DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
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October 31, 2014

Environmental Division

Ed Carlson
Solid Waste Program
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, Maryland 21230

Dear Mr. Carlson:

Enclosed please find the *October 2014 Semi-Annual Monitoring Report for FGGM-17, Closed Sanitary Landfill, Fort George G. Meade, Maryland* (Report). The Report provides the results of the August 2014 sampling event along with historical data.

Copies of this Report have been furnished to John Burchette (U.S. Environmental Protection Agency), Mick Butler (Fort George G. Meade), Francis Coulters (U.S. Army Environmental Command), Elisabeth Green (Maryland Department of Environment), and the Fort George G. Meade Restoration Advisory Board.

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

Sincerely,

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

Enclosure

Imagine the result

Semi-Annual Monitoring Report

FGGM 17, Closed Sanitary Landfill Fort George G. Meade, Maryland

October 2014

Keith Shepherd
Task Manager

Brian R. Stempowski, P.E., PMP
Phase Manager

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Project Manager

Semi-Annual Monitoring Report

FGGM-17, Closed Sanitary Landfill, Fort George G. Meade, Maryland

Prepared for:

U.S. Army

Prepared by:

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Our Ref.:

GP09MEAD.CSL0

Date:

October 2014

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List of Acronyms and Abbreviations

ARCADIS	ARCADIS U.S., Inc.
Coastal Plain	Coastal Plain physiographic province
COC	constituent of concern
CSL	Closed Sanitary Landfill
°F	degree Fahrenheit
FGGM	Fort George G. Meade
ft	feet
ID	Identification
IDW	investigative derived waste
LPA	Lower Patapsco Aquifer
MCL	maximum contaminant level
MDL	method detection limit
MDE	Maryland Department of the Environment
mg/L	milligrams per liter
msl	mean sea level
OU-4	Operable Unit 4
Piedmont	Piedmont physiographic province
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SMCL	secondary maximum contaminant level
SVOC	semi-volatile organic compound
t.o.n.	threshold odor number
µg/L	micrograms per liter
UPA	Upper Patapsco Aquifer
URS	URS Group Inc.
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound
WMP	Waste Management Plan

Executive Summary

This report presents the results of the semi-annual groundwater and surface water monitoring completed at the Closed Sanitary Landfill (CSL) at Fort George G. Meade (FGGM) "FGGM-17" in Anne Arundel County, Maryland, in August 2014. The FGGM CSL is located in the southeastern portion of the base, south of U.S. Route 32 and west of the Amtrak railroad right of way. Cell 1 covers approximately 46 acres and Cell 2 covers 24 acres. A third area that lacks topographic expression is referred to informally as Cell 3, but is not a defined disposal area.

ARCADIS U.S., Inc. (ARCADIS) performed all work in accordance with Contract No.W91ZLK-05-D-0015 Task Order 0005 between ARCADIS and the United States Army Environmental Command. Under regulatory guidance including Federal regulations, 40 Code of Federal Regulations Part 258 and state regulations, Code of Maryland Regulation Title 26 Subtitle 04, a detection and assessment monitoring program is required at the CSL. The field effort was conducted between 25 August and 29 August 2014 and included a comprehensive water-level survey and groundwater sampling and analysis for constituents of concern. A total of 16 monitoring wells were sampled during the semi-annual event.

In samples collected from Upper Patapsco Aquifer (UPA) wells, 22 metals were detected. Arsenic was the only metal detected above its respective Maximum Contaminant Level (MCL). Twenty-two volatile organic compounds (VOCs) were detected in 11 samples from UPA wells, and 13 of 22 VOCs detected were chlorinated compounds. Benzene was the only VOC detected above its MCL. All other metals and VOCs detected were below MCLs.

Two surface water samples were collected during the August 2014 monitoring event. Surface water sampling location SW-2 was dry during the time of sampling, and no sample was collected. Two metals (iron and manganese) were detected above the Maryland Water Quality Criteria for Human Health for Consumption of Drinking Water in the samples collected at SW01 and SW03. One metal (lead) was detected above Maryland Chronic Ambient Water Quality Criteria for Fresh Water in the sample collected at SW01.

1. Introduction

This report presents the results of the semi-annual groundwater and surface water monitoring completed at the Closed Sanitary Landfill (CSL) at Fort George G. Meade (FGGM) "FGGM-17" in Anne Arundel County, Maryland, in August 2014. ARCADIS U.S., Inc. (ARCADIS) performed all work in accordance with Contract No.W91ZLK-05-D-0015 Task Order 0005 between ARCADIS and the United States Army Environmental Command. Under regulatory guidance including Federal regulations, 40 Code of Federal Regulations Part 258 and state regulations, Code of Maryland Regulation Title 26 Subtitle 04, a detection and assessment monitoring program is required at the CSL. The field effort was conducted between 25 August and 29 August 2014 and included a comprehensive water-level survey and groundwater sampling and analysis for constituents of concern (COCs). A total of 16 monitoring wells were sampled during the semi-annual monitoring event.

2. Environmental Setting

2.1 Background

FGGM is located approximately midway between Washington, D.C. and Baltimore, Maryland in Anne Arundel County, Maryland, as illustrated on the regional map in **Figure 1**. The FGGM CSL is located in the southeastern portion of the installation, south of U.S. Route 32 and west of the Amtrak railroad right of way. Cell 1 covers approximately 46 acres and Cell 2 covers 24 acres. A third area that lacks topographic expression is referred to informally as Cell 3, but is not a defined disposal area. Other features in the vicinity of the landfill include surface water retention ponds along a small stream flowing from east to west that bisects the site. A landfill-gas collection and treatment system operates along the eastern edge of the landfill cells to control emissions from the site. Much of the site, outside of the landfill cells, is wooded and there are several areas identified as wetlands. The site map for the CSL is provided as **Figure 2**.

2.2 Climate

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

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

2.3 Topography

FGGM is located in the Coastal Plain physiographic province (Coastal Plain), which is characterized by low-rolling uplands and low-gradient streams. The ground elevation at FGGM generally ranges between 150 and 250 feet (ft) above mean sea level (msl). Ground elevation surveyed at monitoring well locations ranges from 135 to 177 ft above msl.

2.4 Surface Water

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

- Brighton Dam
- Middle Patuxent River
- Little Patuxent River
- Rocky Gorge Dam
- Patuxent River Upper
- Western Branch
- Patuxent River Middle
- Patuxent River Lower

FGGM is predominantly located within the Little Patuxent River sub-basin. Several streams drain FGGM within the Little Patuxent River sub-basin. The streams are, from west to east:

- Little Patuxent River

- Midway Branch
- Franklin Branch

The only significant lake/reservoir present on FGGM is Burba Lake (formerly called Kelly Pool).

At the CSL, there are surface water retention ponds. There is also a small stream flowing from east to west that bisects the site displayed on **Figure 2**. The unnamed stream enters the east side of Fort Meade from a culvert under the Amtrak right of way and flows westward through a retention pond between landfill Cells 1 and 2, through a wooded wetlands and a retention pond at the former munitions storage area, and exits the site flowing westward into ponds adjacent to Range Road.

2.5 Geology

FGGM is located just within the western boundary of the Coastal Plain. The Coastal Plain geology is characterized by a wedge of unconsolidated Cretaceous and Quaternary alluvial sediments (unconsolidated sands, silts and clays) that dip and thicken toward the Atlantic Ocean.

West of the Coastal Plain is the Piedmont physiographic province (Piedmont), comprising igneous and metamorphic rocks. The boundary between the Piedmont and Coastal Plain is termed the “Fall Line,” after falls and rapids were found where streams cross this boundary. The Fall Line is located near the western Anne Arundel County line, immediately west of FGGM.

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

- Quaternary alluvium and Patuxent River terraces
- Patapsco Formation
- Arundel Clay

- Patuxent Formation

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

Coastal Plain groundwater predominantly occurs within the following three major Potomac Group aquifers which underlie FGGM:

- Upper Patapsco

- Lower Patapsco

- Patuxent

The upper and lower portions of the Patapsco Formation are locally separated by the Middle Patapsco. Similarly, the Arundel Formation acts as a confining layer that separates the Patuxent Formation from the Lower Patapsco Formation. Extensive and on-going hydrogeological investigations in the southeast corner of FGGM have documented the Middle Patapsco clay as thick and continuous beneath the CSL occurring at depths between approximately 40 to 50 ft below ground surface. The Middle Patapsco clay is approximately 60 to 80 ft in thickness with the Lower Patapsco aquifer occurring beneath it.

3. Monitoring Program

The CSL monitoring program includes 26 monitoring wells. In accordance with the CSL Monitoring Plan dated 25 February 2013, 16 monitoring wells screened in the Upper Patapsco Aquifer (UPA) are sampled semi-annually, and 10 monitoring wells screened in the Lower Patapsco Aquifer (LPA) are sampled annually. During the August 2014 monitoring event, 16 groundwater samples and two surface water samples were collected between 25 August and 29 August 2014. Surface water sampling location SW2 was dry during the time of sampling, and no sample was collected. Groundwater parameters monitored under Detection Monitoring and Assessment Monitoring are provided in **Tables 1** and **2**, respectively. **Table 3** presents a summary of analytical methods used during the semi-annual sampling at CSL.

All purging and sampling activities were completed in accordance with procedures outlined in Standard Operating Procedure E.7 – Low-flow Groundwater Purging and Sampling Procedures for Monitoring Wells provided in Appendix A of the FGGM Sampling and Analysis Plan (SAP) (ARCADIS, 2010a). Field parameter measurements, purging observations, sampling methods and materials, sampling personnel, and bottle requirements were recorded on Groundwater Sampling Forms, which are presented in **Appendix A**.

3.1 Well Gauging

The 26 monitoring wells included in the CSL sampling program were gauged for groundwater elevations prior to the annual sampling event. Water-level measurements were collected using an electronic water level indicator and measurements were recorded on a Water-Level Measurement Form. Water-level measurements were referenced to a surveyed elevation point located on the top of the well casing. Water levels were measured at least two times to check the reproducibility of the measurement data and ensure accuracy before the measurements were recorded. Monitoring well locations, top of well casing elevations, depth to water readings, and groundwater elevations are presented in **Table 4**. Groundwater elevation contour maps for the UPA and LPA are presented as **Figures 3 and 4**, respectively.

Table B-1 in **Appendix B** provides a comparison of the groundwater elevations in August 2014 to the elevations measured in March 2014. Water levels in five of the UPA wells decreased, ranging between 1.31 ft (MW4S) and 3.85 ft (MW5). Water levels in the remaining eleven UPA wells increased, ranging between 0.53 ft (MW20) and 2.56 ft (MW107). Water levels in four of the LPA wells decreased, ranging between 0.27 ft (MW13D) and 1.25 ft (MW4DR). Water levels in the remaining six LPA wells increased, ranging between 0.02 ft (MW2D) and 0.74 ft (MW109D).

3.2 Groundwater Sampling

3.2.1 Purge Methodology

Groundwater samples were collected in accordance with United States Environmental Protection Agency (USEPA) Region III low-flow groundwater purging methodology (USEPA, 1997). To ensure that representative formation water was being sampled, monitoring wells were purged and sampled using a submersible pump and polyethylene tubing. The submersible pump intake was placed mid-screen. In addition, all non-dedicated equipment and materials were decontaminated prior to and after introduction into each of the monitoring wells.

During well purging, field parameters were monitored using a water quality meter with a flow-through cell. These field parameters included pH, specific conductance, turbidity, dissolved oxygen, temperature, and oxidation-reduction potential. Upon stabilization, groundwater samples were collected through the sample tubing.

