SUPPLEMENTAL GROUNDWATER STUDY
SAMPLING AND ANALYSIS PLAN

OPERABLE UNIT 2, KENILWORTH PARK LANDFILL
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National Capital Parks - East
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PARTNERS FOR SMART THINKING
AND CREATIVE STRATEGIES

TABLE OF CONTENTS

1.0 INTRODUCTION 1
1.1 PURPOSE 2
1.2 DOCUMENT ORGANIZATION 2
2.0 SITE DESCRIPTION 3
2.1 PREVIOUS WASTE DISPOSAL INFORMATION 3
2.2 SURFACE WATER HYDROLOGY 4
2.3 REGIONAL AND SITE GEOLOGY 6
2.4 CURRENT GROUNDWATER MONITORING SYSTEM 7
2.5 PREVIOUS GROUNDWATER ANALYTICAL RESULTS 10
3.0 DATA QUALITY OBJECTIVES 12
3.1 STEP 1 – STATE THE PROBLEM 13
3.2 STEP 2 – IDENTIFY THE DECISION(S) OF THE STUDY 13
3.3 STEP 3 – IDENTIFY INPUTS TO DECISION(S) 14
3.4 STEP 4 – IDENTIFY THE BOUNDARIES OF THE STUDY 15
3.4.1 Spatial Boundaries 15
3.4.2 Temporal Boundaries 15
3.5 STEP 5 – DEVELOP THE ANALYTICAL APPROACH 16
3.6 STEP 6 – SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA 17
3.6.1 Adherence to Standard Operating Procedures 17
3.6.2 Completion of the Entire Sampling Plan 17
3.6.3 Adequate Analytical Detection Limits 17
3.7 STEP 7 – DEVELOP THE PLAN FOR OBTAINING THE DATA 18
4.0 OVERVIEW OF FIELD ACTIVITIES 18
4.1 GENERAL 18
4.1.1 Project Data Needs 18
4.1.2 Major Project Tasks 19
4.2 PROJECT NARRATIVE 20
4.2.1 Aqueous Sample Analysis 20
4.2.2 Piezometers and Staff Gauges 21
4.2.3 Groundwater Monitoring Wells 23
4.3 PROPOSED INVESTIGATION SUMMARY 26
5.0 REFERENCES 29

LIST OF FIGURES

Figure 1 Site Location Map (Historical Basemap)
Figure 2 Aerial Photograph of Site and Vicinity
Figure 3a Historical Layout, 1894 Topographic Map
Figure 3b Historical Layout, 1949 and 1963 Aerial Photographs
Figure 3c Historical Layout, 1968 and 1984 Aerial Photographs
Figure 4 Existing Groundwater Monitoring Wells
Figure 5 Previous Water Table Equipotential Maps

Figure 6 Proposed Groundwater Monitoring Wells and Piezometers

LIST OF TABLES

Tables in Text:

Text Table 4.2.1 Groundwater Analyses 20
Text Table 4.2.2 Proposed Piezometer Locations 22
Text Table 4.2.3 Proposed Monitoring Well Locations 24
Text Table 4.3 Summary of Investigation Monitoring Installations and Sampling 27

Tables in Attachment:

Table 1 Existing Monitoring Well Details
Table 2 Historical Groundwater Data – Metals (micrograms per liter, µg/L)
Table 3 Historical Groundwater Data – VOCs (micrograms per liter, µg/L)
Table 4 Historical Groundwater Data – Pesticides and PCBs (micrograms per liter, µg/L)
Table 5 Historical Groundwater Data – SVOCs and TPH (micrograms per liter, µg/L)
Table 6 Data Quality Objectives Summary Table

LIST OF APPENDICES

Appendix A Supplemental Groundwater Study Field Sampling Plan (FSP)
Appendix B Supplemental Groundwater Study Quality Assurance Project Plan (QAPP)

ABBREVIATIONS AND ACRONYMS

amsl	Above mean sea level
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below ground surface
BHC	Hexachlorocyclohexane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	Cubic feet per second
cm/s	Centimeters per second
D.C.	District of Columbia
DCSEC	District of Columbia Sports and Entertainment Commission
DDOE	District of Columbia Department of the Environment
DDOH	District of Columbia Department of Health
DEHP	bis(2-Ethylhexyl)phthalate or di(2-ethylhexyl)phthalate
DQO	Data quality objective
DRO	Diesel range organics
E & E	Ecology & Environment, Inc.
°F	Degrees Fahrenheit
FS	Feasibility Study
FSP	Field Sampling Plan
HASP	Health and Safety Plan
ISU	Iowa State University
JCO	The Johnson Company, Inc.
KPN	Kenilworth Park North
KPS	Kenilworth Park South
MGS	Maryland Geological Survey
µg/L	Micrograms per liter
NACE	National Capital Parks-East
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	National Resource Conservation Service
NTU	Nephelometric Turbidity Units
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PA/SI	Preliminary Assessment/Site Inspection
PCB	Polychlorinated biphenyl
PRG	Preliminary remediation goal
PSQ	Principle study question
QAPP	Quality Assurance Project Plan
QA/QC	Quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RG	Remediation goal
SVOC	Semi-volatile organic compound
TBC	To be considered

TCLP	Toxicity characteristic leaching procedure
TPH	Total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground storage tank
VOC	Volatile organic compound

1.0 INTRODUCTION

The National Park Service (NPS) is the lead agency for the Kenilworth Park Landfill Site (Site) in the Anacostia Park unit of National Capital Parks-East in Washington, D.C. (Figure 1). The Site covers 130 acres, including the former Kenilworth Park Landfill North (KPN) and Kenilworth Park Landfill South (KPS) bisected by Watts Branch, a tributary to the Anacostia River (Figure 2). The Site includes two operable units (OUs): OU1 comprises surface soils and subsurface soils, including waste material disposed of in KPN and KPS; OU2 includes shallow groundwater underlying OU1. Two Preliminary Assessment/Site Inspections (PA/SIs), two Remedial Investigations (RIs) (one each for KPN and KPS), and one Feasibility Study (FS) for OU1 (KPN and KPS combined) have been completed by NPS (E & E 2000a; E & E 2000; E & E 2007; E & E 2008; JCO 2012).

Given the cap covering the former landfill and existing Site data, groundwater transport is the only potential pathway for Site contaminants to migrate to adjacent water bodies, and groundwater data collected during the RIs do not indicate a significant groundwater transport pathway. The PA/SIs, RIs, and FS preliminarily concluded that Site contaminants are not migrating in groundwater to the Anacostia River. The most recent groundwater sampling event at the Site occurred approximately 7 years ago. The supplemental groundwater study described in this Sampling and Analysis Plan (SAP) will supplement existing groundwater data by: 1) more accurately determining groundwater gradients and flow patterns at the Site; and 2) providing additional subsurface data to evaluate whether dissolved contaminants exist at the Site's groundwater discharge boundaries bordering the Anacostia River and the Kenilworth Marsh. The results of this SAP will be used to develop an OU2 RI Addendum. Depending on the findings, the RI Addendum will be used to support the existing Proposed Plan or serve as the basis for development, evaluation, and selection of a response action for OU2.

NPS will implement and document the results of the supplemental groundwater study in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act

(CERCLA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40CFR Part 300, and other applicable local, state, and federal laws and regulations.

1.1 PURPOSE

The purpose of the supplemental groundwater study is to generate data of sufficient quality and quantity to meet the following objectives.

- Develop a more refined interpretation of the Site groundwater flow paths and concentrations with a larger monitoring network focused on groundwater discharge to the Anacostia River. This interpretation will be used to produce a more detailed water table potentiometric map that illustrates the water table surface and groundwater flow directions toward groundwater discharge boundaries including the Anacostia River, Kenilworth Marsh, and Watts Branch.
- More precisely delineate the groundwater chemistry migrating from KPN and KPS to the primary groundwater/surface water discharge boundaries of the Site at the Anacostia River and Kenilworth Marsh to determine whether hazardous substances are potentially migrating into the Anacostia River.

1.2 DOCUMENT ORGANIZATION

The SAP includes this introduction (Section 1), a brief description of the Site and previous groundwater investigations (Section 2), data quality objectives (DQOs) (Section 3), a description of the field activities (Section 4), and references (Section 5).

Details of the proposed investigation methodology are presented in the Field Sampling Plan (FSP) (Appendix A), and the Quality Assurance Project Plan (QAPP) (Appendix B). The FSP presents detailed descriptions of field activities and procedures. The QAPP details the analytical methods and detection limits required, field and laboratory quality assurance/quality control (QA/QC) protocols, data assessment procedures for the evaluation and identification of data limitations, and preparation of the database and data summaries.

A project-specific JCO Site Safety and Health Plan (SSHP) (under separate cover) provides the detailed health and safety procedures that will be employed by The Johnson Company throughout the supplemental groundwater study.

2.0 SITE DESCRIPTION

Environmental investigations have been performed at the Site since 1998. Although previous investigations comprehensively investigated the nature and extent of contaminants in the landfill and cover soils, the focus of this section is a summary of the information related to groundwater contaminant migration at the groundwater/surface water discharge boundaries to the Anacostia River. The RIs provide detailed descriptions of the Site, including the history of operations at the Site that resulted in the current contamination of Site soils and groundwater (E & E 2007; E & E 2008).

The following Site description summarizes waste disposal information and describes existing knowledge related to Site groundwater contaminant migration to the Anacostia River.

2.1 PREVIOUS WASTE DISPOSAL INFORMATION

The Kenilworth Landfill received municipal waste and incinerator ash. KPN operated from 1942 until 1970. Soil borings at KPN have encountered the following materials in the landfill waste: burned combustible materials, brick, glass, rubble, construction debris, metal[1], wood, plastic, and incinerator ash. KPS was permitted in 1958 for waste disposal and used primarily after 1968, when burning was prohibited (E & E 2007). Boring logs from monitoring wells installed at KPS describe landfill wastes including glass, paper, wood, metal, concrete, ash, leather, and plastic. In the log for one boring (MW13, located at the southern end of KPS), the smell of diesel in a soil core was recorded (E & E 2008).

[1] During the 2006 regrading and filling activities by the District of Columbia Sports and Entertainment Commission (DCSEC) in the eastern side of KPN, a “thermos” sized unexploded ordnance (munitions shell) was unearthed by a construction worker (JCO 2012). The ordnance was removed from the Site and destroyed by the US Army Corps of Engineers; no other ordnances have been reported at the landfill and no historical activities at the Site are known to have been the source of the ordnance (JCO 2012).

There are approximately 3.5 million tons of waste in the landfill at KPN and KPS, including incinerator ash, waste that was burned in-place, and unburned municipal solid waste (JCO 2012). A cap of approximately 3 to 15 feet (the greater thickness is on the eastern side of KPN) of primarily clayey materials was placed on top of the KPN landfill when it ceased operations, and the soil was amended using sewage sludge to establish grass (E & E 2007). The KPS landfill was initially capped when the landfill was closed around 1970, and additional capping occurred in 1997 and 1998; the resulting cap thickness at KPS ranges from 2 to more than 20 feet, with the thickest cap on the western side of KPS (E & E 2008).

2.2 SURFACE WATER HYDROLOGY

The most significant surface water feature associated with and bordering the Site is the Anacostia River (Figure 1), which typically flows from north to south along the western boundary of the Site, although tidal influences can affect the flow direction. A water stage recorder that registers tidal elevations every 6 minutes is located on the Anacostia River approximately 77.5 feet upstream of the tidal inlet to Kenilworth Marsh (USGS 2012), which is approximately 1,000 feet north of the northern edge of KPN. From November 1 to 15, 2012, tidal elevations ranged from -2.1 feet above mean sea level (amsl) at low tide to +2.95 feet amsl at high tide, with a maximum single day difference of 4.34 feet. On average, a 3.0 foot tidal exchange occurs twice daily at the Kenilworth Marsh (NPS 2011), although major storm events including the 2012 storm Sandy have increased maximum high tide elevations to close to 5 feet amsl at this gauging station (USGS 2012). A segment of seawall eligible for inclusion on the National Register of Historic Places is located along the Anacostia River bank approximately between MW-6N and MW-7N at KPN (Figure 4), but is not present at KPS.

The majority of the Site is mapped as a known wetland, called “Kenilworth Aquatic Gardens,” by the District of Columbia Department of Health (DDOH) (DDOH 2012), but there are no wetlands identified at the Site in the National Wetlands Inventory (USFWS 2012). The 77-acre Kenilworth Marsh, located at the northern edge of the landfill at KPN, was dredged to create a lake in 1940, then reconstructed as a wetland in 1993 by the Army Corps of Engineers, and has been managed as a wetland since then by the National Capital Parks-East (NACE) unit

of NPS (Syphax and Hammerschlag 1995; USGS 2008). Dredge spoils from the Anacostia River were used as fill to reconstruct the Kenilworth Marsh wetland (Syphax and Hammerschlag 1995).

The Watts Branch stream flows through the Site between KPN and KPS to the Anacostia River. The Watts Branch has been characterized as "one of the largest tributaries to the Anacostia River located within D.C. boundaries" (USFWS 2002). The reach of Watts Branch that parallels the northern side of Mayfair Mansions and Paradise Apartments (the former Benning Race Course) was shown as channelized as long ago as 1894, as shown on Figure 3a[2]. More recent aerial photographs in Figures 3b and 3c show the Watts Branch channel extended to flow around Mayfair Mansions and Paradise Apartments, discharging directly to the Anacostia River. The U.S. Fish and Wildlife Service (USFWS) identified 41 stormwater outfalls and 13 stormwater pipe/box culvert combinations that discharge into the D.C. portion of Watts Branch. The channelized upper and lower reaches of Watts Branch receive flows from numerous storm sewers, resulting in poor instream habitat ratings for all reaches, primarily caused by "hydrocarbons, heavy metals, pesticides, sewage, and sediment" (USFWS 2002). Recently, the money generated from the DC bag tax was used to restore 1.8 miles of this watershed. The restoration design included structures that create instream habitat and reduce flood stresses on channel banks, while riparian vegetation provides bank stability and wildlife habitat.

The United States Geological Survey (USGS) maintains a stage recorder in the Watts Branch at a location approximately 3,000 feet upstream of the southern border of KPS, approximately 10 feet upstream of the Minnesota Avenue bridge (USGS 2013). Between 1993 and 2011, measured discharge in the Watts Branch has ranged from 0.58 to 130 cubic feet per second (cfs), but average annual discharge values over these recorded years have ranged from 1.76 to 7.25 cfs (USGS 2013).

[2] The difference in channel locations between today's mapping and the 1894 map are likely a result of scale differences, not channel movement.

There is an unnamed southern tributary to Watts Branch located outside the eastern boundary of KPS (Figure 4). This tributary reportedly originates in storm drains in the vicinity of Grant Street and previously drained to a constructed silt pond (E & E 2000), but currently discharges into Watts Branch.

2.3 REGIONAL AND SITE GEOLOGY

The Site is located within the Atlantic Coastal Plain physiographic province, which is underlain by a wedge-shaped sequence of sandstones, clay beds, gravel deposits, and silts that increases in thickness from west to east (NPS 2008). The Fall Line, at which the wedge of Coastal Plain sediments is thinnest, is located approximately 4 miles west of the Site. Arundel Clay (dark grey and maroon lignitic clay) is the dominant Coastal Plain sediment at the Site, but the Patapsco formation (gray, brown, and red variegated silts and clays with sand and minor gravels) may also be present above the Arundel Clay (MGS 1968). No deep boring logs from the Site are available for review, but a well log from the National Arboretum recorded the thickness of Arundel Clay at approximately 100 feet. Because the Arboretum is located on the western bank of the Anacostia River near the Site, a similar thickness could be expected at the Site.

The Site is shown on the NACE geologic map as being in an area of disturbed ground and artificial fill, surrounded by alluvial surficial deposits (NPS 2008). A geologic map from 1958, which pre-dates the landfill, shows that the Site was covered by the Pamlico Formation and recent alluvium, which is composed of gravel, sand, and silt (including artificial fill) (USGS 1958).

According to cross-sections presented in the KPN RI report, the thickness of landfill waste at KPN varies from approximately 10 feet to 30 feet, with the thickest layer located in the northwestern portion of the property (E & E 2007). Although there were no borings at KPS that were advanced to the bottom of the waste except at the edges, the maximum waste thickness has been estimated at approximately 20 feet near the center of the landfill (E & E 2008).

Based on drilling logs from previous investigations at KPN and KPS, the landfill waste at the Site has a soil cover composed of silty clay and silty loam of unknown origin, and the waste is composed of gravel, ash, sand, silt, clay, glass, metal, and rubber. Throughout KPS and in the southwestern portion of KPN, brown silty clay was recorded immediately beneath the waste, underlain by soft, wet, plastic clay. At the eastern side of KPN, a layer of sand and gravel approximately 10 feet thick was recorded between the waste and Arundel Clay (tough, red and cream clay) at the two easternmost wells, but the gravel was only recorded as a thin layer in the borings to the west.

2.4 CURRENT GROUNDWATER MONITORING SYSTEM

The existing groundwater monitoring system is evaluated in this section with respect to the current information available for the purpose of designing a supplemental groundwater study. The existing monitoring system will be refined to thoroughly evaluate groundwater discharge from the Site to the Anacostia River and Kenilworth Marsh.

A total of 29 wells have been installed at the Site, as follows and shown in Figure 4:

- 16 wells at KPN (the suffix "R" indicates that the well is a replacement of an older well) - MW1N, MW-2N, MW-3NR, MW-4N, MW-5N, MW-6N, MW-7N, MW-8NR, MW-9NR, MW-10N, MW-11N, MW-12N, MW-13N, MW-14N, MW-15N, and MW-16N; and
- 13 wells at KPS - MW1 through MW13.

All wells were installed between 1998 and 2008 during investigations by Ecology and Environment (E & E). The boring and well installation logs are included in the KPN and KPS RI reports (E & E 2007; E & E 2008). One monitoring well, MW-11N, is located upgradient of the landfill in the northeastern corner of KPN. MW1 through MW6 at KPS were installed in hand-augered holes along the banks of Watts Branch and the Anacostia River. All other wells were installed by a hollow-stem auger, and soils were retrieved in split spoons at irregular intervals; thus, no continuous cores were collected or observed. Although there is a stream

gauge on the Watts Branch located at Minnesota Avenue, outside the Site, there have been no contemporaneous measurements of the stream gauge and monitoring wells.

