Projects\60249055 - PEPCO - Benning Rd Facility\RI-FS\Prop Soil Samples.dwg Layout: Fig 10 User: deskinsl Plotted: Jul 17, 2012 - 11:22am Xref's:



LEGEND:

- SUS-01 — PROPOSED SURFACE SOIL SAMPLE LOCATION
- POTENTIAL ELECTRICAL RESISTIVE IMAGING (ERI) TRANSECT
- (18) — TARGET AREA # - CORRESPONDS TO DESCRIPTION IN TABLE 2
- TARGET AREA
- OUTFALL 013
- INVESTIGATION AREA
- STORM WATER UTILITY

TARGET AREA KEY:

1. FORMER SLUDGE DEWATERING AREA
2. BENNING FUELING ISLAND
3. FORMER 15,000 GALLON No. 2 FUEL OIL UST
4. 2003 SALVAGE YARD INVESTIGATION
5. 1995 CLEANUP AREA
6. 1991 CLEANUP AREA
7. 1988 PARKING LOT CLEANUP AREA
8. 1985 EXCAVATION AREA
9. GREEN TAG STORAGE AREA
10. RED TAG STORAGE AREA
11. BUILDING #68 (PCB BUILDING)
12. BUILDING #57
13. BULK STORAGE ASTs AND LOADING RACK
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0 75 150 300
SCALE IN FEET

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Proposed Surface Soil Sample and ERI Transect Locations

DATE: 07/17/2012 | DRAWN BY: LAD | CHECKED BY: RD | FIGURE 10