3.2.2 Sampling Methodology

All groundwater samples were collected directly from the discharge point of the sample tubing connected to the submersible pump. Groundwater samples were preserved, labeled, recorded on a Chain of Custody, and packed on ice for shipment to Shealy Laboratories in West Columbia, South Carolina, for analytical methods identified in **Table 3**. For quality assurance/quality control (QA/QC) purposes, two duplicate samples were collected and one trip blank was included in each cooler shipped for volatile organic compound (VOC) analysis. One matrix spike and matrix spike duplicate was also collected.

3.3 Surface Water Sampling

Two surface water samples were collected during the August 2014 monitoring event from the sampling stations (SW01 and SW03) along the stream that crosses the site. The sampling station SW02 was dry and, therefore, no sample was collected from that location. The unnamed stream enters the east side of Fort Meade from a culvert under the Amtrak right of way and flows westward through a retention pond between landfill Cells 1 and 2, through a wooded wetlands and a retention pond at the former munitions storage area, and exits the site flowing westward into ponds adjacent to Range Road. The upstream monitoring point SW01 is in the ditch below the railroad embankment along the eastern boundary of the landfill. Surface water sampling location SW02 is the outfall from the retention pond between landfill Cells 1 and 2. Surface water sampling location SW03 is located at the culvert beneath Magazine Road where the stream crosses the western boundary of the site (**Figure 2**).

Surface water samples were collected by submerging an unpreserved bottle and pouring that water into the respective pre-preserved bottles. When water flow is sufficient at SW02 and SW03 each bottle is filled directly from the outfall. Similar to groundwater sample collection, the surface water VOC sample is collected first, followed by the other parameters in the order of decreasing volatility. For QA/QC purposes, one duplicate sample was collected and one trip blank was included in each cooler shipped for VOC analysis.

3.4 Quality Assurance/Quality Control and Sample Identification

In accordance with the FGGM Quality Assurance Project Plan (ARCADIS, 2010b), additional samples were collected for QC analysis at the rate of 1 per 20 field samples. Duplicate samples were collected at MW17 and SW03. One matrix spike and matrix spike duplicate was also collected at MW106. Daily equipment rinse blanks were also submitted with the groundwater samples each day that non-dedicated sampling equipment was used. Trip blanks were included with any sample cooler containing VOC samples.

Field sample nomenclature was conducted in accordance with the FGGM SAP (ARCADIS, 2010a). Specifically, sample identifications (IDs) were modified to include FM17, an abbreviation for the CSL site. In addition to the site abbreviation and monitoring well ID, the date the sample was collected is also included in the sample ID in parenthesis. For example, FM17MW4S(082514) would be the ID for the sample collected at well MW4S if it was sampled on 25 August 2014.

The analytical results for all QA/QC samples (i.e., trip blanks and equipment blanks) collected are provided in **Appendix C**. Table C-1 presents a summary of abbreviations, laboratory flags, data validation flags, and data validation reason codes that provide additional information on the data qualifiers. Table C-2 is the comprehensive listing of all analytes for the QA/QC samples. Table C-3 presents detections above the reliable detection limits and method detection limits (MDLs) from samples collected from both aquifers.

3.4.1 Data Validation

All groundwater data collected during the August 2014 sampling event received level II data validation performed under USEPA guidelines by Laboratory Data Consultants, Inc. located in Carlsbad, California. The validation process establishes whether the data are usable for the intended purpose of evaluating conditions at the site.

The data validation process includes a review of QC data generated in both the field and the laboratory. Trip and equipment blanks provide information on potential sample contamination introduced in the field and in transit to the laboratory. Method blanks, which are generated in the laboratory, are used to assess such factors as the sensitivity, accuracy, reproducibility, and cleanliness. Validation includes reviewing holding times, daily laboratory calibration curves for the analytical instruments, spike recovery, and confirming laboratory standards are current. The validation concluded that the data are usable, as qualified, for the intended purpose of evaluating the groundwater and surface water at the CSL. The data validation reports for the August 2014 data are presented in **Appendix D**.

3.5 Investigative Derived Waste Management

All investigative derived waste (IDW) generated during the sampling event was managed in accordance with procedures outlined in the FGGM Waste Management Plan (WMP) (ARCADIS, 2010c).

3.5.1 Purge Water

Purge water and decontamination fluids were combined before being containerized. All waste was stored in 55-gallon Department of Transportation approved drums, properly labeled and staged in a secure location at the CSL. At the end of the sampling event, all IDW was relocated to the FGGM designated IDW storage area located at 2250 Rock Avenue pending offsite disposal.

3.5.2 Solid Waste

All personal protective equipment and disposable sampling equipment were collected in plastic trash bags and disposed of in accordance with the FGGM WMP (ARCADIS, 2010c).

4. Chemical Results - Groundwater

This section of the report presents analytical results for the 16 monitoring wells sampled during the August 2014 semi-annual monitoring event and discusses the distribution of COCs in the UPA. To assess site conditions, groundwater results were screened using USEPA Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs) for drinking water.

Laboratory analytical results are presented in three tables. UPA positive detections, detections above MCLs, and detections above SMCLs are presented in **Tables 5, 6, and 7**, respectively. Data qualifiers and laboratory abbreviations are provided in **Appendix C**. Full listings of the laboratory results are presented in **Appendix E**. Benzene and arsenic plume contour maps for the UPA are presented as **Figures 5 and 6**, respectively. Trend plots for arsenic and benzene in the UPA are presented as **Figures 7 and 8**, respectively.

4.1 Upper Patapsco Aquifer

4.1.1 Summary of Detections

Positive detections in the UPA include pesticides, herbicides, metals, semi-volatile organic compounds (SVOCs), VOCs and miscellaneous parameters as shown on **Table 5**.

Pesticides and herbicides were detected at concentrations below MCLs in three groundwater samples. One herbicide, 2,4,5-TP was detected at MW19. Nine pesticides, 4,4-dichlorodiphenyldichloroethane, alpha-bhc, beta-bhc, dieldrin, endosulfane II, endosulfane sulfate, endrin aldehyde, endrin ketone, and gamma-bhc were detected at estimated concentrations below their respective MCLs from three monitoring wells (MW7S, MW12S, and MW19).

Twenty-two metals were detected in samples from the UPA wells. Arsenic was the only metal detected at concentrations exceeding its MCL as described in Section 4.1.2. Twelve metals (aluminum, barium, calcium, cobalt, iron, lead, magnesium, manganese, nickel, potassium, sodium, and zinc) are widespread and appear to be naturally occurring in the UPA and detected at a minimum of 14 out of the 16 monitoring wells sampled. Ten metals (antimony, beryllium, cadmium, chromium, copper, mercury, selenium, thallium, and vanadium) were detected at concentrations below MCLs and were not widespread.

Four SVOCs were detected in one groundwater sample below their respective MCLs. 1,2-dichlorobenzene, 1,4-dichlorobenzene, diethyl phthalate, and naphthalene were detected in the sample from MW19.

Twenty-two VOCs were detected in 11 samples from UPA wells, and 13 of the 22 VOCs detected were chlorinated compounds. Benzene was the only VOC detected above its MCL at one location as described in Section 4.1.2. All other VOCs detected were below MCLs.

4.1.2 Summary of Exceedances above Maximum Contaminant Levels and Secondary Maximum Contaminant Levels

The UPA analytical results were screened against MCLs and SMCLs, as shown on **Tables 6 and 7**, respectively. Three analytes exceeded their MCLs:

- Arsenic exceeded its MCL of 10 µg/L in three samples at concentrations between 17 µg/L (MW12S) and 36 µg/L (MW19).
- Benzene exceeded its MCL of 5 µg/L in the sample from MW19 (8.1 µg/L).
- Nitrate exceeded its MCL of 10 µg/L in the sample from MW13S (21 µg/L).

Eight analytes exceeded their SMCLs:

- Aluminum exceeded its SMCL of 50 µg/L at 11 locations, with concentrations ranging from 230 J µg/L (MW02S) to 2,600 µg/L (MW106).
- Chloride exceeded its SMCL of 250 milligrams per liter (mg/L) in the sample from MW106 (260 mg/L).
- Color exceeded its SMCL of 15 Color Units at five locations, with concentrations ranging from 30 Color Units (MW02S) to 380 Color Units (MW12S and MW14).
- Iron exceeded its SMCL of 300 µg/L at 14 locations, with concentrations ranging from 740 µg/L (MW20) to 140,000 µg/L (MW14).
- Manganese exceeded its SMCL of 50 µg/L at 13 locations, with concentrations ranging from 68 µg/L (MW105) to 1,700 µg/L (MW12S).

- Odor exceeded its SMCL of three threshold odor number (t.o.n.) at five locations, with concentrations ranging from 4.00 t.o.n. (MW08) to 2,790 t.o.n. (MW19).

- Total dissolved solids exceeded its SMCL of 500 mg/L in the sample from MW19 (970 mg/L)

5. Chemical Results – Surface Water

Two surface water samples were collected from the unnamed stream. **Table 8** presents positive surface water detections from samples collected during the August 2014 sampling event. Surface water analytical tables are included in **Appendix E**. Surface water analytical results were screened against State of Maryland Chronic Ambient Water Quality Criteria for Fresh Water and State of Maryland Water Quality Criteria for Human Health for Consumption of Drinking Water.

Five anions (chloride, nitrogen [ammonia], nitrogen [nitrate], sulfate, and sulfide) were detected in the surface water samples. Twenty metals (aluminum, antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, sodium, vanadium, and zinc) were detected in the surface water samples. Two metals (iron and manganese) were detected above the Maryland Water Quality Criteria for Human Health for Consumption of Drinking Water in the samples collected at SW01 and SW03. One metal (lead) was detected above Maryland Chronic Ambient Water Quality Criteria for Fresh Water in the sample collected at SW01.

6. Statistical Analysis

The analytical data were analyzed statistically with a focus as to how the groundwater quality was changing over time. The historic database included data for 247 analytes in 26 monitoring wells in semi-annual monitoring events dated back to 1994. Previous statistical analyses have divided the data into four groups, three of which were in the UPA and one group for all LPA data. Interwell comparisons were made between data in a single well designated as background and a group of downgradient wells. In 2009, the USEPA released a Unified Guidance document for the statistical evaluation of groundwater (USEPA, 2009). Following the concepts in that document, the statistical approach presented herein was modified beginning with the first semiannual monitoring report for 2010. Another modification in the procedure is that the LPA is only monitored annually, in the spring. In this section, the following topics are discussed: the present approach, the data preparation, and the results for both groundwater-bearing units.

6.1 Statistical Procedure

The lack of uncontaminated background wells indicated that a proper statistical analysis program would have to be based on intrawell testing. Typical intrawell tests, such as comparison to intrawell upper prediction limits (UPLs) or Shewhart-CUSUM control charts are typically used to compare new data to previous data that represent unimpacted groundwater conditions. This is not possible at this site because all 26 of the wells have some history of detection of manmade chemicals. For these reasons, the best approach is an intrawell test that could measure trends. Mann-Kendall testing was selected as the test for these data. This nonparametric test can evaluate a set of data points in chronological order and determine if an increasing or decreasing slope is a statistically significant trend.

One important parameter in tests for trends is the number of data points selected from the data set. There have been 42 sampling events, two per year since 1994, for many of the constituent-well pairs. With a data set of this size, it is possible to miss a recent trend due to the legacy of twenty years of data. For this reason, a “sliding window” approach with 12 data points was selected as the most appropriate diagnostic approach. Data points representing the 12 most recent sampling events were selected. For the UPA, these data points cover the time from the spring of 2009 to the autumn of 2014. These 12 points were evaluated for each constituent of concern for each well. In each set of semiannual or annual statistical tests, the oldest point is dropped from the test data sets and the most recent point is added. The statistical tests are conducted on 12 data points, with new points added each sampling event and old ones being removed.