Based on boring logs or other statements in the RI reports, the following interpretations of monitoring well screen (i.e., groundwater intake) depths and locations relative to the objectives of the supplemental groundwater study are provided:

- 13 well screens are installed outside of or below landfill wastes including 6 at KPS (MW1 through MW6), and 7 at KPN (MW-1N, MW-3NR, MW-11N, MW-12N, MW-14N through MW-16N);
- 12 well screens are installed within landfill wastes including 5 at KPS (MW8, MW9, and MW11 through MW13), and 7 at KPN (MW-2N, MW-4N, MW-7N, MW-8N, MW-9NR, MW-10N, and MW-13N);
- 4 well screens may be in landfill wastes, i.e., boring logs are imprecise, including 2 at KPS (MW7 and MW10) and 2 at KPN (MW-5N and MW-6N); and
- approximately 12 of these 29 wells are located along likely groundwater discharge boundaries to the Anacostia River and Kenilworth Marsh relative to the downgradient flow direction from the landfill at KPS and KPN.

Based on water table maps and estimated groundwater flow direction maps presented in the RI reports (see Figure 5), the shallow groundwater table is mounded under both KPN and KPS as a result of the landfills and groundwater primarily migrates toward the topographic low discharge areas at Kenilworth Marsh and the Anacostia River. Portions of the Watts Branch could also influence groundwater flow directions, but the degree of impact cannot be determined by existing data; Watts Branch surface water elevation measurements relative to groundwater elevations were not collected. The maximum groundwater elevation measured at MW-8 near the top and center of KPS was approximately 8 feet higher than the maximum groundwater elevation at KPN, near the northwestern edge of the landfill at MW-5N.

Slug tests were performed to estimate hydraulic conductivities in all monitoring wells except MW-9 at KPS. The hydraulic conductivities at KPS ranged from 2×10^{-6} to 2×10^{-5} centimeters per second (cm/s) except at wells MW12 and MW13, which were tested at a later date and had higher hydraulic conductivities of 3×10^{-3} and 6×10^{-3} cm/s. Hydraulic conductivity values at KPN varied by more than three orders of magnitude from 2×10^{-6} to 3×10^{-3}cm/s, although eight of the twelve wells tested had results ranging from 1×10^{-4} to 6×10^{-4}. Accurate average hydraulic conductivity values for specific subsurface units cannot be calculated using the existing well screen locations given the large variability of geologic units and landfill wastes intersected by the well screens. However, the most common lower hydraulic conductivity values are representative of the silty clay material commonly logged beneath landfill wastes. The supplemental groundwater monitoring system will provide additional hydraulic conductivity measurements from slug test in new wells screens installed relative to more precise geologic logging.

Depth to the groundwater table was measured and recorded in June of 2001 at KPS, in March of 2006 at KPN, and in December of 2012 at both KPN and KPS. A comparison of water levels between June of 2001 and December of 2012 at KPS indicates no seasonal trend, with some levels higher and some lower. At KPN, water levels in March of 2006 were an average of 0.67 feet higher than in December.

Tidal influence studies, intended to evaluate whether water levels in Site monitoring wells are affected by the tides in the Anacostia River, were performed at KPS in June of 2001 and at KPN in March of 2006. The following two monitoring wells were chosen for the tidal influence study at KPS: MW6, located adjacent to Watts Branch approximately 500 feet from the Anacostia River bank; and MW10, located at the eastern edge of KPS, approximately 1,250 feet from the Anacostia River. The MW10 water levels were intended to provide a baseline of barometric pressure effects to compare to the MW6 water levels. The water levels were supposed to be recorded for 12 hours, but the transducer in MW6 malfunctioned for approximately 3 of these hours. No tidal effect was measured in MW10. In MW6, the results

indicated a minimal water level change: the Anacostia River level changed by approximately 36 inches (3 feet) while the groundwater level in MW6 changed approximately 4.1 inches indicating a "tidal efficiency" of 4.1 inches/36 inches, or 11 percent. The tidal response was calculated to have been delayed by approximately 9 hours. Based on the tidal efficiency and the delayed response, E & E concluded that "the well is not reached by surface water recharging the stream bank during the tidal cycle, and well water reflects the quality of groundwater discharging from the Site" (E & E 2008). E & E also concluded that as a result of the relatively low hydraulic conductivity values (averaging 1×10^{-5} cm/s) at the monitoring wells along the Anacostia River and Watts Branch (MW1 through MW5), these wells would respond similarly to MW6, although none of these wells were monitored.

The tidal influence study at KPN was performed using a different approach than at KPS. Pressure transducers and data loggers were installed at five wells at KPN (MW-4N, MW-5N, MW-6N, MW-7N, and MW-15N), and the change in groundwater levels and Anacostia River surface water levels was recorded for 24 hours. During this time, the Anacostia River level varied between approximately 0.25 feet amsl to 3 feet amsl, while the water levels in all five KPN monitoring wells varied less than 0.01 foot. E & E concluded, "it appears that there is no tidal influence on groundwater at the landfill and that the Anacostia River does not appear to have a hydrologic connection to the KPN landfill. Apparently flow is only from the landfill to the river and [there is] no flow from the river into the landfill wells at high tide stages." (E & E 2007).

2.5 PREVIOUS GROUNDWATER ANALYTICAL RESULTS

The entire landfill is considered a potential source of groundwater contamination, but groundwater analytical results from previous investigations indicate that mobile contaminants appear to be limited to metals and a limited number of VOCs and SVOCs; it is possible that sporadic and relatively low detections of less soluble contaminants, such as PCBs and some metals, are related solely to the turbidity of the samples and not dissolved contaminant migration. In addition, of the 29 monitoring wells at the Site, 12 are screened entirely in landfill waste and another 4 appear to be at least partially screened in waste; therefore, only 13 wells can be used to

indicate possible groundwater contaminant transport through geologic media. Of these remaining 13, at least 7 appear to be incapable of providing a non-turbid sample. Therefore, the existing data set of limited detections of contaminants in groundwater may include false positives, and may not accurately represent groundwater contaminant transport in fine-grained deposits at the groundwater/surface water discharge boundaries to the Anacostia River. To determine if dissolved contaminants are transported to primary surface water bodies, monitoring well construction and sampling methods techniques will focus on reducing or eliminating turbidity. The following standard well construction techniques will be used to minimize turbidity in groundwater samples collected from new monitoring wells: 1) pre-packed well screens with additional filter pack surrounding the pre-packed screen; 2) thorough well development until groundwater turbidity is reduced and stable; 3) careful placement of larger and longer filter packs, grout, and bentonite seal above the well screen; and 4) selecting fine grained sand for the filter pack. Despite well construction precautions and the planned use of low-flow sampling techniques, previous sampling data and geologic logs indicate that it may be not be possible to avoid turbid groundwater samples. Some areas of the Site may require screening monitoring wells in fine-grained river sediments and/or clay fill, which cannot be completely filtered by the well's sand pack or avoided by low-flow sampling techniques. Therefore, collecting both filtered and non-filtered metals samples at each location during this study will provide data to evaluate whether previous metals results were affected by suspended particles.

All previous sampling results are summarized in Tables 2 through 5. The lowest relevant[3] human health or ecological screening level is also shown on each table for reference.

The following metals and metalloids were detected above reporting limits in previous samples: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium (total), cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver,

[3] The lowest concentration among the following standards and screening levels is provided in the table: U.S. Environmental Protection Agency Maximum Contaminant Levels (MCLs) (USEPA 2013); DC District of the Environment Class G1 Groundwater Standards 21 DCMR § 1150 (1994); and the National Park Service Ecological Screening Values (NPS 2013).

sodium, thallium, vanadium, and zinc. It is possible that some of the less soluble metals were present at relatively high concentrations in some samples because they were sorbed to sediments in highly turbid samples, particularly those collected at KPS from wells along the Anacostia River.

The VOCs acetone, benzene, carbon disulfide, chlorobenzene, chloroform, methylene chloride (also known as chloromethane), toluene, and xylenes have been detected above laboratory reporting limits in previous samples; however, some of these VOCs are possible laboratory contaminants, particularly acetone and methylene chloride.

Although multiple pesticides were detected at estimated concentrations (i.e., below laboratory reporting limits), only beta hexachlorocyclohexane (BHC) appears to have been present above the laboratory reporting limit in one groundwater sample from MW3 at KPS.

One PCB, Aroclor-1254, was detected above the laboratory reporting limit in one sample from MW-10N at KPN.

SVOC detections above laboratory reporting limits were limited to benzo(a)pyrene, benzoic acid, DEHP, naphthalene, and phenanthrene.

As a result of sampling methods and possibly monitoring well construction methods, groundwater samples from monitoring wells along the Anacostia River were always turbid and, therefore, could reflect concentrations of contaminants that are sorbed to sediments rather than dissolved in groundwater. Furthermore, the existing detections of all contaminants do not represent clear patterns of groundwater plumes or source areas.

3.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are statements that define the type, quality, quantity, purpose, and use of data required to be collected in a study to achieve the study goals and objectives. The design of a study is closely tied to the DQOs, which serve as the basis for key

study design features such as the number and location of samples to be collected and the chemical analyses to be performed. Table 6 summarizes the supplemental groundwater study DQOs described in the following sections.

3.1 STEP 1 – STATE THE PROBLEM

Previous groundwater sampling at the Site detected a limited number of contaminants in groundwater. The RI and FS determined that there are no residential, municipal, or industrial wells or surface water intakes at the Site. Drinking water in the neighborhoods surrounding the Site is provided by DC Water, the District's Water and Sewer Authority. Public water intakes operated by DC Water are in the Potomac River and in reservoirs, and there are no public drinking water intakes in the Anacostia River or in groundwater near or downstream of the Site (DC Water 2012). Regardless, because contaminated groundwater could discharge into the Anacostia River and Kenilworth Marsh and impact recreational uses and aquatic ecological receptors, definition and delineation of contaminated groundwater is required. While the PA/SIs, RIs, and FS data show that the dissolved contaminants migrating in groundwater to the Anacostia River and Kenilworth Marsh are limited and were detected at relatively low concentrations, turbid samples may have produced false positives; also, the sampling density at groundwater discharge areas may be considered insufficient.

Given the existing data, the problem statement for the supplemental groundwater study is as follows.

- An improved and more densely spaced groundwater monitoring network installed at the groundwater/surface water discharge boundary of the Site and Anacostia River is considered necessary to collect sufficient quality and quantity of groundwater samples and confirm conclusions from previous investigations that there are no risks to human and ecological receptors from Site groundwater discharging to the Anacostia River.

3.2 STEP 2 – IDENTIFY THE DECISION(S) OF THE STUDY

Additional groundwater data collected from the supplemental groundwater study will be incorporated into the decision-making process to further evaluate whether and to what extent

contaminated groundwater may be entering the Anacostia River or Kenilworth Marsh and posing a potential human health or ecological risk for recreational users or the aquatic ecosystem receptors.

This supplemental groundwater study will collect additional data to answer the following principle study questions (PSQs).

- *Is there evidence to indicate that dissolved contaminants of concern in groundwater are migrating from the Site into the Anacostia River or Kenilworth Marsh at the groundwater/surface water discharge boundary at concentrations exceeding human health or ecological screening levels?*
- *If contaminants above screening levels are detected in groundwater, can the contaminant transport pathway be defined sufficiently to indicate the general area of concern on the Site causing the contaminant discharge, such as a source area?*

3.3 STEP 3 – IDENTIFY INPUTS TO DECISION(S)

The purpose of this step is to identify the data required to answer to the PSQs listed in Section 3.2 and to determine which inputs require environmental measurements. The four types of data required to answer the PSQ are as follows.

- Groundwater contaminant data from existing and additional monitoring wells at the groundwater/surface water discharge boundary between KPS and the Anacostia River, and between KPN and Kenilworth Marsh and the Anacostia River. These data will be used to determine whether hazardous substances above ecological and human health screening concentrations are potentially migrating into the Anacostia River.
- Water level measurements from existing and new monitoring wells, piezometers, and surface water adjacent to the Site. These data will be used to develop a potentiometric surface map that illustrates groundwater gradient directions at the Site to further characterize groundwater/surface water discharge boundaries at the Anacostia River and at Kenilworth Marsh, Watts Branch and an unnamed south tributary to Watts Branch, all of which flow into the Anacostia River.

- Continuous groundwater water-level measurements in monitoring wells along Site/Anacostia River boundaries to establish if tidal fluctuations impact groundwater levels near groundwater discharge boundaries along the Anacostia River and Kenilworth Marsh.
- Shallow geologic and permeability data at the discharge boundaries to assess migration pathways and rates.

Table 6 shows the specific requirements for the sampling event to be conducted in the fall of 2013 and how each type of data will be used.

3.4 STEP 4 – IDENTIFY THE BOUNDARIES OF THE STUDY

The objective of this step is to define the spatial and temporal components of the study area.

Figure 6 shows a map of the study area. The boundary of the study area is defined by combining the data needed with the spatial and temporal boundaries.

3.4.1 Spatial Boundaries

The spatial boundaries identified for this study are the groundwater/surface water discharge boundaries downgradient of the Site, which include where the Site borders the Anacostia River, in addition to other surface waters that may significantly impact the Anacostia River, including the Kenilworth Marsh, Watts Branch, and the unnamed south tributary to Watts Branch.

3.4.2 Temporal Boundaries

In order to provide an accurate potentiometric surface map of the groundwater table gradient direction relative to tidal influence of the Anacostia River, a minimum of two water level measurements will be collected at all monitoring locations near high and low tide within approximately one hour. If groundwater levels appear to be significantly tidally influenced,

groundwater samples will be collected at the approximate time of low tide to sample groundwater for contaminants during maximum gradients toward the Anacostia River.

3.5 STEP 5 – DEVELOP THE ANALYTICAL APPROACH

The analytic approach for each of the three types of data required to answer the PSQ is summarized below.

1. Supplemental groundwater chemistry data at the groundwater/surface water discharge boundaries of the Anacostia River and Kenilworth Marsh:

Groundwater chemistry data at the groundwater/surface water discharge boundaries of the Anacostia River and Kenilworth Marsh will be compared to human health and ecological screening concentrations to evaluate the proximity and potential migration of hazardous substances from the Site to the Anacostia River. Monitoring well design and sampling methods selected with knowledge of the Site groundwater and geologic characteristics are expected to provide more representative groundwater sample chemistry. Increased sample location density at the groundwater/surface water discharge boundary will improve groundwater chemistry interpretation of the nature and extent of contamination downgradient from the Site.

2. Supplemental and tide-related water level measurements:

Groundwater and surface water measurements will used to develop a potentiometric surface map that will supplement the existing data and confirm water table gradient directions during low and high tide of the Anacostia River.

3. Supplemental geologic and hydraulic permeability information:

Additional geologic and subsurface permeability information from supplemental well logs and monitoring well slug tests will be used to assess groundwater flow rates relative to the Site geology and groundwater concentrations, and will provide insight into contaminant transport to surface water.

3.6 STEP 6 – SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA

3.6.1 Adherence to Standard Operating Procedures

The details of the field and analytical tasks and activities are described in the FSP (Appendix A) and the QAPP (Appendix B). Standard Operating Procedures (SOPs), specified in the FSP and QAPP and available upon request, detail procedures for conducting tasks in the field, analyzing samples in the laboratory, and evaluating and managing data.

To mitigate the potential for errors associated with sampling, field procedures will be consistent with the FSP and SOPs, which describe processes such as sample collection and documentation, geologic logging, and decontamination procedures.

For laboratory analysis of samples, quality assurance/quality control (QA/QC) steps (such as the laboratory controls, matrix spikes, matrix spike duplicates, blanks, etc.) will be consistent with requirements described in the QAPP. Verification that the analytical laboratory adhered to its Laboratory Quality Assurance Plan (QAP) and the analytical method procedures for sample analysis will be documented.

Data validation establishing that data are of sufficient quality to be used in making the project decisions for which they were intended will be performed by a qualified data validator.

3.6.2 Completion of the Entire Sampling Plan

Completion of the entire sampling plan will be verified by The Johnson Company's Project Manager. If any part of the plan is not able to be completed, the consequences of that data gap on achieving the DQOs for this study will be identified and described.

3.6.3 Adequate Analytical Detection Limits

Worksheet 15 of the QAPP (Appendix A) lists the human health and ecological screening concentrations that will be used to evaluate the groundwater chemistry data and the specific analytical detection limits achievable for this supplemental groundwater study.

3.7 STEP 7 – DEVELOP THE PLAN FOR OBTAINING THE DATA

The FSP (Appendix A) and the QAPP (Appendix B) present plans for conducting the investigation in a manner that generates the data required to meet the DQOs identified in Section 3.0. The FSP presents detailed descriptions of field activities and procedures, analytical requirements and data reduction, and preparation of the data summaries. The QAPP (Appendix B) details the analytical methods and detection limits required for the initial defined data needs, QA/QC protocols, and data assessment procedures for the evaluation and identification of data limitations.

4.0 OVERVIEW OF FIELD ACTIVITIES

4.1 GENERAL

This supplemental groundwater study uses existing data to design and develop a more precise investigation of groundwater/surface water discharge boundaries, where potential impacts to the Anacostia River, Watts Branch, and Kenilworth Marsh have been shown from previous investigations to be negligible and potentially the result of turbid samples. Project data needs and major tasks are briefly summarized below with further details in the following sections and in the FSP (Appendix A) and QAPP (Appendix B). The FSP will document in greater detail the specific investigation techniques that will be used at the Site to fulfill the DQOs.

4.1.1 Project Data Needs

- *Supplemental groundwater chemistry data* at the groundwater/surface water discharge boundaries of the Anacostia River and Kenilworth Marsh to determine whether hazardous substances above ecological and human health screening concentrations are potentially migrating into the Anacostia River.
- *Supplemental and tide-related water level measurements* to develop a potentiometric surface map that will confirm water table gradient directions during low and high tide of the Anacostia River.

- *Supplemental geologic and hydraulic permeability information* to assess groundwater flow rates relative to the Site geology and groundwater concentrations, and provide insight into contaminant transport to surface water.

4.1.2 Major Project Tasks

- *Characterize Groundwater Discharge to the Anacostia River* - Water-table monitoring wells will be installed at a sufficient density to characterize the full nature and extent of groundwater contamination, gradient directions, and hydraulic conductivity along the downgradient borders of the Site where shallow groundwater discharges to the Anacostia River, Kenilworth Marsh, or surface water that could impact the Anacostia River with Site contaminants. Deeper wells will be coupled with some shallow water-table wells to determine the vertical extent of contaminant transport.

  Groundwater samples will be collected from new and some existing wells located at the most apparent downgradient Site borders and analyzed for the Site-related contaminants discussed in Section 2.5 to evaluate the potential for contaminant migration to the Anacostia River. Water levels will be measured during low and high tide events in all existing and new wells, and at specific surface water locations to map the groundwater table horizontal gradient direction and vertical gradient directions at new coupled monitoring well locations. If contaminants are present in groundwater at these downgradient locations above concentrations of concern, additional monitoring locations and groundwater samples may be required to further delineate the areas of dissolved contamination discharge. Borehole logging will provide information about subsurface geology that will be used to assess contaminant transport pathways and potential response action alternatives.

- *Groundwater Discharge to Kenilworth Marsh and Watts Branch* - Piezometers and surface water staff gauges will be installed where the Site borders the Kenilworth Marsh and Watts Branch surface waters that flow into the Anacostia River. Piezometers will be used for water-level monitoring along with data from staff gauges to map shallow groundwater gradient directions from the landfill relative to the surface water elevations in Watts Branch

and the Kenilworth Marsh. Anacostia River levels will be downloaded from the website for the USGS Anacostia River water stage recorder, which registers water levels every 6 minutes. All piezometer locations will include a deep and shallow piezometer to assess vertical gradients at potential discharge areas.

4.2 PROJECT NARRATIVE

Key elements of the FSP are discussed in this section. Because the Site is within a park, all field activities will be planned in coordination with park personnel and implemented in a manner that protects public safety and preserves public enjoyment of the park. The analytical results will be evaluated to determine if the investigation objectives were achieved. Proposed sampling locations for this study are illustrated on Figure 6.

4.2.1 Aqueous Sample Analysis

Previous groundwater samples at existing wells have indicated the presence of contaminants above human health and ecological screening concentrations, as discussed in Section 2.5. The analyte list in previous investigations did not include dioxins in soil or groundwater. The supplemental groundwater study does not include groundwater sampling for dioxins because dioxins are hydrophobic, strongly sorb to soils, and are typically not mobile in groundwater in the absence of an oil medium, and there is no historical evidence of high concentrations of petroleum in Site groundwater. The proposed groundwater laboratory analyses are described below in Text Table 4.2.1.

Text Table 4.2.1 Groundwater Analyses

Analyte Group and Rationale	Specific Analytes
Metals – Groundwater will be analyzed for the Target Analyte List of 23 metals. Two sets of samples will be collected: one unfiltered (total metals) and filtered (dissolved metals) to evaluate transport in low permeability silts.	TAL 23 metals: aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium (total), cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Text Table 4.2.1 Groundwater Analyses	
Analyte Group and Rationale	**Specific Analytes**
Polycyclic aromatic hydrocarbons (PAHs) and DEHP – Groundwater will be analyzed for a list of 18 PAHs because PAHs were detected in some historical groundwater samples and PAH contamination in the Anacostia River is a known concern. Groundwater will be analyzed for DEHP because this compound was detected in several previous samples.	18 PAHs: Acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, phenanthrene, and pyrene 1 other SVOC: bis (2-ethylhexyl)phthalate (DEHP)
VOCs – Groundwater will be analyzed for a standard list of VOCs. Approximately 7 years have elapsed since the most recent sampling and it is important to view current conditions for VOCs, which are likely to be transported in groundwater, if present	VOCs – a standard U.S. Environmental Protection Agency (USEPA) Method 8260B analyte list
PCBs – Groundwater will be analyzed for PCBs by Aroclor. Although only one Aroclor was detected in one previous sample, PCBs are present in overlying soils and are a contaminant of concern in the Anacostia River.	PCBs – Aroclor analysis
Dioxins and furans – Groundwater will be analyzed for dioxins and furans. Historical burning of landfill materials at KPN presents a concern that dioxins may be present. A subset of monitoring wells, including two wells screened in waste and the deep/shallow couplets downgradient, will be sampled.	Dioxins and furans

4.2.2 Piezometers and Staff Gauges

Piezometers and staff gauges will be used to monitor groundwater levels to determine groundwater gradient directions and groundwater/surface water interaction areas. Groundwater samples from piezometers will not be collected because it is not yet understood where the streams are gaining or losing and where groundwater discharge occurs. However, piezometers will be constructed such that groundwater samples can be collected, if necessary.

A total of five pairs of piezometers will be installed in two general areas around the Site: 1) along the Watts Branch at KPN; and 2) along the unnamed southern tributary to Watts Branch at KPS. A shallow (“A”; screened approximately 3 feet bgs) and deep (“B”; screened

approximately 7 feet bgs) pair of piezometers will be installed at each location to evaluate vertical groundwater gradients and contaminant migration.

A summary of piezometer locations and rationale for the locations is provided in Text Table 4.2.2.

Text Table 4.2.2 Proposed Piezometer Locations

Count (Sets)	Name	Depth	Location/Rationale
1	PZ-W-01A and PZ-W-01B	Shallow and deep	Located south of all known landfill waste at KPN. This location will provide information regarding groundwater flow direction apparently upgradient of the landfill.
2	PZ-W-02A and PZ-W-02B	Shallow and deep	Located at the northernmost reach of Watts Branch. This location will provide information regarding Watts Branch groundwater discharge or recharge.
3	PZ-W-03A and PZ-W-03B	Shallow and deep	Located west of Deane Road along the east-west reach of Watts Branch at KPN. This location will provide additional information regarding Watts Branch groundwater discharge or recharge below the unnamed southern tributary to Watts Branch.
4	PZ-U-01A and PZ-U-01B	Shallow and deep	Located near existing monitoring well MW10. This location will provide information regarding discharge or recharge conditions at the unnamed stream.
5	PZ-U-02A and PZ-U-02B	Shallow and deep	Located at the southernmost end of the unnamed southern tributary to Watts Branch. This location will provide information regarding groundwater flow direction possibly upgradient or downgradient of the Site.

Staff gauges are vertical rods marked with a measuring tape; they are installed in the stream bed and used to read the water level with respect to a surveyed elevation. Staff gauges will be used to monitor the surface water levels contemporaneously with piezometer water levels to determine the vertical direction of the groundwater gradient relative to surface water at the time of the measurement. One staff gauge will be co-located with each of the three pairs of shallow and deep piezometers located along Watts Branch and two pairs of piezometers on the unnamed southern tributary to Watts Branch. In addition, one staff gauge will be located with each of the three pairs of monitoring wells along the border of KPN and the Kenilworth Marsh. Therefore, eight staff gauges will be installed adjacent to piezometer locations

A minimum of two rounds of water levels will be collected from all new and existing monitoring wells, piezometers, and staff gauges during low and high tides. Data loggers will be used to record water levels in newly-installed shallow monitoring wells for approximately 24 hours during two high and low tide events. No samples will be collected from piezometers during the supplemental groundwater study, but they will be constructed in a manner that is likely to provide clear samples following development; thus, samples can be collected in future stages, if necessary. Unless the results from this supplemental investigation show that groundwater discharges to the Watts Branch and/or monitoring well data show that contaminated groundwater is migrating from the Site to the Anacostia River or Kenilworth Marsh, sampling the piezometers is unnecessary.

4.2.3 Groundwater Monitoring Wells

Groundwater is not in use at the Site and does not discharge into any aquifers or water bodies that are drinking water sources. Groundwater under KPN and KPS has been measured to flow radially away from the highest topographic areas of fill on the ground surface, resulting in apparent flow to Kenilworth Marsh, Watts Branch, the Anacostia River, and the unnamed stream. Transects of groundwater monitoring wells along the Site boundaries adjacent to surface waters are proposed to characterize groundwater contaminant migration at downgradient edges of the Site that may potentially impact the Anacostia River.

All existing wells at the Site are screened across the water table, which will be considered shallow for the purposes of this investigation. The four existing monitoring wells along the Anacostia River at KPS, MW-1 through MW4, produce turbid groundwater samples and will be replaced. Additional monitoring wells will be installed along the Anacostia River at KPN to increase the density of wells along this discharge zone. Wells will be located as close as possible to surface water to avoid encountering waste at the water table; if waste is present in the boring, the well will be installed beneath the waste.

At some locations, deep ("B") monitoring wells will be coupled with new ("A") or existing shallow wells to assess the existence of vertical contaminant migration and contaminant variability along a vertical discharge transport path. The deep groundwater monitoring wells are expected to be installed in the same aquifer as the shallow wells, although the well screens and their sand packs at adjacent deeper locations will be separated by a minimum of 10 feet from the upper water table well or a significant confining layer. All monitoring wells will be installed along the Anacostia River or Kenilworth Marsh at locations where the ground surface elevation is not more than 15 feet amsl. All deep wells will be constructed with the bottom of the screen at 50 feet below ground surface (bgs) or closer to the ground surface.

A total of 20 new wells are proposed, including 11 shallow and 9 deep wells. This number is based on the previous survey, but if MW-15N can be located, MW-N-05A will not be installed unless MW-15N is damaged or cannot be sampled. The proposed groundwater monitoring well locations are detailed in Text Table 4.2.3 and shown on Figure 6.

Text Table 4.2.3 Proposed Monitoring Well Locations

Count	Name	Depth	Location/Rationale
Shallow Monitoring Wells			
KPS			
1	MW-S-01A	Shallow	Replacement of MW1 at KPS. This shallow well will provide information regarding groundwater conditions at the southernmost end of the Site.
2	MW-S-02A	Shallow	Replacement of MW2 at KPS.
3	MW-S-03A	Shallow	Replacement of MW3 at KPS.
4	MW-S-04A	Shallow	Replacement of MW4 at KPS.
KPN			
5	MW-N-05A	Shallow	Replacement of MW-15N at KPN <u>if</u> this well cannot be found. If MW-15N can be located, it will not be replaced unless damaged.
6	MW-N-06A	Shallow	Located between existing wells MW-7N and MW-6N at KPN. This well reduces the spacing between wells from 750 feet to approximately 375 feet.
7	MW-N-07A	Shallow	Located between existing wells MW-6N and MW-5N at KPN. This well reduces the spacing between wells from 700 feet to approximately 350 feet and is located outside the delineated landfill along the riverbank.

Text Table 4.2.3 Proposed Monitoring Well Locations			
Count	**Name**	**Depth**	**Location/Rationale**
8	MW-N-08A	Shallow	Located between existing wells MW-5N and MW-4N at KPN. This well reduces the spacing between wells from 630 feet to approximately 320 feet and is located outside the delineated landfill along the riverbank.
9	MW-N-09A	Shallow	Located east and potentially downgradient of existing well MW-4N near the northern border of KPN with Kenilworth Marsh. This well will provide data regarding groundwater conditions at the potential groundwater discharge zone at Kenilworth Marsh.
10	MW-N-10A	Shallow	Located north and downgradient of existing wells MW-8NR and MW-3NR at the edge of Kenilworth Marsh. This well will provide data regarding contaminant migration from two existing wells in which concentrations of some contaminants were above PSLs to the groundwater discharge zone at Kenilworth Marsh.
11	MW-N-11A	Shallow	Located north of existing monitoring well MW-2N. This well will provide data regarding contaminant migration in groundwater between the eastern portion of KPN and the Kenilworth Marsh.
Deep Monitoring Wells *Rationale: All deep wells will provide information regarding vertical nature and extent of contamination, and be used to determine the vertical gradient.*			
KPS			
1	MW-S-02B	Deep	Located beside MW-S-02A.
2	MW-S-04B	Deep	Located beside MW-S-04A.
KPN			
3	MW-N-05B	Deep	Located beside new well MW-N-05A or existing well MW-15N, if found.
4	MW-N-06B	Deep	Located beside MW-N-06A.
5	MW-N-07B	Deep	Located beside MW-N-07A.
6	MW-N-08B	Deep	Located beside MW-N-08A.
7	MW-N-09B	Deep	Located beside MW-N-09A.
8	MW-N-10B	Deep	Located beside MW-N-10A.
9	MW-N-11B	Deep	Located beside MW-N-11A.

All existing monitoring wells that can be located will be used for measuring water levels; monitoring wells MW-10N, MW-14N, MW-15N, and MW-16N could not be found during the December 2012 visit but additional attempts will be made to locate these wells. Pressure transducers and data loggers will be installed in the 11 newly installed shallow wells to record water levels over at least one day, encompassing two high tides and two low tides.

The following wells will be sampled using low flow methods to minimize turbidity for this investigation:

- the 20 newly installed groundwater monitoring wells (or, if MW-15N can be located, this well and the 19 newly installed wells will be sampled);
- the 4 existing shallow monitoring wells at KPN that border the Anacostia River – MW4N, MW-5N, MW-6N, and MW-7N; and
- the 3 existing shallow monitoring wells near the KPN border with Kenilworth Marsh – MW-2N, MW3NR, and MW8NR.

A total of 27 groundwater monitoring well samples for metals (filtered and unfiltered), PAHs and DEHP, VOCs, and PCBs will be collected during the supplemental groundwater study field work. A total of six groundwater monitoring well samples for dioxins and furans will also be collected. Sampling is expected to require approximately seven to 10 days to complete. If water level monitoring indicates significant tidal impacts in particular wells, these wells will likely only be sampled within a 3 hour period centered on low tide.

Hydraulic conductivity at each sampled well will be estimated using slug tests following groundwater well installation and sampling.

4.3 PROPOSED INVESTIGATION SUMMARY

All proposed sampling locations and analyses are summarized in Text Table 4.3.

Text Table 4.3 Summary of Investigation Monitoring Installations and Sampling

#	Name	Location	Media & Depth	Metals*	PAHs/ DEHP	VOCs	PCBs	Dioxins/ furans
Monitoring Wells								
1	MW-S-01A	On Anacostia River bank at KPS	Groundwater (GW), shallow	x	x	x	x	
2	MW-S-02A	On Anacostia River bank at KPS	GW, shallow	x	x	x	x	
3	MW-S-02B	On Anacostia River bank at KPS	GW, deep	x	x	x	x	
4	MW-S-03A	On Anacostia River bank at KPS	GW, shallow	x	x	x	x	
5	MW-S-04A	On Anacostia River bank at KPS	GW, shallow	x	x	x	x	
6	MW-S-04B	On Anacostia River bank at KPS	GW, deep	x	x	x	x	
7	MW-N-05A	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
8	MW-N-05B	On Anacostia River Bank at KPN	GW, deep	x	x	x	x	
9	MW-7N	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
10	MW-N-06A	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
11	MW-N-06B	On Anacostia River bank at KPN	GW, deep	x	x	x	x	
12	MW-6N	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
13	MW-N-07A	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
14	MW-N-07B	On Anacostia River bank at KPN	GW, deep	x	x	x	x	
15	MW-5N	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
16	MW-N-08A	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
17	MW-N-08B	On Anacostia River bank at KPN	GW, deep	x	x	x	x	
18	MW-4N	On Anacostia River bank at KPN	GW, shallow	x	x	x	x	
19	MW-N-09A	On Anacostia River bank/Kenilworth Marsh at KPN	GW, shallow	x	x	x	x	
20	MW-N-09B	On Anacostia River bank/Kenilworth Marsh at KPN	GW, deep	x	x	x	x	
21	MW-N-10A	At edge of Kenilworth Marsh at KPN	GW, shallow	x	x	x	x	x
22	MW-N-10B	At edge of Kenilworth Marsh at KPN	GW, deep	x	x	x	x	x
23	MW-3NR	Upgradient of MW-N-10B, screened outside landfill waste	GW, shallow	x	x	x	x	
24	MW-8NR	Upgradient of MW-3NR and MW-N-10B	GW, shallow	x	x	x	x	x
25	MW-N-11A	At edge of Kenilworth Marsh at KPN	GW, shallow	x	x	x	x	x
26	MW-N-11B	At edge of Kenilworth Marsh at KPN	GW, deep	x	x	x	x	x
27	MW-2N	Upgradient of MW-N-11A and B, screened in landfill waste	GW, shallow	x	x	x	x	x

Text Table 4.3 Summary of Investigation Monitoring Installations and Sampling

#	Name	Location	Media & Depth	Metals*	PAHs/ DEHP	VOCs	PCBs	Dioxins/ furans
Total groundwater samples from monitoring wells: 27 (6 for dioxins and furans)				27	27	27	27	6
Piezometers and Stream Gauges								
1	PZ-U-01A	At northern end of unnamed southern tributary to Watts Branch	GW, stream level					
2	PZ-U-01B	At northern end of unnamed southern tributary to Watts Branch	GW below stream level					
3	SG-U-01	At northern end of unnamed southern tributary to Watts Branch	Surface water					
4	PZ-U-02A	At southern end of unnamed southern tributary to Watts Branch	GW, stream level					
5	PZ-U-02B	At southern end of unnamed southern tributary to Watts Branch	GW below stream level					
6	SG-U-02	At southern end of unnamed southern tributary to Watts Branch	Surface water					
7	PZ-W-01A	At Watts Branch southeast of landfill	GW, stream level					
8	PZ-W-01B	At Watts Branch southeast of landfill	GW below stream level					
9	SG-W-01	At Watts Branch southeast of landfill	Surface water					
10	PZ-W-02A	Northernmost reach of Watts Branch	GW, stream level					
11	PZ-W-02B	Northernmost reach of Watts Branch	GW below stream level					
12	SG-W-02	Northernmost reach of Watts Branch	Surface water					
13	PZ-W-03A	East-west reach of Watts Branch	GW, stream level					
14	PZ-W-03B	East-west reach of Watts Branch	GW below stream level					
15	SG-W-03	East-west reach of Watts Branch	Surface water					
16	SG-N-09	On Anacostia River bank/Kenilworth Marsh at KPN	Surface water					
17	SG-N-10	On Kenilworth Marsh at KPN	Surface water					
18	SG-N-11	On Kenilworth Marsh at KPN	Surface water					
Total groundwater samples from piezometers and stream gauge locations: 0				0	0	0	0	0

*Both filtered and unfiltered metals samples will be collected.