The data were loaded into a groundwater statistical program, Sanitas ™ prepared by Sanitas Technologies in Shawnee, Kansas. Version 9.4 (released in 2014) was used. The program was designed to automate the statistical analysis of Resource Conservation and Recovery Act (RCRA) hazardous waste (Subtitle C) and municipal (Subtitle D) landfill groundwater quality data. The program's decision logic guides the user through procedures that ensure that the analysis will meet the requirements of the USEPA, American Society for Testing and Materials (ASTM), and state regulations. In intrawell testing, there are separate data sets for each combination of monitoring wells and constituents.

As specified above, most of the data sets had 12 members. A small number of analytes, such as1,4-dichlorobenzene, and 1,3,5-trimethylbenzene were not always in the monitoring program and have fewer members. For each data set, three tests were run using Sanitas: an outlier test, a distribution test, and a trend test. In these tests, non-detections were replaced with values equal to half of the detection limit.

Sanitas contains three outlier tests: EPA Outlier Screening (USEPA, 1989), Dixon's Test, and Rosner's Test. The EPA Outlier Screening test was used to specify suspect outliers and Dixon's Test was used to determine if the suspect data point was a statistically significant outlier. Dixon's Test is valid for data sets with up to 25 members. Rosner's Test is recommended for larger data sets. Because the data sets in this analysis always had 12 or less data points, Rosner's Test was not used. Both the tests were conducted at a 5% level of significance (α = 0.05). All outliers indentified in a data set were listed in the appropriate table. In some cases, a data set had more than one statistically significant outlier. The detection frequency was tabulated. In the event that there were fewer than four detections in a data set, the outliers were not counted.

The Shapiro-Wilk test for normality is recommended by the USEPA for data sets with 50 or fewer members (USEPA, 2009). This test was used to determine if the test data was normally distributed. If the data passed the Shapiro-Wilk test, "Normal" was recorded on the results table. If the data failed the Shapiro-Wilk test, they were logarithmically transformed and retested. If the data passed this test, "Lognormal" was recorded to indicate a lognormal distribution. If the data failed the second test "Unknown" was recorded to indicate that the distribution of the data set was not known. Whenever there were fewer than four detections, the distribution testing indicated an unknown distribution. On the table “NDs” was recorded to indicate that there were too many non-detects to evaluate the true distribution of the data set.

Sen’s Slope Estimator was used for each data set in conjunction with the Mann-Kendall test to determine if the slope in the 12 data points was statistically significant at an $\alpha = 0.02$ level. If the slope was significant, a decreasing or increasing trend was indicated on the summary table. Increasing trends were noted in bold font. Trends were not counted in highly censored data sets (i.e. having fewer than four detections).

Descriptive statistics were tabulated for each constituent of concern (COC) in each monitoring well. These statistics included the number of detections, the number of samples (usually 12), the sample mean, the standard deviation, the variance, the maximum detected value, and the minimum detected value. In computing the mean, the standard deviation, and the variance, non-detects were evaluated at half the detection limit.

6.2 Data Preparation

Several steps were taken in order for the data to be input into the Sanitas program. First, qualified data, such as J-flagged values, were accepted as quantitative. Flags were removed and the data were converted to numerical values. No duplicate data points were included in the statistical analysis in order to satisfy the requirement of statistical independence.

As stated above, detection limits were handled in some tests in Sanitas by inserting one half of the detection limit. This presented a practical challenge, because detection limits for non-detections that occurred prior to September 2009 were not available. One option, using “< 0” as an input, will generate a warning flag in Sanitas because such values can create instability in some tests. It was, therefore, necessary to determine a surrogate detection limit. For all of these data points, the method detection limits (MDLs) that were available in the laboratory reports for spring 2010 were used. It was assumed that the MDLs had the same values in previous sampling events. This compromise seemed to work well, except with the thallium data. For some data sets, a detection limit of 1.0 µg/L from the autumn 2009 data was used as the detection limit instead.

As stated previously, analytes that were never detected or very rarely detected, as well as analytes that appeared to be laboratory contaminants were removed from the statistical analysis. This was necessary in order to minimize the number of tests on data sets composed of detection limits and make the statistical analysis more diagnostic. The decision to remove or keep an analyte was based upon detection frequency in the data base for all sampling events and not just the most recent 12 events.

In preparing the data tables, naphthalene was included with the SVOCs. Four metals (calcium, magnesium, potassium, and sodium) were tabulated with the inorganic parameters rather than the metals. Total 1,2-dichloroethene was excluded in favor of the individual isomers, cis-1,2-dichloroethene and trans-1,2-dichloroethene. The data for the two nitrate entries “nitrate” (measured prior to September 2009) and “nitrate-N” (measured since September 2009) were merged into a single entry designated “nitrate-N”.

6.3 Statistical Results for the Upper Patapsco

The input data sets used in the Sanitas program are included in **Appendix F**. These attachments show the chosen surrogate detection limits and the data points used in computing the statistical results. The metals input data are included in **Attachment F-1** in **Appendix F**. Eighteen metals were statistically analyzed including aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc. Eight inorganic groundwater parameters were analyzed: chloride, nitrate-N, nitrogen, sulfate, calcium, magnesium, potassium, and sodium. These can be found in **Attachment F-2**. The 17 (VOCs included in the statistical analysis were 1,1-dichloroethane, 1,2-dichlorobenzene, 1,2-dichloropropane, 1,3,5-trimethylbenzene, 1,4-dichlorobenzene, benzene, CFC-12, chlorobenzene, chloroethane, cis-1,2-dichloroethene, ethylbenzene, tetrachloroethene, toluene, total xylenes, trans-1,2-dichloroethene, trichloroethene, and vinyl chloride (**Attachment F-3**). The two SVOCs can be found in **Attachment F-4**: 1,4-dichlorobenzene and naphthalene.

The Sanitas output data can also be found in **Appendix F**. The outlier analysis and the normality testing for the UPA COCs are included in **Attachment F-5**. The Sen’s Slope Estimator and Mann-Kendall test results are in **Attachment F-6**.

Descriptive statistics for the analytes in the UPA can be found in **Appendix G**. These statistics are tabulated in **Attachments G-1** to **G-4** for each of the metals, inorganic analytes, VOCs, and SVOCs, respectively. Only analytes for which statistical analysis was conducted were included in **Appendix G**. Analytes deleted due to low detection frequency were not included.

The statistical results for the metals are summarized in **Table 9**. No statistically significant increasing trends were identified. Sixteen decreasing trends were identified. The concentrations of metals are declining in the UPA.

The statistical results for the inorganic constituents are summarized in **Table 10**. Four statistically significant increasing trends were identified: calcium in MW-5; potassium in MW-7S; and sulfate and magnesium in MW-12S. There were nine statistically significant decreasing trends identified.

The statistical results for VOCs in the UPA are summarized in **Table 11**. Two statistically significant increasing trends were identified: chlorobenzene in MW-7S and in MW-19. There were six statistically significant decreasing trends. Thus, the concentrations of VOCs are declining in the UPA.

The statistical results for SVOCs in the UPA are summarized in **Table 12**. No statistically significant increasing or decreasing trends were discernable.

6.4 Statistical Results for the Lower Patapsco

Under an agreement with the Maryland Department of the Environment (MDE) Solid Waste Division, the sampling frequency for the LPA has been changed to annual. Consequently, data were not collected or analyzed in the fall 2014 sampling event. The LPA will be included in the spring analyses.

6.5 Observations and Interpretation

This section presents an interpretation of the statistical analysis completed at the CSL. The LPA was not included in the fall 2014 statistical analyses because the sampling frequency was adjusted to an annual basis. Notable observations include:

- The UPA samples had four statistically significant increasing inorganic constituent trends and two increasing VOC trends.

- The combined number of increasing trends in VOC or SVOCs concentrations in the UPA was two, but there were six decreasing trends for VOCs. The larger number of decreasing trends and the lower number of detections compared to the previous sampling event indicate that groundwater VOC impacts in the UPA are declining.

- In previous sampling events, there were more decreasing trends, but the mass of VOCs in the UPA is beginning to be depleted. Of the 272 well-constituent pairs, 171 of them (63%) are now composed of twelve non-detections; the constituent has not been detected in the monitoring well in at least six years. Another 28 data sets (10%) had only one detection in the last six years.

- Detection monitoring parameters were detected above MCLs in the UPA samples listed below. No increasing or decreasing trends were identified for the parameters listed below.

  - Arsenic in MW-12S, MW-14, and MW-19

  - Benzene in MW-19

  - Nitrate in MW-13S

7. Conclusion and Recommendations

7.1 Summary of August 2014 Monitoring Results

The results of the August 2014 groundwater and surface water monitoring are consistent with the results of prior sampling events. MCL exceedances were isolated and include arsenic, benzene, and nitrate, concentrations of which exceeded their respective MCLs in samples from the UPA at the southeast corner of Cell 1. Historical data for all sampling rounds completed to date are provided in **Appendix H**.

7.1.1 Monitoring in the Upper Patapsco Aquifer

Groundwater sampling activities have been completed under the monitoring requirements for the UPA. Arsenic, benzene, and nitrate are constituents detected in samples from the UPA that have concentrations exceeding MCLs during the August 2014 event and have exceeded MCLs previously; data trend plots for arsenic and benzene concentrations in selected UPA wells are provided as **Figures 7 and 8**, respectively. The trend plots visually display constituent concentrations at selected sampling locations since sampling activities commenced. Neither constituent shows an increasing trend. Statistical analysis shows increasing trends in other constituents detected in samples from the UPA; however, none of these constituents exceeded their MCLs. It should be noted that the MCL exceedances of chromium, cadmium and lead observed during the Annual 2014 groundwater monitoring event at the CSL completed in March 2014 are not representative of consistent or site-wide conditions.

A general assessment of the UPA indicates that samples with constituents exceeding their MCLs are collected from wells south of landfill Cell 1 and wells located between the cells and the railroad right of way. The occasional historical detections of other compounds are in samples from wells from the same part of the site.

7.1.2 Monitoring in Surface Water

Two surface water samples were collected during the August 2014 monitoring event. Constituent detections in these samples are summarized in Section 5. Three metals (iron, lead, and manganese) were detected at concentrations exceeding State of Maryland Water Quality Criteria at SW02 and SW03.

7.2 Evaluation of the Adequacy of the Monitoring Well Network

7.2.1 Upper Patapsco Aquifer Monitoring Wells

The groundwater monitoring well network for the UPA consists of 16 shallow monitoring wells. These wells are located along the periphery of the waste cells and around the CSL property boundary. Three of the shallow monitoring wells are located southeast of the landfill and off FGGM property. Sampling of these three shallow wells has indicated that constituents detected in the shallow groundwater at the landfill have not migrated within the UPA an appreciable distance southeast of the installation boundary. In order to characterize shallow UPA groundwater off-post, groundwater samples were collected from a series of soil borings installed in Anne Arundel County Right-of-Way southeast of the Amtrak property. Sampling methodology and analytical results are presented in the *Focused Feasibility Study / Assessment of Corrective Measures* (ARCADIS, 2014.

7.2.2 Lower Patapsco Aquifer Monitoring Wells

The groundwater monitoring network for the LPA consists of 10 wells. These wells are located northwest and southeast of the waste cells and landfill property boundary. Groundwater flow in the LPA in this area is from the northwest to the southeast. Based on the existing monitoring well network, three of the deep monitoring wells are located hydraulically upgradient of the landfill. Two of the deep monitoring wells are located crossgradient and five are located downgradient. Three of the deep monitoring wells are located southeast of the landfill and off FGGM property.