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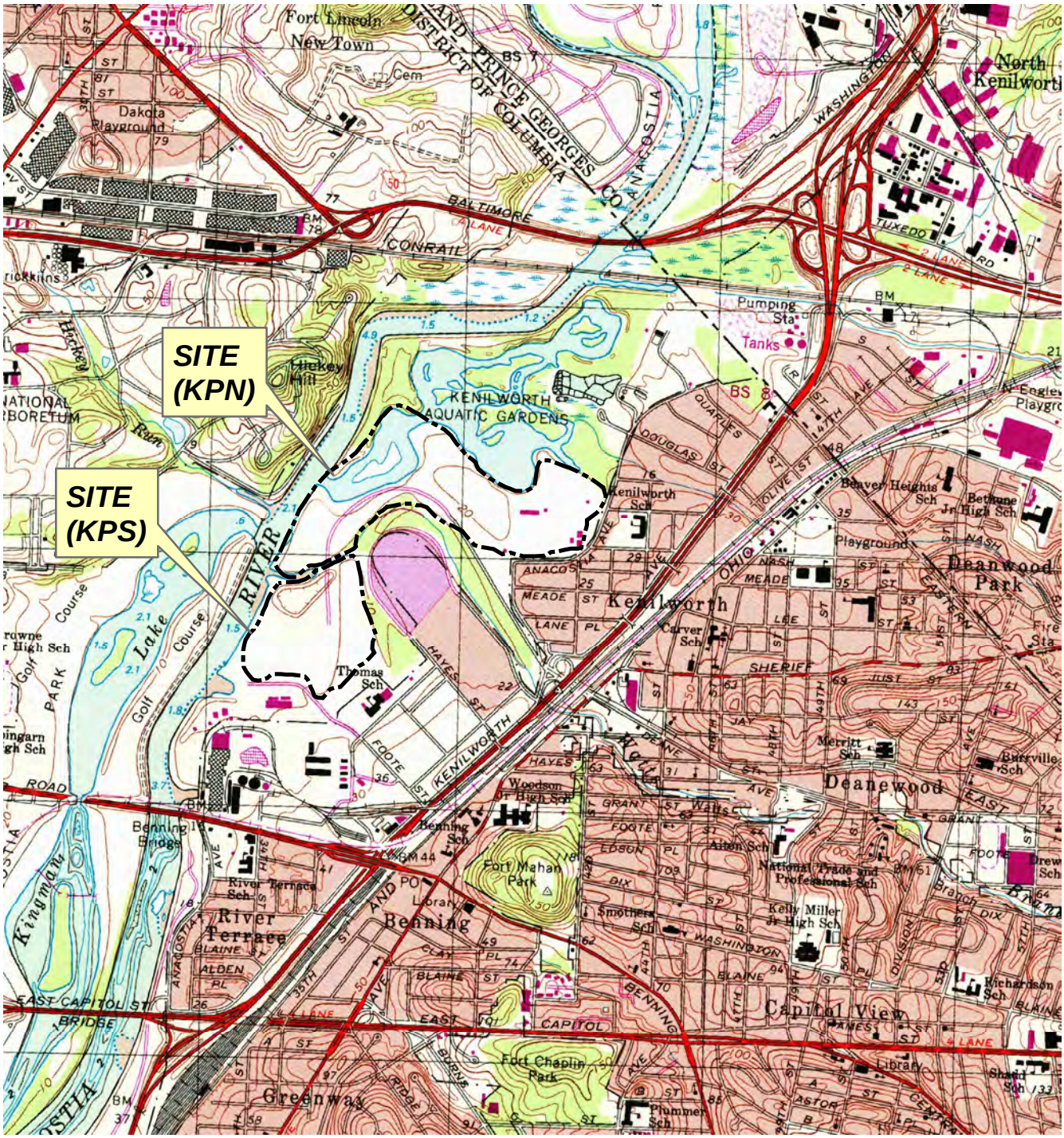
FIGURES

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 1 Kenilworth Site Location Map 111312.mxd



N

1 0.5 0 1

MILES

1,000 0 1,000 2,000 3,000 4,000 5,000 6,000 7,000

FEET

CONTOUR INTERVAL: 10 FEET

Legend

Site Boundary

VA

MAP LOCATION

BASE MAP: USGS 7.5 Minute Topographic Quadrangle Washington East D.C.-MD, 1965 (Updated 1979 and 1982)

Figure 1: Site Location Map
Kenilworth Park Landfill OU2
Washington, D.C.

The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK	Date: 11/13/12
Chk'd by: MBM	Date: 01/16/13
App'd by:	Date:
Scale: 1:24,000	Project: 3-0700-11

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 2 Kenilworth Orthophoto 110613.mxd

Source: 2012 Orthoimagery, USGS.

N

0 500 1,000 2,000 3,000

Feet

Figure 2: Aerial Photograph of Site and Vicinity
Kenilworth Park Landfill Site
Washington, District of Columbia

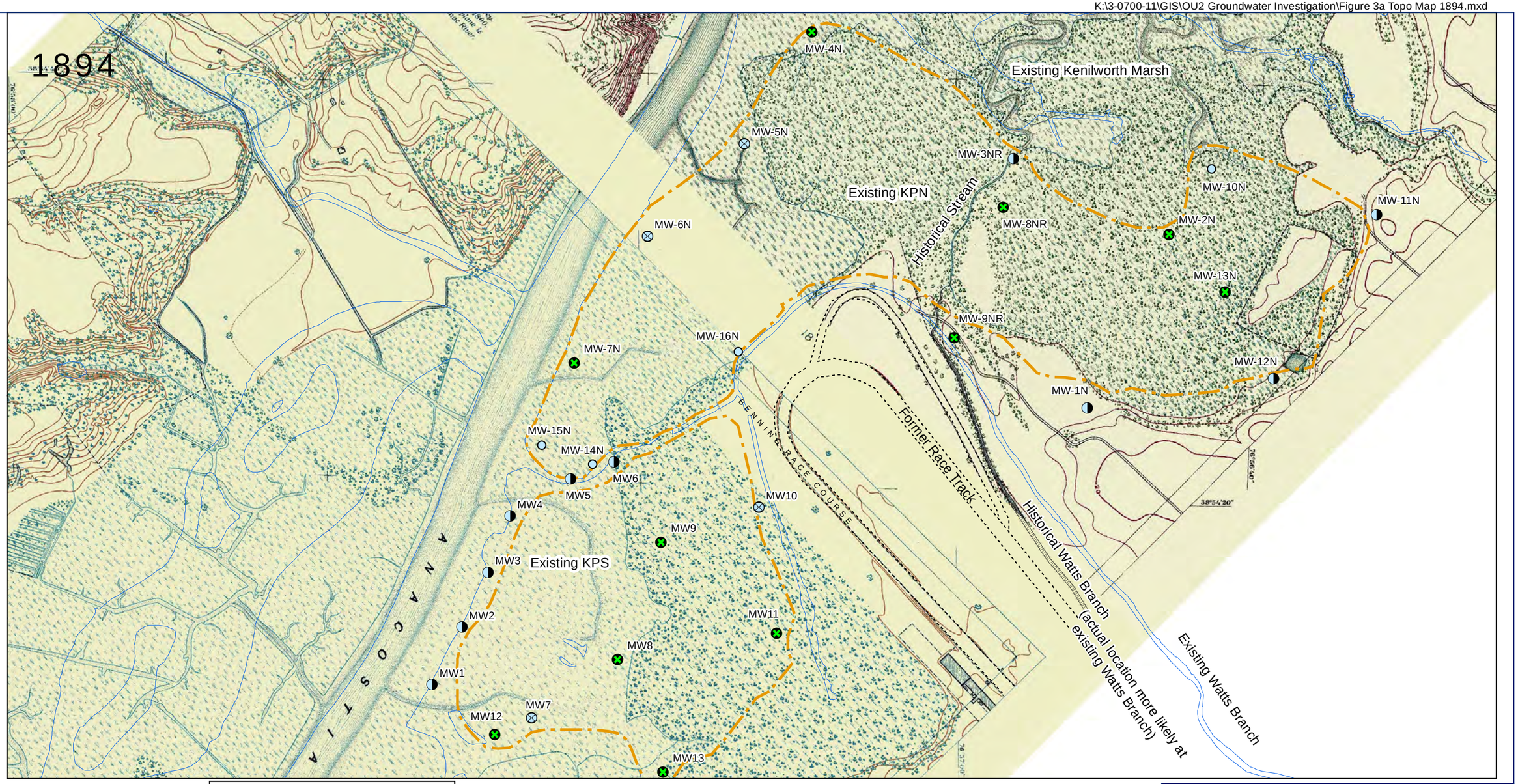
The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 11/06/13
Reviewed by: MBM Date: 11/16/13

Scale: 1 " = 1,000 ' Project: 3-0700-11

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 3a Topo Map 1894.mxd



Legend

- Well Screened below Waste
- Well May be Screened in Waste
- Well Screened in Waste
- Not Found (12/07/12)
- Site
- 2010 Water Outline

0 250 500 750 1,000

Scale in Feet

N

Source: NOAA Historical Maps and Charts, 1894

Figure 3a: Existing Site Features on 1894 Topographic Map
Kenilworth Park Landfill Site
Washington, District of Columbia

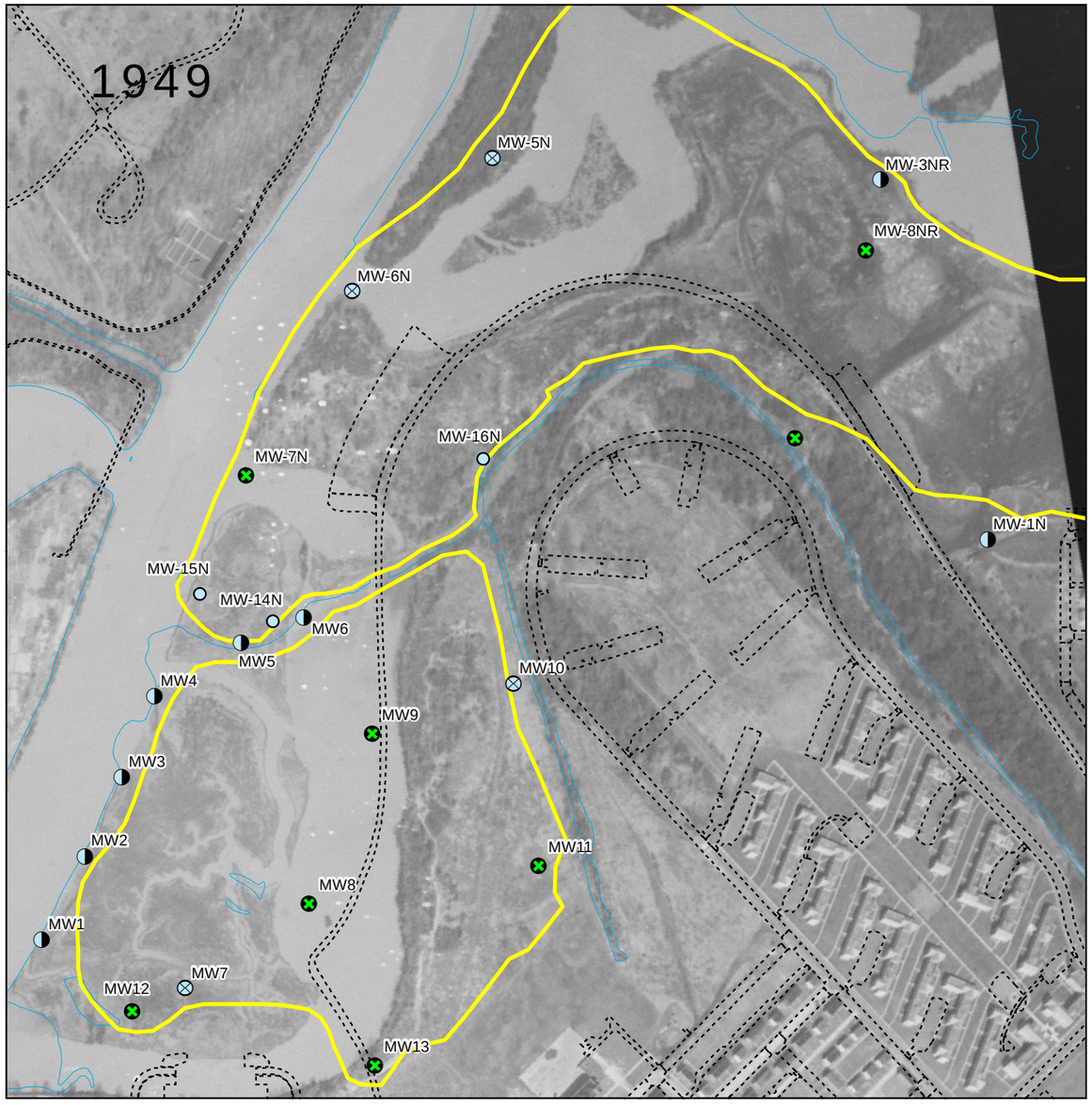
The Johnson Company

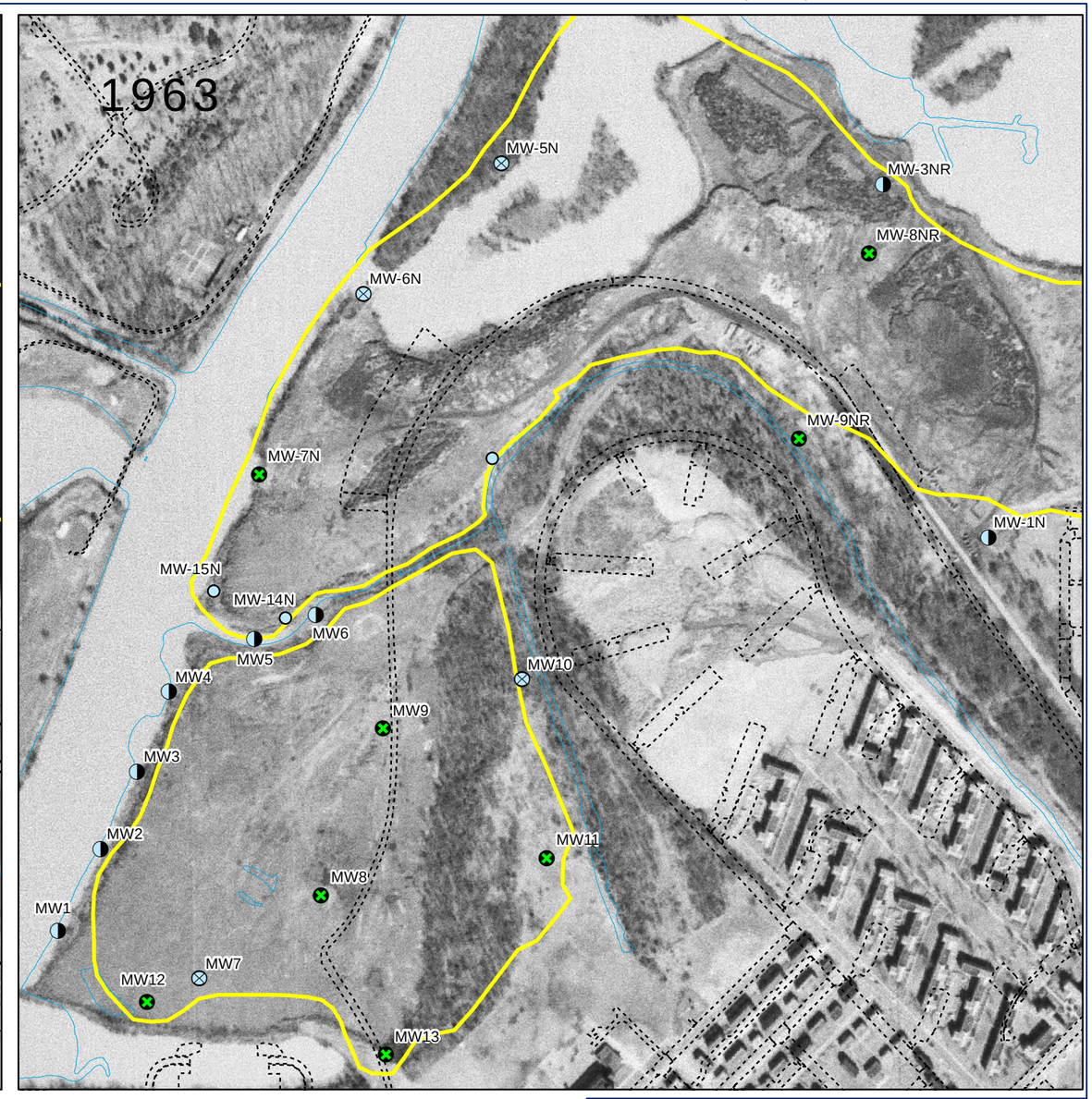
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 01/14/13
Reviewed by: MBM Date: 01/16/13

Scale: 1 " = 500 feet Project: 3-0700-11

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 3b Historical Photos 1949-1963.mxd





Source: USGS EarthExplorer Aerial Photographs from 03/04/1949 and 03/15/1963.

Legend

- Well Not Screened in Waste
- Well May be Screened in Waste
- Well Screened in Waste
- Well Not Found (12/07/12)
- Site
- Existing Road
- 2010 Water Outline

0 250 500 750 1,000

Scale in Feet

N

Figure 3b: Existing Site Features on 1949 and 1963 Aerial Photopgraphs
Kenilworth Park Landfill Site
Washington, District of Columbia

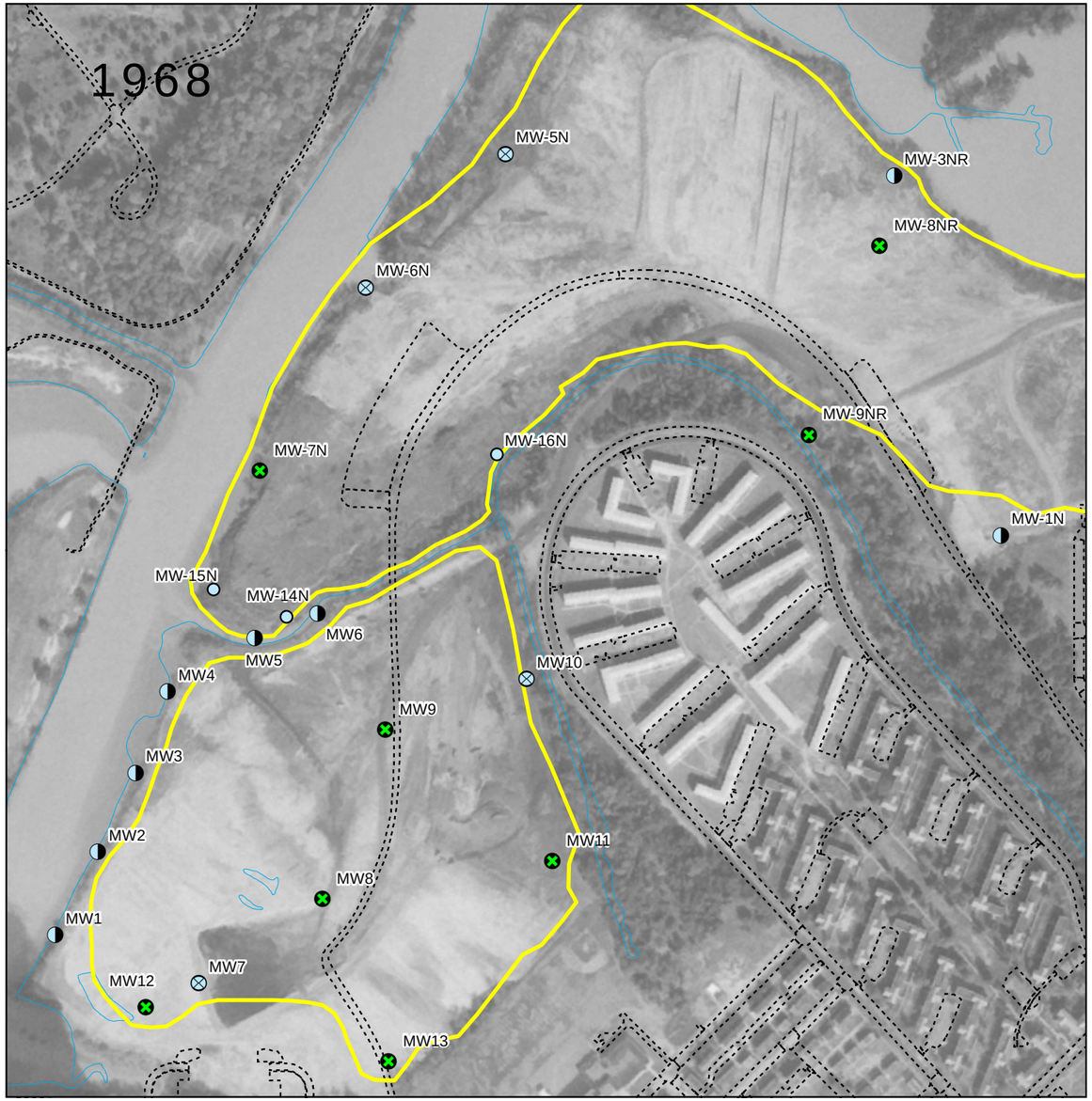
The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 01/14/13
Reviewed by: MBM Date: 01/16/13

Scale: 1 " = 500 feet Project: 3-0700-11

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 3c Historical Photos 1968-1984.mxd



Source: USGS EarthExplorer Aerial Photographs from 10/31/1968 and 02/08/1984.

Legend

- Well Not Screened in Waste
- Well May be Screened in Waste
- Well Screened in Waste
- Well Not Found (12/07/12)
- Site
- Existing Road
- 2010 Water Outline

0 250 500 750 1,000

Scale in Feet

N

Figure 3c: Existing Site Features on 1968 and 1984 Aerial Photopgraphs
Kenilworth Park Landfill Site
Washington, District of Columbia

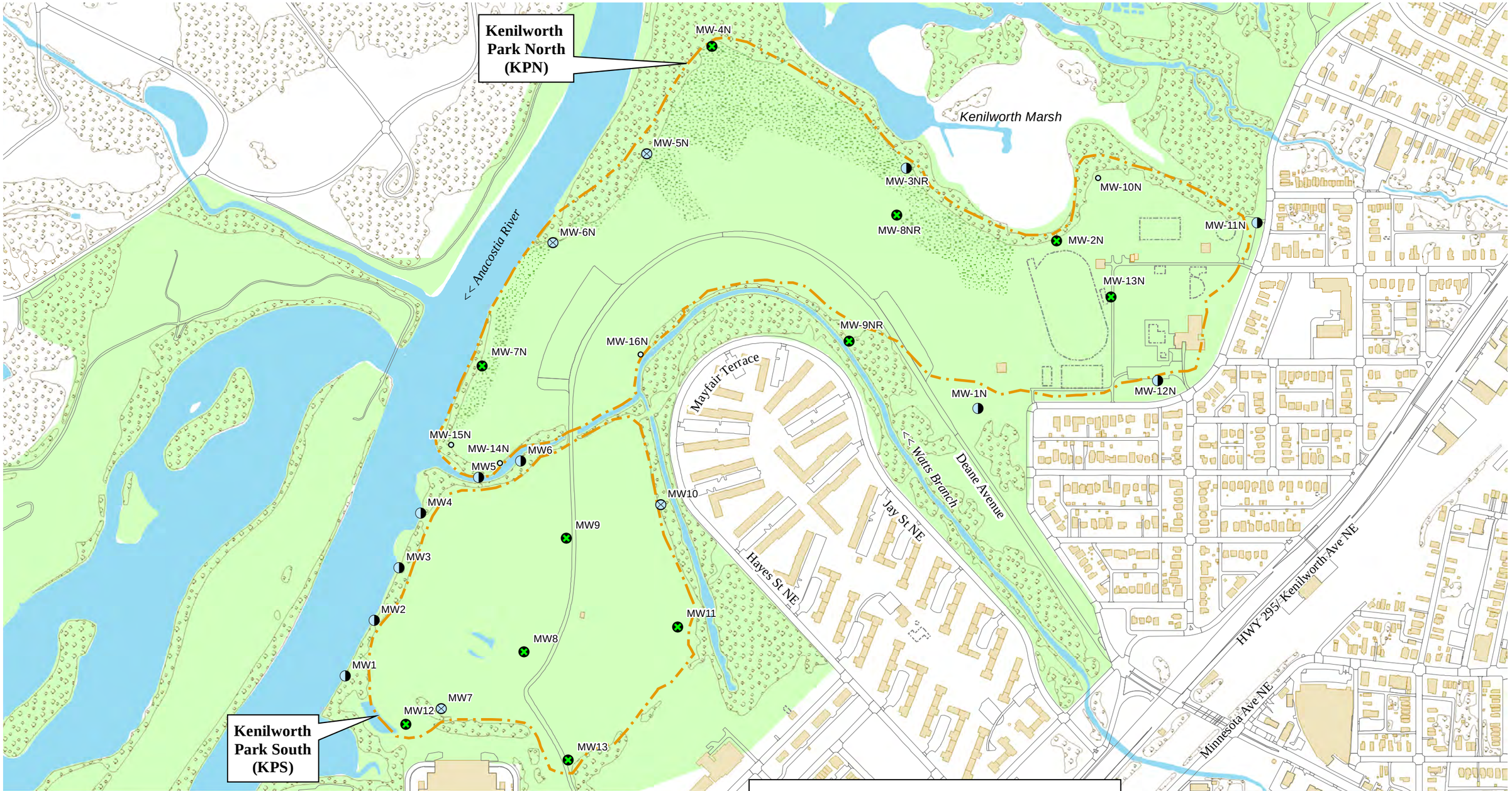
The Johnson Company

100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 01/14/13
Reviewed by: MBM Date: 11/05/13

Scale: 1 " = 500 feet Project: 3-0700-11

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 4 Kenilworth MWs 011413.mxd



Legend

- Well Not Screened in Waste
- Well May Be Screened in Waste
- Well Screened in Waste
- Well Not Found (12/07/12)
- Site
- Road
- Building
- Recreation
- Unmowed Meadow
- Woods
- Water
- Anacostia Park

N

0 250 500 1,000 1,500
Feet

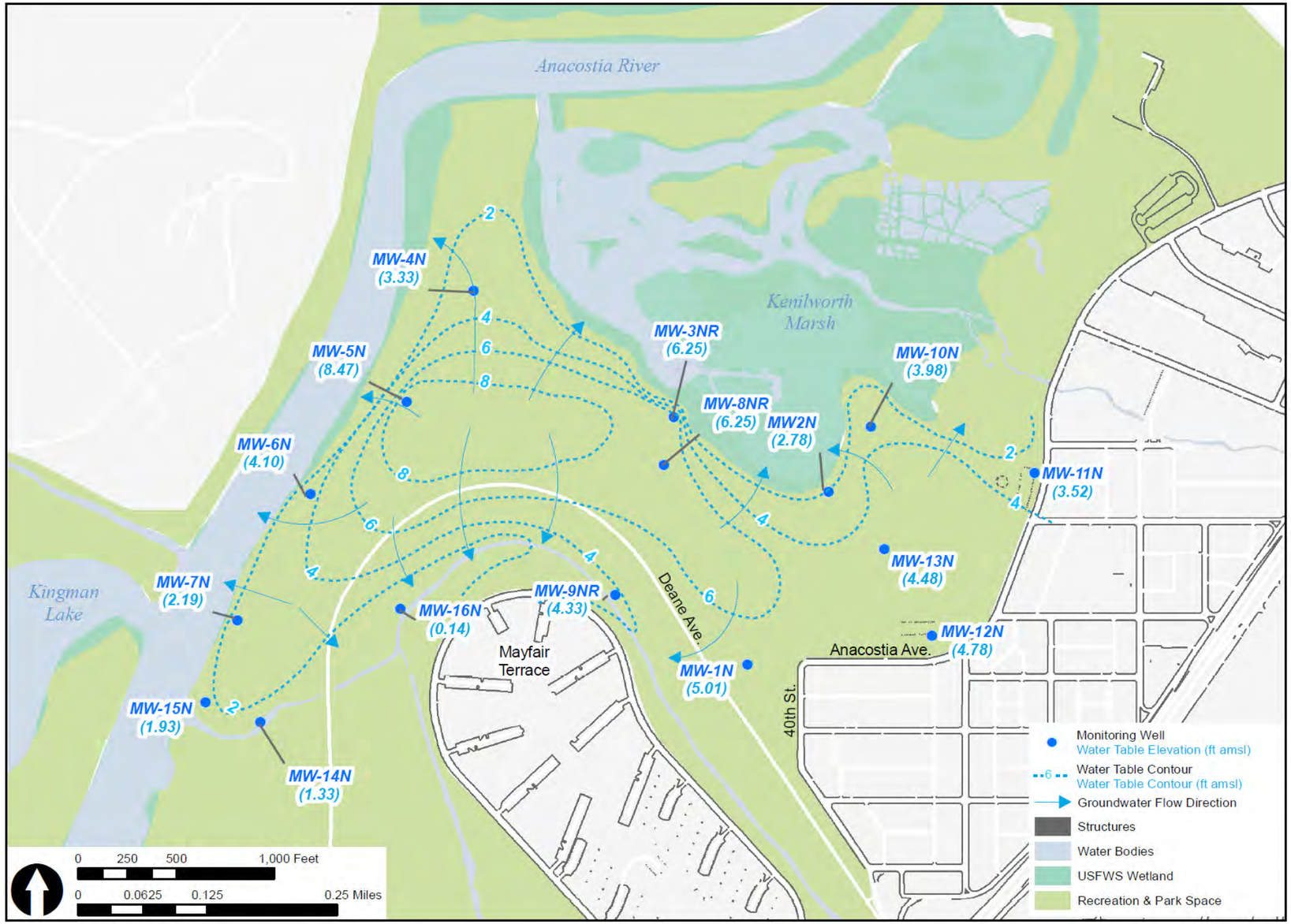
Source: Ecology & Environment, 2003 and 2007

Figure 4: Existing Groundwater Monitoring Wells
Kenilworth Park Landfill Site
Washington, District of Columbia

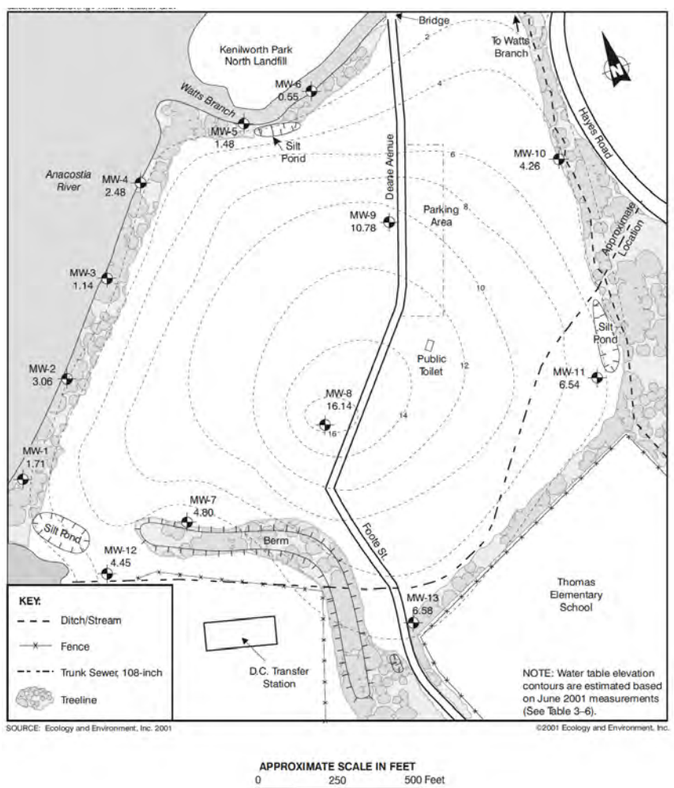
The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 01/14/13
Reviewed by: MBM Date: 11/06/13

Scale: 1 " = 500 ' Project: 3-0700-11



KPN Water Table Equipotential Map (2006)
(Source: E & E, 2007)



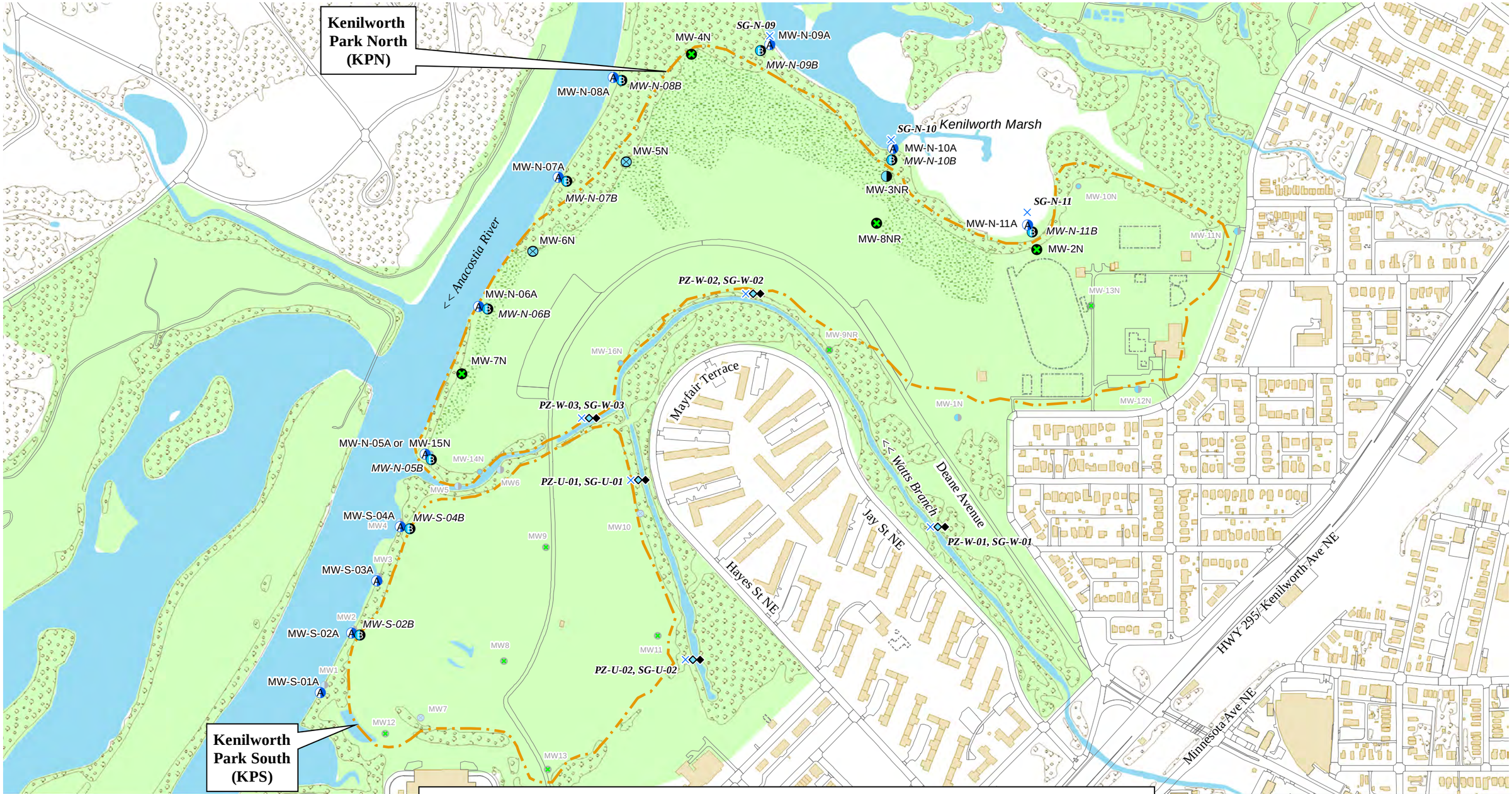
KPS Water Table Equipotential Map (2001)
(Source: E & E, 2008)

Figure 5. Previous Water Table Equipotential Maps
Kenilworth Park Landfill
Washington, DC

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 09/03/13
Reviewed by: MBM Date: 09/25/13
Scale: As Shown Project: 3-0700-11

K:\3-0700-11\GIS\OU2 Groundwater Investigation\Figure 6 Kenilworth Proposed MWs 120413.mxd



0 250 500 1,000 1,500
Feet

N

Source: Ecology & Environment, 2003 and 2007

Legend

- Site
- Proposed Shallow/Deep Piezometers, Staff Gauge
- Proposed Shallow (A) Well
- Proposed Deep (B) Well
- Staff Gauge
- Existing Well Not Screened in Waste, To be Sampled
- Existing Well May be Screened in Waste, To be Sampled
- Existing Well Screened in Waste, To be Sampled
- Existing Well Not Screened in Waste, Not Sampled
- Existing Well Not Found
- Existing Well Screened in Waste, Not Sampled
- Road
- Building
- Recreation
- Unmowed Meadow
- Woods
- Water
- Anacostia Park

Figure 6: Proposed and Existing Groundwater Monitoring Wells and Piezometers
Kenilworth Park Landfill Site
Washington, District of Columbia