Sampling of the deep wells has indicated the presence of constituents. However, these constituents are not related to those detected in samples from the UPA as described in the statistical analysis section (Section 6). Additionally, the Remedial Investigation Report (EM, 2007) documented the presence and effectiveness of the Middle Patapsco Clay as a hydraulic barrier between the Upper and Lower Patapsco aquifers. Although the locations of the LPA wells surround the CSL in areal extent, they do not serve to monitor potential releases to groundwater from the CSL.

It is noted that the LPA is now being handled under a separate Comprehensive Environmental Response, Compensation, and Liability Act Operable Unit 4 (OU-4) and will have its own detailed Remedial Investigation, Feasibility Study, Proposed Plan, and Record of Decision.

An Addendum to the CSL Monitoring Plan dated 20 June 2012 was prepared in response to comments dated 6 April 2012 from the MDE that agreed to the reduction of monitoring frequency of the ten deep LPA wells from semi-annual to annual. Deep LPA groundwater monitoring wells will continue to be monitored on an annual basis moving forward. The correspondence from MDE dated 6 April 2012 also noted that once a corrective action has been approved for OU-4 / LPA, a request to discontinue monitoring of the deep LPA wells under the CSL Monitoring Program will be re-evaluated. The revised CSL Monitoring Plan reflecting these changes was submitted on 25 February 2013.

8. References

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EM Federal Engineering. 2007. Groundwater Remedial Investigation for the Closed Sanitary Landfill. August 2007.

URS Group Inc. (URS). 2003. Remedial Investigation and Baseline Risk Assessment, Defense Reutilization and Marketing Office Site, Fort George G. Meade, Maryland. Final. Prepared for U.S. Army Corps of Engineers Baltimore District. 2003.

United States Environmental Protection Agency (USEPA). 1989. Statistical analysis of ground-water monitoring data at RCRA facilities. Interim Final Guidance. Office of Solid Waste, Waste Management Division, EPA/530-SW-89-026. February 1989.

USEPA. 1997. Low-Flow Purging and Sampling of Groundwater Monitoring Wells. Region III. October 1997.

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Tables

Table 1
Summary of Detection Monitoring Parameters
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics			
1. Antimony	5. Cadmium	9. Lead	13. Thallium
2. Arsenic	6. Chromium	10. Nickel	14. Vanadium
3. Barium	7. Cobalt	11. Selenium	15. Zinc
4. Beryllium	8. Copper	12. Silver	
Organics - List 1			
16. Acetone	28. 1,2-Dibromo-3-chloropropane	40. trans-1,3-Dichloropropene	52. 1,1,2,2-Tetrachloroethane
17. Acrylonitrile	29. 1,2-Dibromoethane	41. Ethylbenzene	53. Tetrachloroethene
18. Benzene	30. 1,2-Dichlorobenzene	42. 2-Hexanone	54 Toluene
19. Bromochloromethane	31. 1,4-Dichlorobenzene	43. Bromomethane	55. 1,1,1-Trichloroethane
20. Bromodichloromethane	32. trans 1,4-Dichloro-2-butene	44. Chloromethane	56. 1,1,2-Trichloroethane
21. Bromoform	33. 1,1 -Dichloroethane	45. Dibromomethane	57. Trichloroethene
22. Carbon disulfide	34. 1,2-Dichloroethane	46. Methylene chloride	58. Trichlorofluoromethane
23. Carbon tetrachloride	35. 1,1-Dichloroethene	47. 2-Butanone	59. 1,2,3-Trichloropropene
24. Chlorobenzene	36. cis-1,2-Dichloroethene	48. Methyl iodide	60. Vinyl acetate
25. Chloroethane	37. trans-1,2-Dichloroethene	49. 4-Methyl-2-pentanone	61. Vinyl chloride
26. Chloroform	38. 1,2-Dichloropropane	50. Styrene	62. Xylenes
27. Dibromochloromethane	39. cis-1,3-Dichloropropene	51. 1,1,1,2-Tetrachloroethane	
State and FGGM Required Parameters			
63. Total Alkalinity	69. Total Dissolved Solids	75. Sodium	81. Color
64. Hardness	70. Mercury	76. Chemical Oxygen Demand	82. Aluminum
65. Ammonia	71. Calcium	77. pH	83. Manganese
66. Nitrate	72. Iron	78. Turbidity	
67. Chloride	73. Magnesium	79. Specific Conductance	
68. Sulfate	74. Potassium	80. Odor	

Table 2
Summary of Assessment Monitoring Parameters
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics			
1 Antimony	5. Cadmium	9. Lead	13. Thallium
2. Arsenic	6. Chromium	10. Nickel	14. Vanadium
3. Barium	7. Cobalt	11. Selenium	15. Zinc
4. Beryllium	8. Copper	12. Silver	
Organics - List 1 (same as Detection Monitoring Parameters)			
Organics - List 2			
63. Acenaphthene	86. Bis(2-ethylhexyl)phthalate	109. Di-n-butyl phthalate	132. Dinoseb
64. Acenaphthylene	87. 4-Bromophenyl phenyl ether	110. Dichlorobenzene	133. Di-n-octyl phthalate
65. Acetonitrile; Methyl cyanide	88. Butyl benzyl phthalate	111. 3,3-Dichlorobenzidine	134. Diphenylamine
66. Acetophenone	89. Chlordane	112. Dichlorodifluoromethane	135. Disulfoton
67. 2-Acetylaminofluorene;2-AAF	90. p-Chloroaniline	113. 2,4-Dichlorophenol	136. Endosulfan I
68. Acrolein	91. Chlorobenzilate	114. 2,6-Dichlorophenol	137. Endosulfan II
69. Aldrin	92. 4-Chloro-3-methylphenol	115. 1,3-Dichloropropane	138. Endosulfan sulfate
70. Allyl chloride	93. 2-Chloronaphthalene	116. 2,2-Dichloropropane	139. Endrin
71. 4-Aminobiphenyl	94. 2-Chlorophenol	117. 1,1-Dichloropropene	140. Endrin aldehyde
72. Anthracene	95. 4-Chlorophenyl phenyl ether	118. Dieldrin	141. Ethyl methacrylate
73. Benzo[a]anthracene	96. Chloroprene	119. Diethyl phthalate	142. Ethyl methanesulfonate
74. Benzo[b]fluoranthene	97. Chryscne	120. Thionazin	143. Famphur
75. Benzo[k]fluoranthene	98. 3-methylphenol	121. Dimethoate	144. Fluoranthene
76. Benzo[ghi]perylene	99. 2-methylphcnol	122. p-(Dimethylamino)azobenzene	145. Fluorene
77. Benzo[a]pyrene	100. 4-methylphenol	123. 7.12-Dimethylbenz[a]anthracene	146. Heptachlor
78. Benzyl alcohol	101. Cyanide	124. 3,3-Dimethylbenzidine	147. Heptachlor epoxide
79. alpha-BHC	102. 2,4-D	125. 2,4-Dimethylphenol	148. Hexachlorobenzene
80. beta-BHC	103. 4,4-DDD	126. Dimethyl phthalate	149. Hexachlorobutadiene
81. deita-BHC	104. 4,4-DDE	127. m-Dinitrobenzene	150. Hexachlorocyclopentadiene
82. gamma-BHC; Lindane	105. 4,4-DDT	128. 4,6-Dinitro-2-methylphenol	151. Hexachloroethane
83. Bis(2-chloroethoxy) methane	106. Diallate	129. 2,4-Dinitrophenol	152. Hexachloropropene
84. Bis(2-chloroethyl) ether	107. Dibenz[a,h]anthracene	130. 2,4-Dinitrotoluene	153. Indeno(l,2,3-cd)pyrene
85. Bis(2-chloro-l-methylethyl) ether	108. Dibenzofuran	131. 2,6-Dinitrotoluene	154. Isobutyl alcohol
155. Isodrin	170. 2-Naphthylamine	185. 5-Nitro-o-toluidine	200. Silvex; 2,4,5-TP
156. Isophorone	171. 2-Nitroaniline	186. Parathion	201. Sulfide
157 Isosafrole	172. 3-Nilroaniline	187. Pentachlorobenzene	202. 2,4,5-T
158. Kepone	173. 4-Nitroaniline	188. Pentachloronitrobenzene	203. 1,2,4,5-Tetrachlorobenzene
159. Methacrylonitrile	174. Nitrobenzene	189. Pentachlorophenol	204. 2,3,4,6-Tetraochlorophenol
160. Methapyrilcne	175. 2-Nitrophenol	190. Phenacetin	205. Tin
161. Methoxychlor	176. 4-Nitrophenol	191. Phenanthrene	206. o-Toluidine
162. 3-Methylcholanthrene	177. N-Nitrosodi-n-butylamine	192. Phenol	207. Toxaphene
163. Methyl methacrylate	178. N-Nitrosodiethylamine	193. p-Phenylenediamine	208. 1,2,4-Trichlorobenzene
164. Methyl methanesulfonate	179. N-Nitrosodimethylamine	194. Phorate	209. 2,4,5-Trichlorophenol
165. 2-Methylnaphthalene	180. N-Nitrosodiphenylamine	195. Polychlorinated biphenyls	210. 2,4,6-Trichlorophenol
166. Methyl parathion	181. N-Nitrosodipropylamine	196. Pronamide	211. 0,0,0-Triethyl phosphorothioate
167. Naphtlialene	182. N-Nitrosomethylethyiamine	197. Propionitrile	212. sym-Trinitrobenzene
168. 1,4-Naphthoquinone	183. N-Nitrosopiperidirie	198. Pyrene	
169. 1-Naphthylamine	184. N-Nitrosopyrrolidine	199. Safrole	
State and FGGM Required Parameters			
213. Total Alkalinity	223. Magnesium	233 1.3-Dinitrobenzene	243. Nitrobenzene
214. Hardness	224. Potassium	234. 2,4,6-Trinitrotoluene	244. RDX
215. Ammonia	225. Sodium	235. 2,4-Dinitrotoluene	245. Tetryl
216. Nitrate	226. Chemical Oxygen Demand	236. 2,6-Dinitrotoluene	246. pH
217. Chloride	227. Aluminum	237. 2-Amino-4.6-dinitrotoluene	247. Turbidity
218. Sulfate	228. Manganese	238. 2-Nitrotoluene	
219. Total Dissolved Solids	229. Specific Conductance	239. 3-Nitrotoluene	
220. Mercury	230. Odor	240. 4-Amino-2,6-dinitrotoluene	
221. Calcium	231. Color	241. 4-Nitrotoluene	
222. Iron	232. 1,3,5-Trinitrobenzene	242. HMX	

Table 3
Summary of Analytical Methods
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Chemical Class			
Analyte	**EPA Analytical Method**	**Sample Container**	**Preservative**
Explosives	8330A	1,000mL Glass	Cool to 4º C
Herbicides	8151A	1,000mL Glass	Cool to 4º C
PCBs	8082A	1,000mL Glass	Cool to 4º C
Pesticides	8081B	1,000mL Glass	Cool to 4º C
Mercury	7470A	500 mL Plastic	pH <2 HNO3
SVOCs	8270D	1,000mL Glass	Cool to 4º C
TAL Metals	6010C	500 mL Plastic	pH <2 HNO3
VOCs	8260	40 mL Glass	pH <2 HCL

Wet Chemistry			
Analyte	**EPA Analytical Method**	**Sample Container**	**Preservative**
Alkalinity	SM2320B	250 mL Plastic	Cool to 4º C
Ammonia - N	350.1	250mL Plastic	pH <2 H2SO4
Chemical Oxygen Demand	SM5220D	250mL Plastic	pH <2 H2SO4
Chloride	300.1	250mL Plastic	Cool to 4º C
Color	SM2120B	500mL Plastic	Cool to 4º C
Cyanide	9012B	250mL Plastic	pH >12 NaOH
Hardness	SM2320C	250mL Plastic	pH <2 HNO3
Odor	2150	500mL plastic	Cool to 4º C
pH	SM2400-HB	100mL Plastic	Cool to 4º C
Specific Conductance	120.1	250mL Plastic	Cool to 4º C
Sulfate	300.1	250mL Plastic	Cool to 4º C
Sulfide	SM4500-S2F	500mL Plastic	Zinc Acetate, pH>9 NAOH
Total Dissolved Solids	SM2540C	250mL Plastic	Cool to 4º C
Turbidity	180.1	250mL Plastic	Cool to 4º C

Notes:
EPA - United Stated Environmental Protection Agency
mL - milliliter
º C - degrees Celsius
PCB - polychlorinated biphenyl
SVOC - semi-volatile organic compound
TAL metals - Target Analyte List Metals
VOC - volatile organic compound
HNO3 - Nitric Acid
H2SO4 - Sufluric Acid
HCL - Hydrochloric Acid
NaOH - Sodium Hydroxide

Table 4
Monitoring Well Network
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Well ID	Well Material	Well Diameter	Ground Surface Elevation	Top of Casing Elevation	Measured Total Depth	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Screen Length	Depth to Water (8/25/2014)	Groundwater Elevation (MSL)
Upper Patapsco Aquifer										
MW2S	PVC	4	161.60	163.93	27.63	24	29	5	14.95	148.98
MW4S	PVC	4	159.34	161.88	15.20	7	12	5	8.08	153.80
MW5	PVC	4	147.35	148.50	29.33	8	28	20	6.32	142.18
MW7S	PVC	4	136.16	137.99	27.30	5.5	25.5	20	4.49	133.50
MW8	PVC	4	140.58	141.76	24.46	8	23	15	9.71	132.05
MW10S	PVC	4	157.93	159.39	19.52	8	18	10	6.61	152.78
MW12S	PVC	4	172.88	174.44	29.94	18	28	10	21.35	153.09
MW13S	PVC	4	167.36	169.16	35.71	19	34	15	22.85	146.31
MW14	PVC	4	163.46	165.68	32.34	20	30	10	16.20	149.48
MW17	PVC	4	170.21	171.81	36.91	20	35	15	21.79	150.02
MW18	PVC	4	166.58	167.84	36.99	20	35	15	21.69	146.15
MW19	PVC	4	168.61	170.01	38.54	22.5	37.5	15	19.64	150.37
MW20	PVC	4	170.27	171.70	32.99	21	31	10	20.20	151.50
MW105	PVC	4	192.84	192.70	62.27	49	59	10	51.01	141.69
MW106	PVC	4	169.21	171.41	33.84	21.5	31.5	10	25.53	145.88
MW107	PVC	4	177.81	179.91	46.23	31.5	41.5	10	32.83	147.08
Lower Patapsco Aquifer										
MW2D	PVC	4	160.32	162.27	88.55	76.5	86.5	10	71.33	90.94
MW4DR	PVC	4	165.58	167.76	150.99	129	149	20	67.10	100.66
MW7D	PVC	4	135.43	137.37	107.51	98	108	10	37.95	99.42
MW10D	PVC	4	158.03	159.62	133.68	117	127	10	62.68	96.94
MW12D	PVC	4	172.45	174.52	136.11	121	131	10	83.94	90.58
MW13D	PVC	4	167.35	168.05	125.45	100	120	20	72.21	95.84
MW101D	PVC	4	160.77	161.17	151.34	133	143	10	73.68	87.49
MW108D	PVC	4	177.15	179.55	176.46	155	165	10	91.48	88.07
MW109D	PVC	4	171.51	171.26	166.42	133.5	153.5	20	84.45	86.81
MW110D	PVC	4	165.42	167.91	159.06	140	160	20	79.59	88.32

Notes:
All measurements in feet
MSL = Mean Sea Level
ft bgs = feet below ground surface
PVC = polyvinyl chloride

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics			Sample Location Sample ID Date	FM17MW02S FM17MW2S(082814) 8/28/2014	FM17MW04S FM17MW4S(082914) 8/29/2014	FM17MW05 FM17MW5(082514) 8/25/2014	FM17MW07S FM17MW7S(082714) 8/27/2014	FM17MW08 FM17MW8(082714) 8/27/2014
Analyte	**Units**	**MCL**	**SMCL**					
Aluminum	ug/l	NS	**50**	**230 J**	**2300 J**	**610 J**	38 J	**290 J**
Antimony	ug/l	6	NS	--	--	--	0.23 J	--
Arsenic	ug/l	10	NS	2.3	0.43 J	0.30 J	9.3	0.78 J
Barium	ug/l	2000	NS	37	110	32	100	36
Beryllium	ug/l	4	NS	0.034 J	0.71	0.76	--	0.35 J
Cadmium	ug/l	5	NS	0.069 J	0.26	0.27	--	0.088 J
Calcium	ug/l	NS	NS	7800	3800	2700	48000	4000
Chromium	ug/l	100	NS	0.50 J	0.62 J	--	0.58 J	0.63 J
Cobalt	ug/l	NS	NS	7	7.4	11	29	23
Copper	ug/l	1000	1000	7.8 J	--	6.4	--	--
Iron	ug/l	NS	**300**	**46000**	**1000**	**1000**	**51000**	**4900**
Lead	ug/l	15	NS	0.46 J	0.82 J	0.83 J	--	0.095 J
Magnesium	ug/l	NS	NS	3400	1700	1900	19000	1900
Manganese	ug/l	NS	**50**	**510**	49	**360**	**780**	**230**
Mercury	ug/l	2	NS	--	--	0.21	--	--
Nickel	ug/l	NS	NS	1.6 J	7.6	27	3.4 J	20
Potassium	ug/l	NS	NS	1700	880	1100	6200	1100
Selenium	ug/l	50	NS	0.27 J	--	0.51 J	1.4	--
Sodium	ug/l	NS	NS	16000	3100	5600	54000	2200
Thallium	ug/l	2	NS	--	--	0.093 J	--	--
Vanadium	ug/l	NS	NS	--	--	--	2.6 J	--
Zinc	ug/l	NS	5000	23 J	74 J	35	39 J	23 J

Notes:
MCL = Maximum Contaminant Level exceedances are shaded
SMCL = Secondary Maximum Contaminant Level exceedances are bolded
-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics			Sample Location Sample ID Date	FM17MW105 FM17MW105(082614) 8/26/2014	FM17MW106 FM17MW106(082714) 8/27/2014	FM17MW107 FM17MW107(082714) 8/27/2014	FM17MW10S FM17MW10S(082714) 8/27/2014
Analyte	**Units**	**MCL**	**SMCL**				
Aluminum	ug/l	NS	**50**	**380 J**	**2600 J**	**120 J**	--
Antimony	ug/l	6	NS	--	--	--	--
Arsenic	ug/l	10	NS	--	--	--	1.5
Barium	ug/l	2000	NS	120	140	20	52
Beryllium	ug/l	4	NS	0.21 J	3	--	--
Cadmium	ug/l	5	NS	0.23	1.2	--	--
Calcium	ug/l	NS	NS	9800	21000	13000	13000
Chromium	ug/l	100	NS	1.0 J	0.81 J	--	--
Cobalt	ug/l	NS	NS	10	71	0.24 J	29
Copper	ug/l	1000	1000	3.2 J	6.2 J	--	--
Iron	ug/l	NS	**300**	180	**4300**	170	**40000**
Lead	ug/l	15	NS	0.19 J	0.73 J	0.12 J	0.076 J
Magnesium	ug/l	NS	NS	7000	12000	1800 J	3800
Manganese	ug/l	NS	**50**	**68**	**270**	2.4 J	**540**
Mercury	ug/l	2	NS	--	--	--	--
Nickel	ug/l	NS	NS	9.1	76	0.74 J	14
Potassium	ug/l	NS	NS	2400	1400	1300	2400
Selenium	ug/l	50	NS	0.82 J	--	--	--
Sodium	ug/l	NS	NS	71000	140000	2400	3500
Thallium	ug/l	2	NS	--	--	--	--
Vanadium	ug/l	NS	NS	--	--	--	--
Zinc	ug/l	NS	5000	58 J	81 J	9.6 J	28 J

Notes:
MCL = Maximum Contaminant Level exceedances are shaded
SMCL = Secondary Maximum Contaminant Level exceedances are bolded
-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics			Sample Location Sample ID Date	FM17MW12S FM17MW12S(082614) 8/26/2014	FM17MW13S FM17MW13S(082814) 8/28/2014	FM17MW14 FM17MW14(082614) 8/26/2014	FM17MW17 FM17DUP01(082814) 8/28/2014
Analyte	**Units**	**MCL**	**SMCL**				
Aluminum	ug/l	NS	**50**	**410 J**	**1900 J**	39 J	**360 J**
Antimony	ug/l	6	NS	0.15 J	--	0.098 J	0.21 J
Arsenic	ug/l	10	NS	17	--	32	0.40 J
Barium	ug/l	2000	NS	81	44	67	31
Beryllium	ug/l	4	NS	0.46	2.5	--	--
Cadmium	ug/l	5	NS	0.48	0.47	--	--
Calcium	ug/l	NS	NS	44000	36000	85000	29000
Chromium	ug/l	100	NS	0.55 J	1.4 J	2.7 J	0.47 J
Cobalt	ug/l	NS	NS	18	36	6.2	0.22 J
Copper	ug/l	1000	1000	39 J	15 J	0.67 J	2.3 J
Iron	ug/l	NS	**300**	**82000**	**920**	**140000**	**2200**
Lead	ug/l	15	NS	0.20 J	3.3	0.17 J	0.26 J
Magnesium	ug/l	NS	NS	8000	6100	18000	2800
Manganese	ug/l	NS	**50**	**1700**	**810**	**1300**	3.5 J
Mercury	ug/l	2	NS	--	--	--	--
Nickel	ug/l	NS	NS	9.6	9.6	2.6 J	0.84 J
Potassium	ug/l	NS	NS	3700	2600	7400	2700
Selenium	ug/l	50	NS	0.54 J	--	0.67 J	0.27 J
Sodium	ug/l	NS	NS	2700	3900	7400	14000
Thallium	ug/l	2	NS	--	--	--	--
Vanadium	ug/l	NS	NS	--	--	--	--
Zinc	ug/l	NS	5000	61 J	39 J	26 J	14 J