The Johnson Company
100 State Street, Suite 600
Montpelier, VT 05602

Drawn by: RTK Date: 12/04/13
Reviewed by: MBM Date: 12/04/13

Scale: 1 " = 500 ' Project: 3-0700-11

TABLES

Table 1. Existing Monitoring Well Details
Kenilworth Park Site, Washington, DC

Well Name	Installed Depth (ft bgs)	Stick-up at Installation (ft)	Screen Interval-Top to Bottom (ft amsl)	December 6-7, 2012 Measured Total Depth (ft bgs)	Installation Method	Finish Type	Top of Casing Elevation (ft amsl)	December 6-7, 2012 Groundwater Elevation (ft amsl)
KPS								
MW-1	6	1	3.3 to -1.7	3.57	Hand auger	Stainless steel stickup	5.31	1.85
MW-2	5.75	1.25	3.9 to -1.1	5.2	Hand auger	Stainless steel stickup	5.86	2.8
MW-3	6	1	3.0 to -2.0	6.9	Hand auger	Stainless steel stickup	5.04	0.86
MW-4	6	1	3.5 to -1.5	3.22	Hand auger	Stainless steel stickup	5.48	3.33
MW-5	5.5	1.5	4.3 to -0.7	6.24	Hand auger	Stainless steel stickup	6.28	0.96
MW-6	5.6	1.4	3.4 to -1.7	5.9	Hand auger	Stainless steel stickup	5.35	0.05
MW-7	29	2.46	5.8 to -4.2	25.26	4.25" HSA	Protective casing with 3 bollards	27.3	4.89
MW-8	25	2.45	13.1 to 3.1	24.55	4.25" HSA	Protective casing	30.54	16.56
MW-9	22	2.35	14.1 to 4.1	19.13	4.25" HSA	Protective casing	28.48	12.79
MW-10	15	2.56	6.8 to -3.2	15.02	4.25" HSA	Protective casing	14.36	5.77
MW-11	15	2.42	9.6 to -0.4	15.22	4.25" HSA	Protective casing	17.04	7.98
MW-12	20.2	3	8.8 to -1.3	20	6.25" HSA	Protective casing	21.75	4.58
MW-13	20.2	0	9.8 to -0.2	20.25	6.25" HSA	Flush mounted, road box	19.78	7.37
KPN								
MW-1N	18	-0.2	6.3 to -3.7	17.88	7.5" HSA	Flush mounted, road box	14.11	4.26
MW-2N	25	-0.2	0.5 to -9.5	25.5	7.5" HSA	Flush mounted, road box, with 1 bollard	15.28	2.46
MW-3NR	29.4	1.75	1.9 to -8.1	29.19	7.5" HSA	Protective casing	23.05	5.05
MW-4N	15	2.88	5.8 to -4.2	14.9	7.5" HSA	Protective casing, in brambles	13.67	2.62
MW-5N	10	3.19	9.6 to 4.6	9.89	7.5" HSA	Protective casing	17.81	7.67
MW-6N	20	3.18	3.2 to -6.8	19.92	7.5" HSA	Protective casing	16.35	3.27

Table 1. Existing Monitoring Well Details
Kenilworth Park Site, Washington, DC

Well Name	Installed Depth (ft bgs)	Stick-up at Installation (ft)	Screen Interval-Top to Bottom (ft amsl)	December 6-7, 2012 Measured Total Depth (ft bgs)	Installation Method	Finish Type	Top of Casing Elevation (ft amsl)	December 6-7, 2012 Groundwater Elevation (ft amsl)
MW-7N	15	2.67	5.0 to -5	14.78	7.5" HSA	Protective casing	12.69	1.72
MW-8NR	40	0	2.9 to -7.1	39.91	4.25" HSA	Flush mounted, road box	32.91	4.56
MW-9NR	14	1	6.5 to -3.5	14.05	4.25" HSA	Protective casing	11.53	4.31
MW-10N	25	0	-0.4 to -10.4	NM	4.25" HSA	Flush mounted, could not find	14.58	NM
MW-11N	20	0	4.7 to -5.3	14.5	4.25" HSA	Flush mounted, road box	14.72	3.17
MW-12N	20	0	7.7 to -2.3	20.02	4.25" HSA	Flush mounted, road box	17.68	4.61
MW-13N	33	0	1.5 to -8.5	33.14	4.25" HSA	Flush mounted, road box	24.48	4.46
MW-14N	10	0	3.5 to -6.5	NM	4.25" HSA	Flush mounted, could not find	3.48	NM
MW-15N	10	0	4.6 to -5.4	NM	4.25" HSA	Flush mounted, could not find	4.63	NM
MW-16N	15	0	2.7 to -7.3	NM	4.25" HSA	Flush mounted, could not find	7.74	NM

Notes:

Elevations of KPS wells provided in Table 3-6 of KPS RI Report, E & E, 2008

Elevations of KPN wells provided in Table 3-7 of KPN RI Report, E & E, 2008

ft bgs = Feet below ground surface

ft amsl = Feet above mean sea level

NM = Not measured because well was not found

Table 2. Historical Groundwater Data - Metals (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Lowest Screening Level[1]	KPS																							
		MW1								MW2								MW3							
		Total		Total		*Dissolved*		Total		Total		Total		*Dissolved*		Total		Total		Total		*Dissolved*		Total	
Analyte (µg/L)	(µg/L)	May, 1999		3/14/00		3/14/00		6/18/01		May, 1999		3/14/00		3/14/00		6/18/01		May, 1999		3/14/00		3/14/00		6/18/01	
Aluminum	87		**21,000**	---	---	---	---		**969**		**1,200**	---	---	---	---		**859**		**2,300**	---	---	---	---	J	**187**
Antimony	6	<	5	---	---	---	---		**13.1**	<	5	---	---	---	---		**14**	<	5	---	---	---	---	J	5.55
Arsenic	10		**11**	<	10	<	10	J	9.63	<	5	<	10	<	10	<	25		**15**	<	10	<	10		**25.8**
Barium	4		**450**		**230**		**183**		**459**		**1,200**		**1,140**		**1,040**		**2,130**		**230**		**193**		**161**		**349**
Beryllium	0.66	---	---	---	---	---	---	<	5	---	---	---	---	---	---	<	5	---	---	---	---	---	---	<	5
Cadmium	0.25	<	5	<	5	<	5	<	5		**5.1**		**5.49**	<	5	<	5	<	5	<	5	<	5	<	5
Calcium	None		100,000	---	---	---	---		81,700		91,000	---	---	---	---		68,300		61,000	---	---	---	---		64,500
Chromium (total)	11		**59**		**28.5**	<	10		**11.9**	<	5	<	10	<	10	J	4.28		**15**	<	10	<	10	<	10
Cobalt	23	<	5	---	---	---	---	J	4.69	<	5	---	---	---	---	<	20	<	5	---	---	---	---	J	5.68
Copper	1,000		34	---	---	---	---	J	10.4	<	5	---	---	---	---	J	14.5	<	5	---	---	---	---	J	5.36
Iron	1,000		**78,000**	---	---	---	---		**45,900**		**39,000**	---	---	---	---		**49,800**		**24,000**	---	---	---	---		**16,400**
Lead	3		**37**		**7.91**	<	5	<	5		**14**		**15.6**	<	5		**6.46**		**13**	<	5	<	5	<	5
Magnesium	None		61,000	---	---	---	---		56,300		89,000	---	---	---	---		50,000		340,000	---	---	---	---		41,400
Manganese	120		**4,500**	---	---	---	---		**3,180**		**600**	---	---	---	---		**258**		**1,600**	---	---	---	---		**1,290**
Mercury	0.77	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2
Nickel	52		41	---	---	---	---	<	20	<	5	---	---	---	---	<	20	<	5	---	---	---	---		**57.5**
Potassium	None	<	500	---	---	---	---		66,100	<	5	---	---	---	---		64,900		95	---	---	---	---		87,600
Selenium	5	<	5	<	10	<	10	J	**8.05**	<	5	<	10	<	10	J	**13.3**	<	5	<	10	<	10	J	**9.04**
Silver	2	<	5	<	10	<	10	<	10	<	5	<	10	<	10	<	10	<	5	<	10	<	10	<	10
Sodium	None	<	1,500	---	---	---	---		162,000	<	1,500	---	---	---	---		140,000		260,000	---	---	---	---		246,000
Thallium	2		**5.2**	---	---	---	---	<	20	<	5	---	---	---	---	<	20		**6.3**	---	---	---	---	<	20
Vanadium	20		**56**	---	---	---	---	J	3.05	<	5	---	---	---	---	J	3.07	<	5	---	---	---	---	<	20
Zinc	120		**160**	---	---	---	---		14.4		61	---	---	---	---		45		42	---	---	---	---	J	9.29

Notes:

[1] Concentration shown is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and Surface Water Ecological Screening Levels

If parent and duplicate results were reported, the highest result is shown

< = Not detected above laboratory reporting limit shown --- = Not sampled or not reported

Table 2. Historical Groundwater Data - Metals (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Lowest Screening Level[1]	KPS																							
		MW4								MW5								MW6							
		Total		Total		*Dissolved*		Total		Total		Total		*Dissolved*		Total		Total		Total		*Dissolved*		Total	
Analyte (µg/L)	(µg/L)	May, 1999		3/14/00		3/14/00		6/19/01		May, 1999		3/13/00		3/13/00		6/19/01		May, 1999		3/13/00		3/13/00		6/21/01	
Aluminum	87		**4,800**	---	---	---	---		**404**		**31,000**	---	---	---	---	J	**144**		**2,100**	---	---	---	---		**587**
Antimony	6	<	5	---	---	---	---	J	2.63		**13**	---	---	---	---	J	2.67	<	5	---	---	---	---	<	10
Arsenic	10	<	5	<	10	<	10	J	**15.3**		**14**	<	10	<	10	<	25	<	5	<	10	<	10	<	25
Barium	4		**300**		**309**		**301**		**345**		**430**		**200**		**184**		**191**		**240**		**243**		**151**		**245**
Beryllium	0.66	---	---	---	---	---	---	<	5	---	---	---	---	---	---	<	5	---	---	---	---	---	---	<	5
Cadmium	0.25	<	5	<	5	<	5	<	5	<	5	<	5		**5**	<	5	<	5	<	5	<	5	<	5
Calcium	None		48,000	---	---	---	---		41,300		54,000	---	---	---	---		68,000		66,000	---	---	---	---		54,100
Chromium (total)	11		**12**	<	10	<	10	<	10		**200**		10.6	<	10	<	10	<	5		**1,550**	<	10		10
Cobalt	23	<	5	---	---	---	---	<	20	<	5	---	---	---	---	<	20	<	5	---	---	---	---	J	4.97
Copper	1,000	<	5	---	---	---	---		20.4		200	---	---	---	---	J	9.33		22	---	---	---	---		58.1
Iron	1,000		**7,300**	---	---	---	---		**1,390**		**64,000**	---	---	---	---		**5,930**		**10,000**	---	---	---	---		**6,840**
Lead	3		**13**	<	5		**8.35**	J	**3.77**		**340**		**35.6**		**94.5**	J	**3.49**		**26**		**17.1**	<	5	<	5
Magnesium	None		40,000	---	---	---	---		41,400		20,000	---	---	---	---		31,200		22,000	---	---	---	---		20,800
Manganese	120		**850**	---	---	---	---		**252**		**1,100**	---	---	---	---		**1,070**		**2,300**	---	---	---	---		**1,780**
Mercury	0.77	<	0.2	<	0.2	<	0.2	<	0.2		0.21	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2
Nickel	52	<	5	---	---	---	---		24.5		**57**	---	---	---	---	<	20	<	5	---	---	---	---		**121**
Potassium	None		140	---	---	---	---		153,000		27	---	---	---	---		66,800		29	---	---	---	---		43,000
Selenium	5	<	5	<	10	<	10	J	**8.23**	<	5	<	10	<	10	J	**8.31**	<	5	<	10	<	10	<	20
Silver	2	<	5	<	10	<	10	<	10	<	5	<	10	<	10	<	10	<	5	<	10	<	10	<	10
Sodium	None		460,000	---	---	---	---		564,000		100,000	---	---	---	---		376,000		430,000	---	---	---	---		314,000
Thallium	2		**9.6**	---	---	---	---	<	20	<	5	---	---	---	---	<	20		**9.7**	---	---	---	---	<	20
Vanadium	20	<	5	---	---	---	---	J	8.6		**110**	---	---	---	---	J	6.04	<	5	---	---	---	---	J	8.27
Zinc	120		35	---	---	---	---		18.1		**710**	---	---	---	---		19.4		59	---	---	---	---		74.8

Notes:

[1] Concentration shown is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and Surface Water Ecological Screening Levels

If parent and duplicate results were reported, the highest result is shown

< = Not detected above laboratory reporting limit shown --- = Not sampled or not reported

Table 2. Historical Groundwater Data - Metals (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Lowest Screening Level[1]	KPS																					
		MW7				MW8				MW9				MW10				MW11				MW12		MW13	
		Total		Total		Total		Total		Total		Total		Total		Total		Total		Total		Total		Total	
Analyte (µg/L)	(µg/L)	May, 1999		6/22/01		May, 1999		6/22/01		May, 1999		6/22/01		May, 1999		6/21/01		May, 1999		6/21/01		6/27/01		6/29/01	
Aluminum	87		**82,000**		**1,250**	<	5	<	200		**6,100**	<	200		**7,900**	<	200		**2,200**	<	200	<	200	<	200
Antimony	6		**53**	<	10	<	5	<	10	<	5	J	**6.33**	<	5		**13**	<	5	J	**8.26**	J	4.55	J	3.41
Arsenic	10		**60**	<	25	<	5	J	9.89	<	5	<	25	<	5	<	25	<	5	J	**13.7**	<	25	<	25
Barium	4		**2,500**		**782**	<	20		**1,240**		**1,100**		**1,290**		**370**		**1,310**		**4,000**		**6,880**		**289**		**847**
Beryllium	0.66	---	---	<	5	---	---	<	5	---	---	<	5	---	---	<	5	---	---	<	5	<	5	<	5
Cadmium	0.25		**21**	<	5	<	5	<	5		**5.3**	<	5	<	5	<	5	<	5	<	5	<	5	<	5
Calcium	None		65,000		19,700		29,000		37,000		78,000		102,000		87,000		117,000		120,000		123,000		114,000		124,000
Chromium (total)	11		**280**	J	3.79	<	5	<	10	<	5	<	10		**24**	<	10	<	5	<	10	<	10	J	9.91
Cobalt	23		**32**	<	20	<	5	<	20	<	5	<	20	<	5	<	20	<	5	<	20	<	20	<	20
Copper	1,000		**1,800**	J	9.31	<	5	<	20		150	<	20	<	5		20.4	<	5	<	20	J	6.07	J	5.79
Iron	1,000		**220,000**		**3,780**		**39,000**		**7,220**		**26,000**		**23,500**		**60,000**		**38,000**		**23,000**		**27,400**		**9,600**		**92,800**
Lead	3		**2,800**		**24.3**	<	5	<	5		**620**	<	5		**44**		**53.4**		**98**	J	**3.62**	<	5	<	5
Magnesium	None		31,000		19,500		5,500		66,400		72,000		29,100		26,000		34,600		31,000		35,500		29,600		17,900
Manganese	120		**2,300**		52		**1,900**		39.3		**250**		**140**		**920**		**310**		89		74.6		**364**		**722**
Mercury	0.77		0.6	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2
Nickel	52		**280**	<	20	<	5	<	20	<	5	<	20	<	5	J	13.8	<	5	<	20	<	20	<	20
Potassium	None		65,000		61,200	<	5		104,000		150,000		49,700		11,000		17,300		11,000		16,800		25,200		8,820
Selenium	5		**50**	J	**7.72**	<	5	J	**9.64**	<	5	J	**9.25**		**20**	J	**12.1**	<	5	J	**8.22**	J	**14.2**	J	**9.34**
Silver	2		**150**	<	10	<	5	<	10	<	5	<	10	<	5	<	10	<	5	<	10	<	10	<	10
Sodium	None		190,000		176,000	<	5		441,000		920,000		187,000		30,000		50,600		32,000		44,000		67,000		11,600
Thallium	2	<	5	<	20	<	5	<	20	<	5	<	20	<	5	<	20	<	5	<	20	<	20	<	20
Vanadium	20		**300**	J	3.08	<	5	<	20	<	5	<	20		**57**	<	20	<	5	<	20	<	20	J	4.54
Zinc	120		**5,700**		70.7		20	J	8.15		**650**	J	5.26		69		16.7		91		13.6		24		73.7

Notes:

[1] Concentration shown is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and Surface Water Ecological Screening Levels

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< = Not detected above laboratory reporting limit shown --- = Not sampled or not reported

Table 2. Historical Groundwater Data - Metals (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Lowest Screening Level[1]	Kenilworth Marsh				KPN																	
		TMW12				MW-1N				MW2N				MW-3NR		MW-4N		MW-5N				MW-6N	
		Total		*Dissolved*		Total		Total		Total		Total		Total		Total		Total				Total		Total	
Analyte (µg/L)	(µg/L)	3/13/00		3/13/00		6/25/01		3/6/06		6/25/01		3/6/06		3/10/06		6/25/01		3/7/06		6/29/01		3/6/06		6/26/01		3/7/06	
Aluminum	87	---	---	---	---	<	200		5,000		665		4,400		52,500		6,230		2,200		3,470		980		62.4		1,600
Antimony	6	---	---	---	---	<	20	<	20	<	20	<	20	<	20		2.71	<	20		4.26	<	20	<	20	<	20
Arsenic	10	<	10	<	10	---	---	<	10	---	---	<	10		22	---	---	<	10	---	---		28	---	---	<	10
Barium	4		144		122		52.7		37		216		1,500		830		611		370		229		140		158		250
Beryllium	0.66	---	---	---	---	---	---	<	2	---	---	<	2		5.8	---	---	<	2	---	---	<	2	---	---	<	2
Cadmium	0.25	<	5	<	5	---	---	<	1	---	---	<	1	<	1	---	---	<	1	---	---	<	1	---	---	<	1
Calcium	None	---	---	---	---		25,800		31,500		36,100		42,100		120,000		107,000		111,000		154,000		101,000		137,000		126,000
Chromium (total)	11		18.7	<	10	<	10		11		12		15		91		15.2		5.8		16.1		5		3.71		6.3
Cobalt	23	---	---	---	---	<	20		11	<	20		4.2		70		5.1	<	4		21.4	<	4	<	4	<	4
Copper	1,000	---	---	---	---		8.09		24		7.35		14		98		40.3		17		22.9		21		13.9		11
Iron	1,000	---	---	---	---		52.7		17,900		33,700		34,600		82,400		13,200		5,900		26,500		18,200		9,410		12,300
Lead	3		20.3		8.71	<	5		18	<	5		14		110		148		71		20.3		7.3	<	5		11
Magnesium	None	---	---	---	---		4,930		7,000		26,500		22,800		60,100		36,800		27,400		60,800		14,500		52,300		48,200
Manganese	120	---	---	---	---		63		130		1,940		1,300		2,400		541		390		1,600		590		1,110		990
Mercury	0.77	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2		0.125	<	0.2	<	0.2	<	0.2
Nickel	52	---	---	---	---		5.4	<	10	<	10		11		100		10.2	<	10		37.8	<	10	<	10	<	10
Potassium	None	---	---	---	---		2,760		2.5		68,900		64,700		84,200		12,100		7,300		13,900		4,400		75,200		78,200
Selenium	5	<	10	<	10	<	15	<	15	<	15	<	15	<	15		8.54	<	15		17.2	<	15		11.7	<	15
Silver	2	<	10	<	10	---	---	<	3	---	---	<	3	<	3	---	---	<	3	---	---	<	3	---	---	<	3
Sodium	None	---	---	---	---		10,000		12,000		376,000		390,000		234,000		36,200		24,800		39,000		5,000		331,000		291,000
Thallium	2	---	---	---	---	---	---	<	20	---	---	<	20	<	20	---	---	<	20	---	---	<	20	---	---	<	20
Vanadium	20	---	---	---	---	<	20		23		12.2		23		130		14.8		5.2		11.2		5.7		22.1		69
Zinc	120	---	---	---	---		43.1		30		21.9		40		330		244		130		84.5		23		42.1		32