Notes:
MCL = Maximum Contaminant Level exceedances are shaded
SMCL = Secondary Maximum Contaminant Level exceedances are bolded
-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics			Sample Location Sample ID Date	FM17MW17 FM17MW17(082814) 8/28/2014	FM17MW18 FM17MW18(082814) 8/28/2014	FM17MW19 FM17MW19(082614) 8/26/2014	FM17MW20 FM17MW20(082914) 8/29/2014
Analyte	**Units**	**MCL**	**SMCL**				
Aluminum	ug/l	NS	**50**	**330 J**	13 J	37 J	**410 J**
Antimony	ug/l	6	NS	0.16 J	--	0.15 J	--
Arsenic	ug/l	10	NS	0.28 J	2	36	0.77 J
Barium	ug/l	2000	NS	29	98	320	98
Beryllium	ug/l	4	NS	--	0.046 J	--	0.96
Cadmium	ug/l	5	NS	--	--	--	0.11
Calcium	ug/l	NS	NS	28000	24000	73000	3700
Chromium	ug/l	100	NS	0.79 J	0.66 J	2.4 J	--
Cobalt	ug/l	NS	NS	0.23 J	8.3	0.88 J	8.7
Copper	ug/l	1000	1000	2.3 J	2.1 J	--	--
Iron	ug/l	NS	**300**	**2000**	**23000**	**45000**	**740**
Lead	ug/l	15	NS	0.36 J	--	0.085 J	0.22 J
Magnesium	ug/l	NS	NS	2700	4000	38000	3200
Manganese	ug/l	NS	**50**	3.4 J	**270**	**99**	**110**
Mercury	ug/l	2	NS	--	--	--	--
Nickel	ug/l	NS	NS	0.87 J	10	12	8.3
Potassium	ug/l	NS	NS	2700	2500	52000	1200
Selenium	ug/l	50	NS	0.51 J	0.39 J	4.6	--
Sodium	ug/l	NS	NS	13000	61000	160000	2700
Thallium	ug/l	2	NS	--	--	--	--
Vanadium	ug/l	NS	NS	--	--	19	1.8 J
Zinc	ug/l	NS	5000	15 J	42 J	110 J	71 J

Notes:
MCL = Maximum Contaminant Level exceedances are shaded
SMCL = Secondary Maximum Contaminant Level exceedances are bolded
-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Pesticides/Herbicides			Sample Location Sample ID Date	FM17MW07S FM17MW7S(082714) 8/27/2014	FM17MW12S FM17MW12S(082614) 8/26/2014	FM17MW19 FM17MW19(082614) 8/26/2014
Analyte	**Units**	**MCL**	**SMCL**			
2,4,5-TP	ug/l	50	NS	--	--	0.56
4,4-DDE	ug/l	NS	NS	--	0.0015 J	--
Alpha-Bhc	ug/l	NS	NS	0.0013 J	0.0014 J	--
Beta-Bhc	ug/l	NS	NS	0.0041 J	0.0079 J	--
Dieldrin	ug/l	NS	NS	--	--	0.017 J
Endosulfan II	ug/l	NS	NS	0.018 J	0.022 J	--
Endosulfan Sulfate	ug/l	NS	NS	0.0012 J	--	--
Endrin Aldehyde	ug/l	NS	NS	0.0041 J	0.0024 J	--
Endrin Ketone	ug/l	NS	NS	--	0.0022 J	--
Gamma-Bhc	ug/l	0.2	NS	--	0.0017 J	--

Notes:
MCL = Maximum Contaminant Level exceedances are shaded
SMCL = Secondary Maximum Contaminant Level exceedances are bolded
-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Semi-volatile Organic Compounds			Sample Location Sample ID Date	FM17MW19 FM17MW19(082614) 8/26/2014
Analyte	**Units**	**MCL**	**SMCL**	
1,2-Dichlorobenzene	ug/l	600	NS	3.5 J
1,4-Dichlorobenzene	ug/l	75	NS	7.2
Diethyl Phthalate	ug/l	NS	NS	6
Naphthalene	ug/l	NS	NS	4.9 J

Notes:
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-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Volatile Organic Compounds			Sample Location Sample ID Date	FM17MW02S FM17MW2S(082814) 8/28/2014	FM17MW05 FM17MW5(082514) 8/25/2014	FM17MW07S FM17MW7S(082714) 8/27/2014	FM17MW105 FM17MW105(082614) 8/26/2014
Analyte	**Units**	**MCL**	**SMCL**				
1,1-Dichloroethane	ug/l	NS	NS	--	--	0.20 J	--
1,2,4-Trichlorobenzene	ug/l	70	NS	--	--	--	--
1,2-Dichlorobenzene	ug/l	600	NS	--	--	--	--
1,2-Dichloropropane	ug/l	5	NS	--	--	--	--
1,3-Dichlorobenzene	ug/l	NS	NS	--	--	--	--
1,4-Dichlorobenzene	ug/l	75	NS	0.17 J	--	1.1	--
2-Phenylbutane	ug/l	NS	NS	--	--	--	--
Benzene	ug/l	5	NS	--	--	0.69	--
CFC-12	ug/l	NS	NS	--	--	--	--
Chlorobenzene	ug/l	100	NS	0.22 J	--	1.9	--
Chloroethane	ug/l	NS	NS	--	--	0.46 J	--
Chloroform	ug/l	80	NS	--	--	--	--
cis-1,2-Dichloroethene	ug/l	70	NS	--	0.18 J	--	--
Isopropylbenzene	ug/l	NS	NS	--	--	--	--
Methyl-Tert-Butylether	ug/l	NS	NS	--	--	0.26 J	2.2
Naphthalene	ug/l	NS	NS	--	--	--	--
N-Butylbenzene	ug/l	NS	NS	--	--	--	--
N-Propylbenzene	ug/l	NS	NS	--	--	--	--
Toluene	ug/l	1000	NS	--	--	--	--
trans-1,2-Dichloroethene	ug/l	100	NS	--	--	--	--
Trichloroethene	ug/l	5	NS	--	0.45 J	--	--
Vinyl Chloride	ug/l	2	NS	0.35 J	--	--	--

Notes:
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-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Volatile Organic Compounds			Sample Location Sample ID Date	FM17MW106 FM17MW106(082714) 8/27/2014	FM17MW107 FM17MW107(082714) 8/27/2014	FM17MW10S FM17MW10S(082714) 8/27/2014	FM17MW12S FM17MW12S(082614) 8/26/2014	FM17MW14 FM17MW14(082614) 8/26/2014
Analyte	**Units**	**MCL**	**SMCL**					
1,1-Dichloroethane	ug/l	NS	NS	--	--	0.66	--	--
1,2,4-Trichlorobenzene	ug/l	70	NS	--	--	--	--	--
1,2-Dichlorobenzene	ug/l	600	NS	--	--	--	--	3.5
1,2-Dichloropropane	ug/l	5	NS	--	--	--	--	--
1,3-Dichlorobenzene	ug/l	NS	NS	--	--	--	--	--
1,4-Dichlorobenzene	ug/l	75	NS	--	--	0.45 J	1.9	3.5
2-Phenylbutane	ug/l	NS	NS	--	--	--	--	--
Benzene	ug/l	5	NS	--	--	0.5	0.96	1.4
CFC-12	ug/l	NS	NS	--	--	--	--	3.2
Chlorobenzene	ug/l	100	NS	--	--	0.18 J	0.91	14
Chloroethane	ug/l	NS	NS	--	--	--	0.53	1
Chloroform	ug/l	80	NS	1.5	0.51	--	--	--
cis-1,2-Dichloroethene	ug/l	70	NS	--	--	0.59	0.18 J	0.19 J
Isopropylbenzene	ug/l	NS	NS	--	--	--	--	--
Methyl-Tert-Butylether	ug/l	NS	NS	--	--	--	--	--
Naphthalene	ug/l	NS	NS	--	--	--	--	--
N-Butylbenzene	ug/l	NS	NS	--	--	--	--	--
N-Propylbenzene	ug/l	NS	NS	--	--	--	--	--
Toluene	ug/l	1000	NS	--	--	--	--	--
trans-1,2-Dichloroethene	ug/l	100	NS	--	--	--	--	--
Trichloroethene	ug/l	5	NS	--	--	--	--	--
Vinyl Chloride	ug/l	2	NS	--	--	--	--	--

Notes:
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SMCL = Secondary Maximum Contaminant Level exceedances are bolded
-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Volatile Organic Compounds			Sample Location Sample ID Date	FM17MW18 FM17MW18(082814) 8/28/2014	FM17MW19 FM17MW19(082614) 8/26/2014
Analyte	**Units**	**MCL**	**SMCL**		
1,1-Dichloroethane	ug/l	NS	NS	--	0.82
1,2,4-Trichlorobenzene	ug/l	70	NS	--	0.55
1,2-Dichlorobenzene	ug/l	600	NS	--	--
1,2-Dichloropropane	ug/l	5	NS	--	0.19 J
1,3-Dichlorobenzene	ug/l	NS	NS	--	5.3
1,4-Dichlorobenzene	ug/l	75	NS	0.57	12
2-Phenylbutane	ug/l	NS	NS	--	1.7
Benzene	ug/l	5	NS	--	8.1
CFC-12	ug/l	NS	NS	--	1.1
Chlorobenzene	ug/l	100	NS	--	5.7
Chloroethane	ug/l	NS	NS	--	1
Chloroform	ug/l	80	NS	--	--
cis-1,2-Dichloroethene	ug/l	70	NS	--	0.61
Isopropylbenzene	ug/l	NS	NS	--	3.8
Methyl-Tert-Butylether	ug/l	NS	NS	--	1.8
Naphthalene	ug/l	NS	NS	--	5.8
N-Butylbenzene	ug/l	NS	NS	--	1.7
N-Propylbenzene	ug/l	NS	NS	--	3.7
Toluene	ug/l	1000	NS	--	0.20 J
trans-1,2-Dichloroethene	ug/l	100	NS	--	0.40 J
Trichloroethene	ug/l	5	NS	--	--
Vinyl Chloride	ug/l	2	NS	--	--

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-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Wet Chemistry			Sample Location Sample ID Date	FM17MW02S FM17MW2S(082814) 8/28/2014	FM17MW04S FM17MW4S(082914) 8/29/2014	FM17MW05 FM17MW5(082514) 8/25/2014	FM17MW07S FM17MW7S(082714) 8/27/2014
Analyte	**Units**	**MCL**	**SMCL**				
Alkalinity	mg/l	NS	NS	32	--	--	190
Ammonia Nitrogen	mg/l	NS	NS	1.1	--	--	6.9
Chemical Oxygen Demand	mg/l	NS	NS	13 J	9.3 J	--	24 J
Chloride	mg/l	NS	**250**	33	7.4	27	83
Nitrate-N	mg/l	10	NS	--	--	--	0.038 J
Nitrogen, as Ammonia	mg/l	NS	NS	1.1	--	--	6.9
Odor	t.o.n.	NS	**3**	1.97	1.52	1	**6.96**
pH	SU	NS	8.5	6.16	4.02	3.9	6.22
Platinum Cobalt Color Units	color unit	NS	**15**	**30**	--	5	--
Specific Conductivity	umhos/cm	NS	NS	178	111	134	655
Sulfate	mg/l	NS	**250**	14	130	71 J	19
Sulfide	mg/l	NS	NS	--	--	--	1
Total Dissolved Solids	mg/l	NS	**500**	100	64	51	350
Total Hardness	mg/l	NS	NS	42	17	16 J	--
Turbidity	ntu	NS	NS	220	11	22	520

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ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Wet Chemistry			Sample Location Sample ID Date	FM17MW08 FM17MW8(082714) 8/27/2014	FM17MW105 FM17MW105(082614) 8/26/2014	FM17MW106 FM17MW106(082714) 8/27/2014	FM17MW107 FM17MW107(082714) 8/27/2014
Analyte	**Units**	**MCL**	**SMCL**				
Alkalinity	mg/l	NS	NS	--	4.8 J	--	23
Ammonia Nitrogen	mg/l	NS	NS	0.12	--	--	--
Chemical Oxygen Demand	mg/l	NS	NS	--	5.9 J	13 J	--
Chloride	mg/l	NS	**250**	3.9	130	**260**	3.5
Nitrate-N	mg/l	10	NS	--	1.8	--	1.1 J
Nitrogen, as Ammonia	mg/l	NS	NS	0.12	--	--	--
Odor	t.o.n.	NS	**3**	**4**	1	**55.2**	1.32
pH	SU	NS	8.5	4.77	4.81	4.26	5.85
Platinum Cobalt Color Units	color unit	NS	**15**	--	--	--	--
Specific Conductivity	umhos/cm	NS	NS	94.3	480	923	98.2
Sulfate	mg/l	NS	**250**	100	58	160	16
Sulfide	mg/l	NS	NS	--	--	--	--
Total Dissolved Solids	mg/l	NS	**500**	--	280	530	--
Total Hardness	mg/l	NS	NS	12 J	59 J	110	41
Turbidity	ntu	NS	NS	8	10	5.6	4.6