Notes:

[1] Concentration shown is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and Surface Water Ecological Screening Levels

If parent and duplicate results were reported, the highest result is shown

< = Not detected above laboratory reporting limit shown --- = Not sampled or not reported

Table 2. Historical Groundwater Data - Metals (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Lowest Screening Level[1]	KPN																											
		MW-7N				MW-8NR				MW-9N				MW-10N		MW-11N		MW-12N		MW-13N		MW-14N		MW-15N		MW-16N	
		Total		Total		Total		*Dissolved*		Total		Total		Total		Total		Total		Total		Total		Total		Total	
Analyte (µg/L)	(µg/L)	6/29/01		3/7/06		3/10/06		3/10/06		6/25/01		3/13/06		3/13/06		3/13/06		3/14/06		3/14/06		3/10/06		3/10/06		3/10/06	
Aluminum	87		150		1,700		29,200		6,200	<	200		15,200		74,300		11,200		39,300		25,600		7,600		2,400		36,700
Antimony	6		2.55	<	20	<	20	<	20		4.26	<	20	<	20	<	20	<	20	<	20	<	20	<	20	<	20
Arsenic	10	---	---	<	10		51		40	---	---		11		43		22		64		160		11	<	10		23
Barium	4		55		120		1,900		800		271		290		1,400		420		1,000		1,800		2,200		520		390
Beryllium	0.66	---	---	<	2		2.8	<	2	---	---		3.2		6.2	<	2		6.7		2.9	<	2	<	2		3.2
Cadmium	0.25	---	---	<	1		5.3		2.5	---	---		2.5		7.4	<	1	<	1		2	<	1	<	1	<	1
Calcium	None		181,000		208,000		25,000		9,900		127,000		171,000		60,000		96,900		163,000		59,000		44,500		25,300		40,900
Chromium (total)	11		3.6		7.2		200		92		4.12		73		210	J	28		130		160		30		5		100
Cobalt	23	<	20	<	4		28		11	<	20		27		73		110		140		24		23	<	4		37
Copper	1,000		5.31		27		180		48		6.05		56		620	J	36		190		120		31		12		53
Iron	1,000		9,730		21,100		47,400		15,400		23,200		70,300		233,000		100,000		405,000		57,000		49,100		2,200		116,000
Lead	3	<	5		65		1,300		800	<	5		140		1,400	J	19		260		260		22		30		41
Magnesium	None		89,600		75,600		4,800		1,600		21,900		26,400		48,700		25,100		62,700		49,700		23,100		38,000		16,200
Manganese	120		1,080		1,300		830		360		996		1,700		4,900		2,000		2,200		460		1,100		83		4,600
Mercury	0.77	<	0.2	<	0.2		0.32	<	0.2	<	0.2	<	0.2		0.69	<	0.2		0.34	<	0.2	<	0.2	<	0.2	<	0.2
Nickel	52	<	10	<	10		70		33	<	10		85		130		25		78		38		13	<	10		57
Potassium	None		67,500		50,400		292,000		262,000		8,570		8,000		76,700		32,800		65,500		174,000		14,700		38,700		43,600
Selenium	5		21.9	<	15	<	15	<	15		12.5	<	15	<	15	<	15	<	15	<	15	<	15	<	15	<	15
Silver	2	---	---	<	3		4.5	<	3	---	---	<	3		13	<	3		4.4		3.5	<	3	<	3	<	3
Sodium	None		145,000		96,600		1,940,000		1,860,000		27,700		28,000		140,000		178,000		563,000		996,000		116,000		120,000		129,000
Thallium	2	---	---	<	20	<	20	<	20	---	---	<	20	<	20	<	20	<	20	<	20	<	20	<	20	<	20
Vanadium	20		4.94		21		190		180	<	20		72		280	J	49		210		240		39	<	20		160
Zinc	120		19.8		92		1,400		660		16.6		360		2,800	J	66		470		630		80		42		250

Notes:

[1] Concentration shown is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and Surface Water Ecological Screening Levels

If parent and duplicate results were reported, the highest result is shown

< = Not detected above laboratory reporting limit shown --- = Not sampled or not reported

Table 3. Historical Groundwater Data - VOCs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS																							
		MW1		MW2		MW3		MW4		MW5		MW6		MW7		MW8		MW9		MW10		MW11		MW12	
Analyte (µg/L)	(µg/L)	May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		6/27/01	
1,1,1-Trichloroethane	11	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,1,2,2-Tetrachloroethane	610	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,1,2-Trichloroethane	5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,1-Dichloroethane	47	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,1-Dichloroethene	7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,2,4-Trichlorobenzene	70	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dibromo-3-chloropropane	0.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichlorobenzene	14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,2-Dichloroethane	5.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,2-Dichloropropane	5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,3-Dichlorobenzene	71	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
1,4-Dichlorobenzene	15	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	J	3.4
2-Butanone (MEK)	None	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	10
2-Hexanone	99	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Acetone	1,500	J	5.1	<	5	<	5	J	2	<	5	<	5	<	5	<	5	<	5	<	5	<	5	J	8.41
Benzene	5	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	5
Bromodichloromethane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Bromoform	320	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Bromomethane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Carbon disulfide	1	<	1	<	1	J	**1.3**	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	1	<	5
Carbon tetrachloride	5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Chlorobenzene	64	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	J	2.8
Chloroethane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Chloroform	28	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Chloromethane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
cis-1,2-Dichloroethene	70	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
cis-1,3-Dichloropropene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Cyclohexane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Dibromochloromethane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Dichloromethane (Methylene chloride)	5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	7.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Ethylene dibromide	0.05	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Freon-11	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Freon-113	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Freon-12	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Isopropylbenzene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Table 3. Historical Groundwater Data - VOCs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS																							
		MW1		MW2		MW3		MW4		MW5		MW6		MW7		MW8		MW9		MW10		MW11		MW12	
Analyte (µg/L)	(µg/L)	May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		6/27/01	
Methyl acetate	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl isobutyl ketone (MIBK)	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Methyl tert-butyl ether (MTBE)	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Styrene	72	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Tetrachloroethene	5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Toluene	9.8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
trans-1,2-Dichloroethene	100	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
trans-1,3-Dichloropropene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Trichloroethene	5	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5
Vinyl chloride	2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Xylenes (unspecified)	10,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	5

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

< = Less than laboratory reporting limit shown --- = Not sampled or not reported

Table 3. Historical Groundwater Data - VOCs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS		KPN																									
		MW13		MW-1N				MW-2N		MW-3N		MW-4N				MW-5N				MW-6N				MW-7N				MW-8NR	
Analyte (µg/L)	(µg/L)	6/29/01		6/25/01		3/6/06		3/6/06		3/10/06		6/25/01		3/7/06		6/29/01		3/6/06		6/26/01		37/2006		6/29/01		3/7/06		3/10/06	
1,1,1-Trichloroethane	11	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,1,2,2-Tetrachloroethane	610	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,1,2-Trichloroethane	5	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,1-Dichloroethane	47	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,1-Dichloroethene	7	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,2,4-Trichlorobenzene	70	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,2-Dibromo-3-chloropropane	0.2	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,2-Dichlorobenzene	14	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,2-Dichloroethane	5.0	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,2-Dichloropropane	5	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,3-Dichlorobenzene	71	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
1,4-Dichlorobenzene	15	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
2-Butanone (MEK)	None	<	10	---	---	<	5	<	50	J	16	---	---	<	5	---	---	<	5	---	---	<	25	---	---	<	5	<	50
2-Hexanone	99	<	10	---	---	<	5	<	50	<	20	---	---	<	5	---	---	<	5	---	---	<	25	---	---	<	5	<	50
Acetone	1,500	<	10	<	10	<	5	<	50	<	20		7.25	<	5	<	10		8.1	<	10	<	25	<	10	<	5	J	25
Benzene	5	<	5	---	---	J	0.64		**42**	<	4	---	---	<	1	---	---	J	0.61	---	---	<	5	---	---	<	1	<	10
Bromodichloromethane	None	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Bromoform	320	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Bromomethane	None	<	10	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Carbon disulfide	1	J	**4.58**	<	10		**2.5**	<	10	<	4	<	10	<	1	<	10	J	0.7	<	10	<	5		**3.1**	<	1	<	10
Carbon tetrachloride	5	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Chlorobenzene	64	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---		8.2	---	---	<	1	<	10
Chloroethane	None	<	10	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Chloroform	28	<	5	---	---		14	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Chloromethane	None	<	10	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
cis-1,2-Dichloroethene	70	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
cis-1,3-Dichloropropene	None	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Cyclohexane	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Dibromochloromethane	None	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Dichloromethane (Methylene chloride)	5	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Ethylbenzene	7.3	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Ethylene dibromide	0.05	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Freon-11	None	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Freon-113	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Freon-12	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Isopropylbenzene	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10

Table 3. Historical Groundwater Data - VOCs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS		KPN																									
		MW13		MW-1N				MW-2N		MW-3N		MW-4N				MW-5N				MW-6N				MW-7N				MW-8NR	
Analyte (µg/L)	(µg/L)	6/29/01		6/25/01		3/6/06		3/6/06		3/10/06		6/25/01		3/7/06		6/29/01		3/6/06		6/26/01		37/2006		6/29/01		3/7/06		3/10/06	
Methyl acetate	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Methyl isobutyl ketone (MIBK)	None	<	5	---	---	<	5	<	50	<	20	---	---	<	5	---	---	<	5	---	---	<	25	---	---	<	5	<	50
Methyl tert-butyl ether (MTBE)	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Methylcyclohexane	None	---	---	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Styrene	72	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Tetrachloroethene	5	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Toluene	9.8	<	5	---	---	J	0.57		**24**	<	4	---	---	<	1	---	---	J	0.64	---	---	<	5	---	---	<	1	<	10
trans-1,2-Dichloroethene	100	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
trans-1,3-Dichloropropene	None	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Trichloroethene	5	<	5	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Vinyl chloride	2	<	10	---	---	<	1	<	10	<	4	---	---	<	1	---	---	<	1	---	---	<	5	---	---	<	1	<	10
Xylenes (unspecified)	10,000	<	5	---	---	<	3	J	14	<	12	---	---	<	3	---	---	<	3	---	---	<	15	---	---	<	3	<	30

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

< = Less than laboratory reporting limit shown --- = Not sampled or not reported

Table 3. Historical Groundwater Data - VOCs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPN																			
		MW-9N/NR				MW-10N		MW-11N		MW-12N		MW-13N		MW-14N		MW-15N		MW-16N		MW-17N	
Analyte (µg/L)	(µg/L)	6/25/01		3/13/06		3/13/06		3/13/06		3/14/06		3/14/06		3/10/06		3/10/06		3/10/06		3/13/06	
1,1,1-Trichloroethane	11	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,1,2,2-Tetrachloroethane	610	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,1,2-Trichloroethane	5	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,1-Dichloroethane	47	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,1-Dichloroethene	7	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,2,4-Trichlorobenzene	70	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,2-Dibromo-3-chloropropane	0.2	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,2-Dichlorobenzene	14	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,2-Dichloroethane	5.0	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,2-Dichloropropane	5	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,3-Dichlorobenzene	71	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
1,4-Dichlorobenzene	15	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
2-Butanone (MEK)	None	---	---	<	10	<	10	<	10	<	50	<	25	J	13	<	5	<	20	<	10
2-Hexanone	99	---	---	<	10	<	10	<	10	<	50	<	25	<	20	<	5	<	20	<	10
Acetone	1,500	<	10	<	10		11	<	10	<	50	<	25		22	J	3.1	<	20	<	10
Benzene	5	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Bromodichloromethane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Bromoform	320	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Bromomethane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Carbon disulfide	1	<	10	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Carbon tetrachloride	5	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Chlorobenzene	64	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Chloroethane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Chloroform	28	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Chloromethane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
cis-1,2-Dichloroethene	70	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
cis-1,3-Dichloropropene	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Cyclohexane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Dibromochloromethane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Dichloromethane (Methylene chloride)	5	---	---	<	2	<	2	<	2	J	**9.6**	J	3.4	<	4	<	1	<	4	<	2
Ethylbenzene	7.3	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Ethylene dibromide	0.05	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Freon-11	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Freon-113	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Freon-12	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Isopropylbenzene	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2

Table 3. Historical Groundwater Data - VOCs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPN																			
		MW-9N/NR				MW-10N		MW-11N		MW-12N		MW-13N		MW-14N		MW-15N		MW-16N		MW-17N	
Analyte (µg/L)	(µg/L)	6/25/01		3/13/06		3/13/06		3/13/06		3/14/06		3/14/06		3/10/06		3/10/06		3/10/06		3/13/06	
Methyl acetate	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Methyl isobutyl ketone (MIBK)	None	---	---	<	10	<	10	<	10	<	50	<	25	<	20	<	5	<	20	<	10
Methyl tert-butyl ether (MTBE)	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Methylcyclohexane	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Styrene	72	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Tetrachloroethene	5	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Toluene	9.8	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
trans-1,2-Dichloroethene	100	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
trans-1,3-Dichloropropene	None	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Trichloroethene	5	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Vinyl chloride	2	---	---	<	2	<	2	<	2	<	10	<	5	<	4	<	1	<	4	<	2
Xylenes (unspecified)	10,000	---	---	<	6	<	6	<	6	<	30	<	15	<	12	<	3	<	12	<	6

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

< = Less than laboratory reporting limit shown --- = Not sampled or not reported

Table 4. Historical Groundwater Data - Pesticides and PCBs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS																					
		MW1		MW2		MW3		MW4		MW5		MW6		MW7		MW8		MW9		MW10		MW11	
Organochlorine Pesticides (µg/L)	(µg/L)	May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999	
4,4'-DDE	0.0110	<	0.05	<	0.05	<	0.05	<	0.05	J	**0.012**	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
4,4'-DDD	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4,4'-DDT	0.0010	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Alpha BHC	2.2000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
alpha-Chlordane	0.0043	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
gamma-Chlordane	0.004	<	0.05	<	0.05	J	**0.018**	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
Aldrin	0.300	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Beta BHC	2.2	<	0.05	<	0.05		0.055	J	0.045	J	0.015	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
Delta BHC	2.2	<	0.05	<	0.05	J	0.034	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
Dieldrin	0.056	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Alpha Endosulfan (Endosulfan I)	0.056	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Beta Endosulfan (Endosulfan II)	0.056	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Endosulfan Sulfate	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Endrin	0.036	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Endrin Aldehyde	0.036	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Endrin Ketone	0.036	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
gamma-BHC (Lindane)	0.095	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Heptachlor	0.004	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Heptachlor epoxide	0.004	<	0.05	<	0.05	J	**0.024**	J	**0.013**	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05	<	0.05
Methoxychlor	0.030	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toxaphene	0.0003	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Polychlorinated Biphenyls (PCBs) (µg/L)																							
Aroclor-1016	0.500	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
Aroclor-1221	0.280	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
Aroclor-1232	0.500	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
Aroclor-1242	0.053	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
Aroclor-1248	0.081	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
Aroclor-1254	0.033	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5
Aroclor-1260	0.500	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