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mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Wet Chemistry			Sample Location Sample ID Date	FM17MW10S FM17MW10S(082714) 8/27/2014	FM17MW12S FM17MW12S(082614) 8/26/2014	FM17MW13S FM17MW13S(082814) 8/28/2014	FM17MW14 FM17MW14(082614) 8/26/2014
Analyte	**Units**	**MCL**	**SMCL**				
Alkalinity	mg/l	NS	NS	66	42	--	270
Ammonia Nitrogen	mg/l	NS	NS	0.81	3.6	--	8.4
Chemical Oxygen Demand	mg/l	NS	NS	14 J	14 J	9.9 J	41 J
Chloride	mg/l	NS	**250**	6.7	2.4	2.8	7
Nitrate-N	mg/l	10	NS	--	6.8	21	0.012 J
Nitrogen, as Ammonia	mg/l	NS	NS	0.81	3.6	--	8.4
Odor	t.o.n.	NS	**3**	--	1	1	**528**
pH	SU	NS	8.5	5.72	5.67	4.2	6.19
Platinum Cobalt Color Units	color unit	NS	**15**	--	**380**	--	**380**
Specific Conductivity	umhos/cm	NS	NS	205	452	323	659
Sulfate	mg/l	NS	**250**	37	**310**	160	55
Sulfide	mg/l	NS	NS	--	--	--	--
Total Dissolved Solids	mg/l	NS	**500**	130	330	230	440
Total Hardness	mg/l	NS	NS	56	--	130	--
Turbidity	ntu	NS	NS	83	280	14	420

Notes:
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-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 5
Upper Patapsco Aquifer Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Wet Chemistry			Sample Location Sample ID Date	FM17MW17 FM17DUP01(082814) 8/28/2014	FM17MW17 FM17MW17(082814) 8/28/2014	FM17MW18 FM17MW18(082814) 8/28/2014	FM17MW19 FM17MW19(082614) 8/26/2014	FM17MW20 FM17MW20(082914) 8/29/2014
Analyte	**Units**	**MCL**	**SMCL**					
Alkalinity	mg/l	NS	NS	87	86	69	640	--
Ammonia Nitrogen	mg/l	NS	NS	--	--	0.87	66	--
Chemical Oxygen Demand	mg/l	NS	NS	--	--	9.9 J	100 J	--
Chloride	mg/l	NS	**250**	10	10	78	250	4.9
Nitrate-N	mg/l	10	NS	1.5	1.5	1.1	--	0.089
Nitrogen, as Ammonia	mg/l	NS	NS	--	--	0.87	66	--
Odor	t.o.n.	NS	**3**	1	1.58	1.58	**2790**	1.15
pH	SU	NS	8.5	6.58	6.6	6.29	6.38	4.67
Platinum Cobalt Color Units	color unit	NS	**15**	--	--	**35**	**250**	--
Specific Conductivity	umhos/cm	NS	NS	229	230	449	1960	725
Sulfate	mg/l	NS	**250**	10	10	38	15	60
Sulfide	mg/l	NS	NS	--	--	--	--	--
Total Dissolved Solids	mg/l	NS	**500**	150	150	260	**970**	50
Total Hardness	mg/l	NS	NS	92	92	82	--	19
Turbidity	ntu	NS	NS	39	43	58	430	11

Notes:
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-- = non detects
mg/L = milligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 6
Upper Patapsco Aquifer Detections Above Maximum Contaminant Levels
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Well ID	Analyte	MCL	Concentration (ug/L)
FM17MW12S	Arsenic	10	17
FM17MW14	Arsenic	10	32
FM17MW19	Arsenic	10	36
FM17MW19	Benzene	5	8.1
FM17MW13S	Nitrate-N	10	21

*MCLs are from the "National Primary Water Drinking Water" regulations, USEPA website updated May 2009
Notes:
MCL = Maximum Contaminant Level
Laboratory Data qualifiers are defined in Appendix C Table C-1
ug/L= micrograms per liter

Table 7
Upper Patapsco Aquifer Detections Above Secondary Maximum Contaminant Levels
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics

Well ID	Analyte	SMCL	
FM17MW02S	Aluminum	50	230 J
FM17MW02S	Iron	300	46000
FM17MW02S	Manganese	50	510
FM17MW04S	Aluminum	50	2300 J
FM17MW04S	Iron	300	1000
FM17MW05	Aluminum	50	610 J
FM17MW05	Iron	300	1000
FM17MW05	Manganese	50	360
FM17MW07S	Iron	300	51000
FM17MW07S	Manganese	50	780
FM17MW08	Aluminum	50	290 J
FM17MW08	Iron	300	4900
FM17MW08	Manganese	50	230
FM17MW105	Aluminum	50	380 J
FM17MW105	Manganese	50	68
FM17MW106	Aluminum	50	2600 J
FM17MW106	Iron	300	4300
FM17MW106	Manganese	50	270
FM17MW107	Aluminum	50	120 J
FM17MW10S	Iron	300	40000
FM17MW10S	Manganese	50	540
FM17MW12S	Aluminum	50	410 J
FM17MW12S	Iron	300	82000
FM17MW12S	Manganese	50	1700
FM17MW13S	Aluminum	50	1900 J
FM17MW13S	Iron	300	920
FM17MW13S	Manganese	50	810
FM17MW14	Iron	300	140000
FM17MW14	Manganese	50	1300
FM17MW17 - Duplicate	Aluminum	50	360 J
FM17MW17	Aluminum	50	330 J
FM17MW17 - Duplicate	Iron	300	2200
FM17MW17	Iron	300	2000
FM17MW18	Iron	300	23000
FM17MW18	Manganese	50	270
FM17MW19	Iron	300	45000
FM17MW19	Manganese	50	99
FM17MW20	Aluminum	50	410 J
FM17MW20	Iron	300	740
FM17MW20	Manganese	50	110
FM17MW02S	Platinum Cobalt Color Units	15	30
FM17MW07S	Odor	3	6.96
FM17MW08	Odor	3	4.00
FM17MW106	Chloride	250	260
FM17MW106	Odor	3	55.2
FM17MW12S	Platinum Cobalt Color Units	15	380
FM17MW12S	Sulfate	250	310
FM17MW14	Odor	3	528
FM17MW14	Platinum Cobalt Color Units	15	380
FM17MW18	Platinum Cobalt Color Units	15	35
FM17MW19	Odor	3	2790
FM17MW19	Platinum Cobalt Color Units	15	250
FM17MW19	Total Dissolved Solids	500	970

Notes:
SMCL = Secondary Maximum Contaminant Level
* SMCLs are from the "national Secondary Water Drinking Water" regulations, United States Environmental Protection Agency website updated May 2009
Laboratory Data qualifiers are defined in Appendix C Table C-1
J = estimated concentration

Table 8
Surface Water Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Inorganics	Sample Location Sample ID Date	Maryland Water Quality Criteria		FM17SW01 FM17SW1(082514) 8/25/2014	FM17SW03 FM17DUP02(082514) 8/25/2014	FM17SW03 FM17SW3(082514) 8/25/2014
Analyte	Units	Drinking Water	Fresh Water			
Aluminum	ug/l	3700	NS	510 J	13 J	46 J
Antimony	ug/l	6	NS	0.30 J	--	--
Arsenic	ug/l	10	150	3.6	1.3 J	0.68 J
Barium	ug/l	2000	NS	42	61	62
Beryllium	ug/l	4	NS	0.032 J	--	--
Calcium	ug/l	NS	NS	34000	33000	33000
Chromium	ug/l	100	NS	1.4 J	--	--
Cobalt	ug/l	NS	NS	1.6 J	0.26 J	0.34 J
Copper	ug/l	1300	9	5.6	2.5	--
Iron	ug/l	2600	NS	5200	3800	3600
Lead	ug/l	15	**2.5**	**2.7**	--	--
Magnesium	ug/l	NS	NS	5000	5800	5800
Manganese	ug/l	73	NS	300	190	220
Mercury	ug/l	NS	0.77	0.11	0.12	--
Nickel	ug/l	73	52	5.6	1.9 J	2.8 J
Potassium	ug/l	NS	NS	4200	5800	5700
Selenium	ug/l	50	5	0.43 J	0.30 J	0.41 J
Sodium	ug/l	NS	NS	31000	17000	16000
Vanadium	ug/l	3.7	NS	1.6 J	--	--
Zinc	ug/l	1100	120	27	28	32

Notes:
Laboratory data qualifiers are defined in Appendix C Table C-1
Shaded - value exceeds Maryland Water Quality Criteria for Human Health for Consumption of Drinking Water
Bolded - value exceeds Maryland Chronic Ambient Water Quality Criteria for Fresh Water
--non detects
mg/L = miligrams per liter
ug/L = micrograms per liter
ntu = nephelometric turbidity units
t.o.n. = threshold odor number
umhos/cm = micromhos per centimeter
NS = not specified
J = estimated concentration

Table 8
Surface Water Positive Detections
FGGM-17 Closed Sanitary Landfill
Fort George G. Meade, Maryland

Wet Chemistry	Sample Location Sample ID Date	Maryland Water Quality Criteria		FM17SW01 FM17SW1(082514) 8/25/2014	FM17SW03 FM17DUP02(082514) 8/25/2014	FM17SW03 FM17SW3(082514) 8/25/2014
Analyte	Units	Drinking Water	Fresh Water			
Alkalinity	mg/l	NS	NS	93 J	110 J	110 J
Ammonia Nitrogen	mg/l	NS	NS	0.23	0.36	0.33
Chemical Oxygen Demand	mg/l	NS	NS	27 J	24 J	18 J
Chloride	mg/l	NS	NS	52	25	25
Nitrate-N	mg/l	NS	NS	0.048	0.2	0.15
Nitrogen, as Ammonia	mg/l	NS	NS	0.23	0.36	0.33
Odor	t.o.n.	NS	NS	1	1	1
pH	SU	NS	NS	6.59	7.23	7.16
Platinum Cobalt Color Units	color unit	NS	NS	130	45	40
Specific Conductivity	umhos/cm	NS	NS	349	293	289
Sulfate	mg/l	NS	NS	4.0 J	2.8 J	2.8 J
Sulfide	mg/l	NS	NS	--	0.90 J	--
Total Dissolved Solids	mg/l	NS	NS	220	180	160
Total Hardness	mg/l	NS	NS	120 J	120 J	120 J
Turbidity	ntu	NS	NS	110	22	17

Notes:
Laboratory data qualifiers are defined in Appendix C Table C-1
Shaded - value exceeds Maryland Water Quality Criteria for Human Health for Consumption of Drinking Water
Bolded - value exceeds Maryland Chronic Ambient Water Quality Criteria for Fresh Water
--non detects
mg/L = miligrams per liter
ntu = nephelometric turbidity units
t.o.n. = threshold odor number
umhos/cm = micromhos per centimeter
SU = standard units
J = estimated concentration
NS = not specified