< = Less than laboratory reporting limit shown --- = Not sampled or not reported

Table 4. Historical Groundwater Data - Pesticides and PCBs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS				KPN																			
		MW12		MW13		MW-1N				MW-2N				MW-3NR		MW-4N				MW-5N				MW-6N			
Organochlorine Pesticides (µg/L)	(µg/L)	6/27/01		6/29/01		6/25/01		3/6/06		6/25/01		3/6/06		3/10/06		6/25/01		3/7/06		6/29/01		3/6/06		6/26/01		3/7/06	
4,4'-DDE	0.0110	<	0.1	<	0.1	---	---	<	0.049	---	---	<	0.048	<	0.05	---	---	J	**0.032**	---	---	<	0.048	---	---	J	**0.03**
4,4'-DDD	None	<	0.09	<	0.09	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	J	0.032		0.098	<	0.048	<	0.049	J	0.027
4,4'-DDT	0.0010	<	0.1	<	0.1	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		**0.122**	<	0.048	<	0.049	<	0.048
Alpha BHC	2.2000	<	0.04	<	0.04	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		0.012	<	0.048	<	0.049	<	0.048
alpha-Chlordane	0.0043	<	0.06	J	0.001	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	J	**0.024**	J	**0.03**	<	0.048	<	0.049	<	0.048
gamma-Chlordane	0.004	<	0.05	<	0.05	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	J	**0.03**		**0.067**	<	0.048	<	0.049	J	**0.03**
Aldrin	0.300	<	0.07	<	0.07	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		0.014	<	0.048	<	0.049	<	0.048
Beta BHC	2.2	<	0.05	<	0.05	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		0.099	<	0.048	<	0.049	<	0.048
Delta BHC	2.2	<	0.06	<	0.06	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		0.099	<	0.048	<	0.049	<	0.048
Dieldrin	0.056	<	0.1	<	0.1	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		**0.097**	J	0.03	<	0.049	<	0.048
Alpha Endosulfan (Endosulfan I)	0.056	<	0.05	J	0.001	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048	J	0.03	<	0.048	<	0.049	<	0.048
Beta Endosulfan (Endosulfan II)	0.056	<	0.18	<	0.18	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		**0.059**	<	0.048	<	0.049	<	0.048
Endosulfan Sulfate	None	<	0.4	<	0.4	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		0.071	<	0.048	<	0.049	<	0.048
Endrin	0.036	<	0.1	<	0.1	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		**0.197**	<	0.048	<	0.049	<	0.048
Endrin Aldehyde	0.036	<	0.3	<	0.3	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		**0.122**	<	0.048	<	0.049	<	0.048
Endrin Ketone	0.036	<	0.2	<	0.2	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048	J	0.03	<	0.048	<	0.049	<	0.048
gamma-BHC (Lindane)	0.095	<	0.04	<	0.04	---	---	<	0.049	---	---	<	0.048	<	0.05	---	---	<	0.048	---	---	---	---	---	---	<	0.048
Heptachlor	0.004	<	0.1	<	0.1	<	0.049	<	0.049	<	0.049	<	0.048	<	0.05	<	0.049	<	0.048		**0.075**	<	0.048	<	0.049	<	0.048
Heptachlor epoxide	0.004	<	0.1	<	0.1	---	---	<	0.049	---	---	<	0.048	<	0.05	---	---	<	0.048	---	---	<	0.048	---	---	<	0.048
Methoxychlor	0.030	<	1	<	1	---	---	<	0.049	---	---	<	0.048	<	0.05	---	---	<	0.048	---	---	---	---	---	---	<	0.048
Toxaphene	0.0003	<	3	<	3	---	---	<	0.98	---	---	<	0.96	<	1	---	---	<	0.96	---	---	---	---	---	---	<	0.96
Polychlorinated Biphenyls (PCBs) (µg/L)																											
Aroclor-1016	0.500	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48
Aroclor-1221	0.280	<	1	<	1	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48
Aroclor-1232	0.500	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48
Aroclor-1242	0.053	J	**0.327**	<	0.5	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48
Aroclor-1248	0.081	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48
Aroclor-1254	0.033	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48
Aroclor-1260	0.500	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.5	<	0.5	---	---	<	0.48	---	---	<	0.48	---	---	<	0.48

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

< = Less than laboratory reporting limit shown --- = Not sampled or not reported

Table 4. Historical Groundwater Data - Pesticides and PCBs (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPN																							
		MW-7N				MW-8NR		MW-9N				MW-10N		MW-11N		MW-12N		MW-13N		MW-14N		MW-15N		MW-16N	
Organochlorine Pesticides (µg/L)	(µg/L)	6/29/01		3/7/06		3/10/06		6/25/01		3/13/06		3/13/06		3/13/06		3/14/06		3/14/06		3/10/06		3/10/06		3/10/06	
4,4'-DDE	0.0110	---	---	<	0.049	<	0.048	---	---	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.048	<	0.048	<	0.05
4,4'-DDD	None	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.048	<	0.048	<	0.05
4,4'-DDT	0.0010	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.048	<	0.048	<	0.05
Alpha BHC	2.2000	<	0.049	<	0.049	J	0.035	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	J	0.039	<	0.048	<	0.048	<	0.05
alpha-Chlordane	0.0043	J	**0.014**	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	J	**0.022**	<	0.048	<	0.05
gamma-Chlordane	0.004	J	**0.01**	<	0.049	J	**0.027**	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	J	**0.027**	<	0.048	<	0.05
Aldrin	0.300	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Beta BHC	2.2	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Delta BHC	2.2	<	0.049	<	0.049	J	0.035	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Dieldrin	0.056	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	J	0.032	<	0.048	<	0.05
Alpha Endosulfan (Endosulfan I)	0.056	J	0.014	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Beta Endosulfan (Endosulfan II)	0.056	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Endosulfan Sulfate	None	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Endrin	0.036	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Endrin Aldehyde	0.036	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	J	**0.04**	<	0.05	<	0.048	<	0.05
Endrin Ketone	0.036	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
gamma-BHC (Lindane)	0.095	---	---	<	0.049	<	0.048	---	---	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Heptachlor	0.004	<	0.049	<	0.049	<	0.048	<	0.049	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Heptachlor epoxide	0.004	---	---	<	0.049	<	0.048	---	---	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Methoxychlor	0.030	---	---	<	0.049	<	0.048	---	---	<	0.05	<	0.048	<	0.048	<	0.05	<	0.048	<	0.05	<	0.048	<	0.05
Toxaphene	0.0003	---	---	<	0.98	<	0.96	---	---	<	1	<	0.96	<	0.96	<	1	<	0.96	<	0.96	<	0.96	<	1
Polychlorinated Biphenyls (PCBs) (µg/L)																									
Aroclor-1016	0.500	---	---	<	0.49	<	0.48	---	---	<	0.5	<	0.48	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5
Aroclor-1221	0.280	---	---	<	0.49	<	0.48	---	---	<	0.5	<	0.48	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5
Aroclor-1232	0.500	---	---	<	0.49	<	0.48	---	---	<	0.5	<	0.48	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5
Aroclor-1242	0.053	---	---	<	0.49	<	0.48	---	---	<	0.5	<	0.48	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5
Aroclor-1248	0.081	---	---	<	0.49	<	0.48	---	---	<	0.5	J	**0.39**	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5
Aroclor-1254	0.033	---	---	<	0.49	<	0.48	---	---	<	0.5		**0.86**	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5
Aroclor-1260	0.500	---	---	<	0.49	<	0.48	---	---	<	0.5	<	0.48	<	0.48	<	0.5	<	0.48	<	0.48	<	0.48	<	0.5

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

< = Less than laboratory reporting limit shown --- = Not sampled or not reported

Table 5. Historical Groundwater Data - SVOCs and TPH (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

Analyte (µg/L)	Project Screening Level[1] (µg/L)	KPS																							
		MW1		MW2		MW3		MW4		MW5		MW6		MW7		MW8		MW9		MW10		MW11		MW12	
		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		May, 1999		6/27/01	
2-Methylnaphthalene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
2,4-Dimethylphenol	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
4-Methylphenol	None	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	J	2.8	<	0.5	<	0.5	J	6.5	<	0.5	<	10
Acenaphthene	23	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Acenaphthylene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Anthracene	0.73	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Benzo(a)anthracene	0.027	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Benzo(a)pyrene	0.014	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Benzo(b)fluoranthene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Benzo(g,h,i)perylene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Benzo(k)fluoranthene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Benozoic acid	1.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	150
bis(2-Ethylhexyl) phthalate	3.0	<	0.5	J	2.8	<	0.5		**23**	<	0.5	J	2.2	<	0.5	<	0.5	J	**7.8**	<	0.5	<	0.5	J	**6.63**
Butylbenzylphthalate	19	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Chrysene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Dibenzo(a,h)anthracene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Dibenzofuran	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Diethylphthalate	210	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Dimethylphthalate	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Di-n-butylphthalate	35	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5		**40**	<	0.5	<	0.5	<	10
Di-n-octylphthalate	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Fluoranthene	0.04	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Fluorene	3.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Indeno(1,2,3-cd)pyrene	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Naphthalene	12	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	J	6.2	<	10
Phenanthrene	0.40	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	J	**2.0**	<	10
Pyrene	0.25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<	10
Total Petroleum Hydrocarbons	None	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5		42	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	---	---

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

J = Estimated

< = Less than laboratory reporting limit shown

--- = Not sampled or not reported

Table 5. Historical Groundwater Data - SVOCs and TPH (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

	Project Screening Level[1]	KPS		KPN																									
		MW13		MW-1N				MW-2N				MW-3NR		MW-4N				MW-5N				MW-6N				MW-7N			
Analyte (µg/L)	(µg/L)	6/29/01		6/25/01		3/6/06		6/25/01		3/6/06		3/10/06		6/25/01		3/7/06		6/25/01		3/6/06		6/25/01		3/7/06		6/25/01		3/7/06	
2-Methylnaphthalene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
2,4-Dimethylphenol	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
4-Methylphenol	None	<	10	---	---	<	10	---	---	<	10	J	1	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Acenaphthene	23	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Acenaphthylene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Anthracene	0.73	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Benzo(a)anthracene	0.027	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	J	**2**
Benzo(a)pyrene	0.014	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	J	**2**
Benzo(b)fluoranthene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	J	2
Benzo(g,h,i)perylene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	J	1
Benzo(k)fluoranthene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Benozoic acid	1.0	<	150	---	---	<	140	---	---	<	140	<	150	---	---	<	150	---	---	<	140	---	---	<	140	---	---	<	140
bis(2-Ethylhexyl) phthalate	3.0	J	**9.07**		**10.8**	<	10	<	10	<	10	J	3	<	10	<	10	<	10		**13**	<	10	<	10	<	10	<	10
Butylbenzylphthalate	19	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Chrysene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	J	1
Dibenzo(a,h)anthracene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Dibenzofuran	1.1	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Diethylphthalate	210	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Dimethylphthalate	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Di-n-butylphthalate	35	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Di-n-octylphthalate	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Fluoranthene	0.04	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	J	**0.6**	---	---	J	**3**
Fluorene	3.9	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Indeno(1,2,3-cd)pyrene	None	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	J	1
Naphthalene	12	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	<	10	---	---	<	10
Phenanthrene	0.40	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10		**4.04**	<	10	<	10	<	10	<	10	J	**2**
Pyrene	0.25	<	10	---	---	<	10	---	---	<	10	<	10	---	---	<	10	---	---	<	10	---	---	J	**0.6**	---	---	J	**2**
Total Petroleum Hydrocarbons	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

If parent and duplicate results were reported, the highest result is shown

J = Estimated

< = Less than laboratory reporting limit shown

--- = Not sampled or not reported

Table 5. Historical Groundwater Data - SVOCs and TPH (Micrograms per Liter, μg/L)
Kenilworth Landfill Site, Washington, DC

Analyte (µg/L)	Project Screening Level[1] (µg/L)	KPN																					
		MW-8NR		MW-9N				MW-10N		MW-11N		MW-12N		MW-13N		MW-14N		MW-15N		MW-16N		MW-17N	
		3/10/06		6/25/01		3/13/06		3/13/06		3/13/006		3/14/06		3/14/06		3/10/06		3/10/06		3/10/06		3/13/06	
2-Methylnaphthalene	None	J	2	---	---	<	10	<	10	<	10	<	10	J	7	J	2	<	10	<	10	<	10
2,4-Dimethylphenol	None	J	5	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
4-Methylphenol	None	J	5	---	---	<	10	<	10	<	10	<	10	J	1	<	10	<	10	<	10	<	10
Acenaphthene	23	J	4	---	---	<	10	<	10	<	10	<	10	J	5	<	10	<	10	<	10	<	10
Acenaphthylene	None	<	10	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
Anthracene	0.73	<	10	---	---	<	10	<	10	<	10	<	10	J	**2**	<	10	<	10	<	10	<	10
Benzo(a)anthracene	0.027	<	10	---	---	J	**0.6**	<	10	<	10	<	10	J	**3**	<	10	<	10	<	10	<	10
Benzo(a)pyrene	0.014	<	10	---	---	<	10	<	10	<	10	<	10	J	**2**	<	10	<	10	<	10	<	10
Benzo(b)fluoranthene	None	<	10	---	---	J	0.5	<	10	<	10	<	10	J	3	<	10	<	10	<	10	<	10
Benzo(g,h,i)perylene	None	<	10	---	---	<	10	<	10	<	10	<	10	J	1	<	10	<	10	<	10	<	10
Benzo(k)fluoranthene	None	<	10	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
Benozoic acid	1.0	J	**140**	---	---	<	140	<	140	<	140	<	140		**140**	<	150	<	150	<	150	<	140
bis(2-Ethylhexyl) phthalate	3.0	<	10	<	10	<	10	J	**4**	<	10	<	10	<	10	<	10	<	10	J	3	<	10
Butylbenzylphthalate	19	<	10	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
Chrysene	None	<	10	---	---	<	10	<	10	<	10	<	10	J	3	<	10	<	10	<	10	<	10
Dibenzo(a,h)anthracene	None	<	10	---	---	<	10	<	10	<	10	<	10	J	0.5	<	10	<	10	<	10	<	10
Dibenzofuran	1.1	J	0.9	---	---	<	10	<	10	<	10	<	10	J	**2**	<	10	<	10	<	10	<	10
Diethylphthalate	210	<	10	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
Dimethylphthalate	None	<	10	---	---	<	10	<	10	<	10	<	10	<	10		11	<	10	<	10	<	10
Di-n-butylphthalate	35	<	10	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
Di-n-octylphthalate	None	<	10	---	---	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10	<	10
Fluoranthene	0.04	J	**0.8**	---	---	J	**0.8**	<	10	<	10	<	10	J	**6**	<	10	<	10	<	10	<	10
Fluorene	3.9	J	2	---	---	<	10	<	10	<	10	<	10	J	**4**	<	10	<	10	<	10	<	10
Indeno(1,2,3-cd)pyrene	None	<	10	---	---	<	10	<	10	<	10	<	10	J	1	<	10	<	10	<	10	<	10
Naphthalene	12		**16**	---	---	<	10	<	10	<	10	<	10		**38**	J	0.6	<	10	<	10	<	10
Phenanthrene	0.40	J	**2**	<	10	J	**0.5**	<	10	<	10	<	10	J	**9**	<	10	<	10	<	10	<	10
Pyrene	0.25	J	**0.7**	---	---	J	**0.9**	<	10	<	10	<	10	J	**5**	<	10	<	10	<	10	<	10
Total Petroleum Hydrocarbons	None	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:

[1] Project screening level is the lowest of the EPA Maximum Contaminant Levels (MCLs), DDOE Class G1 Groundwater Standards, and NPS Surface Water Ecological Screening Values

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Table 6. Data Quality Objectives Summary Table				
Problem Statement	**Principal Study Questions / Decision Questions**	**Information Inputs**	**Study Boundaries**	**Analytic Approach/Decision Rules**
Why is this investigation being performed?	*What questions does the investigation need to answer?*	*What data do we need to answer the decision question?*	*Specific details regarding sample composition.*	*How will the data answer the question or what additional data will be collected?*
An improved and more densely spaced groundwater monitoring network installed at the groundwater/surface water discharge boundary of the Site and Anacostia River is considered necessary to collect sufficient quality and quantity of groundwater samples and confirm conclusions from previous investigations that there are no risks to human and ecological receptors from Site groundwater discharging to the Anacostia River.	Is there evidence to indicate that dissolved contaminants of concern in groundwater are migrating from the Site into the Anacostia River or Kenilworth Marsh at the groundwater/surface water discharge boundary at concentrations exceeding human health or ecological screening levels? If contaminants above screening levels are detected in groundwater at the groundwater/surface water discharge boundary, can the contaminant transport pathway be defined sufficiently to indicate the general area of concern on the Site causing the contaminant discharge, such as a source area?	Recent high quality groundwater contaminant concentration data (i.e., only dissolved transport) from existing and additional monitoring wells at the groundwater/surface water discharge boundary between KPS and the Anacostia River, and KPN and Kenilworth Marsh and the Anacostia River. Water level measurements from existing and new monitoring wells, piezometers, and surface water adjacent to the Site to develop a water table potentiometric surface map that illustrates groundwater gradient directions at the Site to further characterize groundwater/surface water discharge boundaries at the Anacostia River and at Kenilworth Marsh, Watts Branch, and an unnamed southern tributary to Watts Branch, all of which flow into the Anacostia River. Continuous groundwater water-level measurements in monitoring wells along Site/Anacostia River boundaries to establish if tidal fluctuations impact groundwater levels near groundwater discharge boundaries along the Anacostia River and Kenilworth Marsh. Additional shallow geologic and permeability data at the discharge boundaries to be used along with potentiometric maps and dissolved concentration data to assess migration pathways and rates.	The spatial boundaries identified for this study are the groundwater/surface water discharge boundaries downgradient of the Site, which include where the Site borders the Anacostia River, Kenilworth Marsh, Watts Branch, and the unnamed southern tributary to Watts Branch. Spatial boundaries also include definition of dissolved contaminant chemistry from groundwater samples collected below the water table from relatively deeper wells coupled with shallow water table wells to determine if contaminants exist at greater depths at the groundwater/surface water discharge boundary, and if there is any concentration variability from vertical transport. To provide an accurate potentiometric surface map of the water table gradient direction relative to tidal influence of the Anacostia River, temporal boundaries include a minimum of two water level measurements collected at all monitoring locations near high and low tide. If significant tidal effects are observed in groundwater monitoring wells, groundwater samples from these wells will be collected near low tide to characterize groundwater for contaminants when it is most likely flowing toward the Anacostia River.	Contaminant concentrations and groundwater flow directions will be interpreted to a degree of certainty acceptable to NPS to assess whether Site groundwater contamination is discharging to the Anacostia River at concentrations likely to contribute to unacceptable human health or ecological risks. Results may show that additional wells and/or piezometers may be required in an additional investigation stage. Piezometers installed during the supplemental study may be sampled in an additional stage. If contaminants are present in groundwater at the downgradient Site discharge boundaries along the Anacostia River, piezometers may be installed below the Anacostia River bed to determine groundwater chemistry before discharging into the river. If there is evidence of significant contaminant transport in groundwater to the Anacostia River and/or Kenilworth Marsh, collection of surface water samples in the approximate area of transport and discharge will be considered for an additional stage. Water-level elevations will be plotted on a Site map to create water table maps and horizontal groundwater gradient directions from the landfill to surface water bodies, and can be used to delineate horizontal contaminant transport pathways. Vertical gradient directions and magnitude will be determined from monitoring well and piezometer pairs to determine gaining and losing reaches of the Watts Branch. Gradient data along with groundwater concentrations, geology from boring logs, and permeability data will be used to identify potential subsurface contaminant transport pathways, groundwater flow rates, possible contaminant source areas, and response action alternatives.

APPENDIX A

SUPPLEMENTAL GROUNDWATER STUDY FIELD SAMPLING PLAN (FSP)

Available in the Administrative Record

APPENDIX B

SUPPLEMENTAL GROUNDWATER STUDY QUALITY ASSURANCE PROJECT PLAN (QAPP)

Available in the Administrative Record