Table 9. Statistical Analysis of Metals Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Thallium	Vanadium	Zinc
MW-4S																		
Outliers	Yes	No	No	No	Yes	No	No	No	No	Yes	Yes	Yes	No	Yes	No	No	No	No
Distribution	Normal	ND	ND	Normal	Normal	Normal	Unknown	Normal	Normal	Normal	Lognormal	Normal	ND	Lognormal	ND	ND	ND	Normal
Detection Freq.	11	2	3	12	8	8	6	11	7	12	9	12	3	7	2	0	2	12
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-5																		
Outliers	No	No	No	No	Yes (2)	No	No	No	Yes	No	No	No	No	Yes (2)	No	No	No	No
Distribution	Unknown	ND	ND	Normal	Normal	Unknown	Unknown	Normal	Normal	Lognormal	Lognormal	Normal	Unknown	Normal	Unknown	Unknown	ND	Normal
Detection Freq.	9	3	3	12	7	7	4	12	12	12	10	12	4	12	4	6	0	12
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-7S																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Unknown	Unknown	Normal	Normal	ND	ND	Normal	Normal	ND	Normal	Unknown	Normal	Lognormal	Unknown	Unknown	ND	Unknown	ND
Detection Freq.	6	5	9	12	2	0	5	12	1	12	4	12	4	5	5	2	5	3
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-13S																		
Outliers	No	No	No	No	No	No	No	No	Yes	No	No	Yes	No	No	No	No	No	No
Distribution	Normal	Lognormal	Lognormal	Normal	Normal	Normal	Lognormal	Lognormal	Lognormal	Lognormal	Unknown	Lognormal	ND	Normal	Lognormal	ND	ND	Normal
Detection Freq.	11	4	5	12	10	11	7	12	11	12	9	12	0	12	6	3	2	12
Trend	No	Decreasing	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-17																		
Outliers	No	No	No	No	No	No	Yes	No	Yes	No	No	No	No	No	No	No	No	No
Distribution	Normal	Lognormal	Lognormal	Normal	ND	ND	Normal	Unknown	Lognormal	Lognormal	Lognormal	Unknown	ND	Lognormal	Lognormal	ND	Unknown	Lognormal
Detection Freq.	10	6	7	12	3	1	9	7	10	12	9	10	3	6	6	2	5	6
Trend	No	No	No	No	No	No	No	Decreasing	No	No	No	No	No	No	No	No	Decreasing	No
MW-10S																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No
Distribution	Unknown	ND	Lognormal	Normal	ND	ND	ND	Normal	ND	Normal	Unknown	Normal	Lognormal	Normal	ND	ND	ND	Normal
Detection Freq.	6	1	4	12	1	2	1	12	2	12	6	12	4	8	0	3	0	8
Trend	Decreasing	No	No	No	No	No	No	No	No	No	Decreasing	No	No	No	No	No	No	No
MW-8																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Normal	ND	ND	Normal	Unknown	Lognormal	Normal	Lognormal	Lognormal	Normal	Lognormal	Normal	ND	Normal	ND	ND	ND	Normal
Detection Freq.	9	2	3	12	7	8	5	12	5	12	9	12	3	12	2	0	1	12
Trend	No	No	No	No	Decreasing	No	Decreasing	No	No	No	No	No	No	No	No	No	No	No
MW-12S																		
Outliers	Yes	No	No	No	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No
Distribution	Lognormal	ND	Lognormal	Normal	Unknown	Lognormal	Lognormal	Lognormal	Lognormal	Normal	Lognormal	Normal	ND	Lognormal	Lognormal	ND	ND	Lognormal
Detection Freq.	8	3	9	12	5	7	7	10	12	12	7	12	1	6	8	2	0	10
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-2S																		
Outliers	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Unknown	ND	Lognormal	Normal	Unknown	Unknown	Normal	Normal	Lognormal	Normal	Lognormal	Lognormal	ND	Normal	Lognormal	ND	ND	Lognormal
Detection Freq.	9	2	7	12	5	6	4	11	10	12	8	12	3	7	5	1	1	11
Trend	No	No	No	No	Decreasing	Decreasing	No	No	No	No	Decreasing	No	No	No	No	No	No	No

Footnotes one page 2.

Table 9. Statistical Analysis of Metals Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Selenium	Thallium	Vanadium	Zinc
MW-14																		
Outliers	No	No	No	No	No	No	Yes (2)	No	No	No	No	No	No	No	Yes	No	No	No
Distribution	Unknown	Unknown	Normal	Normal	ND	ND	Normal	Unknown	Lognormal	Normal	Lognormal	Lognormal	ND	Unknown	Lognormal	ND	Normal	Lognormal
Detection Freq.	8	4	12	12	1	2	10	7	6	12	6	12	3	6	6	2	6	7
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-18																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Lognormal	Lognormal	Normal	Normal	Unknown	ND	Unknown	Normal	Lognormal	Normal	Lognormal	Lognormal	ND	Lognormal	Lognormal	ND	ND	Lognormal
Detection Freq.	8	4	10	12	4	0	5	7	10	12	6	12	3	7	5	3	1	7
Trend	No	No	No	No	Decreasing	No	No	No	No	No	Decreasing	No	No	No	No	No	No	No
MW-19																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Unknown	Unknown	Normal	Normal	ND	ND	Normal	Unknown	Lognormal	Normal	Unknown	Normal	ND	Unknown	Unknown	ND	Normal	Unknown
Detection Freq.	7	5	12	12	3	0	9	6	6	12	6	12	1	7	7	2	12	6
Trend	No	No	No	No	No	No	No	Decreasing	No	Decreasing	No	No	No	No	No	No	No	No
MW-20																		
Outliers	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	Yes
Distribution	Unknown	ND	Lognormal	Normal	Unknown	Normal	ND	Normal	Lognormal	Lognormal	Lognormal	Normal	ND	Unknown	Unknown	ND	Unknown	Normal
Detection Freq.	10	2	4	12	5	8	2	12	7	12	8	12	3	7	4	1	4	12
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-105																		
Outliers	No	No	No	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No
Distribution	Normal	Lognormal	Unknown	Lognormal	Unknown	Normal	Lognormal	Normal	Lognormal	Lognormal	Lognormal	Normal	Lognormal	Lognormal	Normal	ND	ND	Normal
Detection Freq.	11	4	4	11	6	8	8	12	11	11	8	11	4	9	6	1	1	11
Trend	No	No	Decreasing	No	No	No	No	No	No	No	No	No	Decreasing	No	No	No	No	No
MW-106																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Normal	ND	Lognormal	Normal	Lognormal	Lognormal	Normal	Unknown	Normal	Lognormal	Unknown	Normal	Lognormal	Unknown	Normal	ND	ND	Normal
Detection Freq.	12	3	5	12	12	10	6	12	10	12	9	12	6	12	4	2	2	12
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-107																		
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Lognormal	ND	ND	Normal	ND	ND	ND	Unknown	Lognormal	Normal	Lognormal	Unknown	ND	Unknown	ND	ND	ND	Normal
Detection Freq.	8	1	1	12	2	0	3	5	5	11	7	4	2	5	2	0	0	7
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Footnotes:

Detection Freq. is the detection frequency.

If more than one outlier is found, the number is indicated in parentheses after "Yes."

NDs indicates that there was an insufficient number of detections to determine the distribution.
If the number of detections was 3 or fewer, any "outlier" reported by SANITAS was ignored, and
the distribution was reported as ND, regardless of the findings of SANITAS.

If the Mann-Kendall test did not indicate a statistically significant trend, "No" was recorded for trend.
If the trend was statstically significant but decreasing, then "Decreasing" was indicated.
If the trend was statstically significant and increasing, then "**Increasing**" was indicated in **bold font**.

Table 10. Statistical Analysis of Inorganic Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	Chloride	Nitrate-N	Nitrogen	Sulfate	Calcium	Magnesium	Potassium	Sodium
MW-4S								
Outliers	No	No	No	Yes	No	No	Yes	No
Distribution	Normal	Lognormal	ND	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	9	2	12	12	10	9	12
Trend	No	No	No	No	No	No	No	No
MW-5								
Outliers	No	No	No	No	No	Yes	No	No
Distribution	Normal	Lognormal	Unknown	Normal	Normal	Normal	Unknown	Normal
Detection Freq.	12	9	4	12	12	10	7	12
Trend	No	No	No	No	**Increasing**	No	No	No
MW-7S								
Outliers	No	No	No	No	No	Yes	No	No
Distribution	Normal	Lognormal	Normal	Normal	Normal	Normal	Lognormal	Normal
Detection Freq.	12	6	12	12	12	12	12	12
Trend	No	No	No	Decreasing	No	No	**Increasing**	No
MW-13S								
Outliers	No	No	No	No	No	No	No	No
Distribution	Normal	Normal	Lognormal	Normal	Normal	Normal	Lognormal	Normal
Detection Freq.	12	12	8	12	12	12	12	12
Trend	No	No	No	No	No	No	No	No
MW-17								
Outliers	No	No	No	No	No	No	No	No
Distribution	Lognormal	Normal	ND	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	12	3	12	12	12	12	12
Trend	No	No	No	No	No	No	No	No
MW-10S								
Outliers	No	No	No	No	Yes	Yes	No	Yes
Distribution	Unknown	Unknown	Normal	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	4	12	12	12	12	12	12
Trend	No	No	No	No	No	No	No	No
MW-8								
Outliers	No	No	No	No	No	No	No	No
Distribution	Unknown	Unknown	Unknown	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	4	5	12	12	11	8	12
Trend	Decreasing	No	No	No	No	No	No	No
MW-12S								
Outliers	Yes	No	No	No	No	Yes	No	Yes
Distribution	Normal	Lognormal	Normal	Normal	Normal	Normal	Normal	Normal
Detection Freq.	11	12	11	12	12	12	12	11
Trend	Decreasing	No	No	**Increasing**	No	**Increasing**	No	No
MW-2S								
Outliers	No	No	No	No	No	No	No	No
Distribution	Lognormal	Unknown	Normal	Normal	Lognormal	Unknown	Normal	Lognormal
Detection Freq.	12	6	11	12	12	8	9	10
Trend	No	No	No	No	No	No	No	No

Footnotes one page 2.

Table 10. Statistical Analysis of Inorganic Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	Chloride	Nitrate-N	Nitrogen	Sulfate	Calcium	Magnesium	Potassium	Sodium
MW-14								
Outliers	No	No	No	No	No	Yes	No	No
Distribution	Lognormal	Unknown	Normal	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	5	12	11	12	12	12	12
Trend	No	No	No	No	No	No	No	No
MW-18								
Outliers	No	No	No	No	No	No	No	No
Distribution	Normal	Lognormal	Lognormal	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	7	12	10	12	12	12	12
Trend	No	No	No	No	No	No	No	No
MW-19								
Outliers	No	No	No	No	No	No	No	Yes
Distribution	Normal	Unknown	Normal	Lognormal	Normal	Normal	Normal	Normal
Detection Freq.	12	5	12	10	12	12	12	11
Trend	Decreasing	No	Decreasing	No	Decreasing	Decreasing	Decreasing	No
MW-20								
Outliers	No	No	No	Yes (2)	Yes	No	No	No
Distribution	Normal	Lognormal	Unknown	Normal	Lognormal	Lognormal	Unknown	Normal
Detection Freq.	12	12	5	12	12	12	9	12
Trend	No	No	No	No	No	No	No	No
MW-105								
Outliers	No	No	No	No	No	No	Yes	No
Distribution	Lognormal	Normal	ND	Lognormal	Normal	Lognormal	Lognormal	Lognormal
Detection Freq.	12	12	1	12	11	12	12	12
Trend	No	No	No	No	No	No	No	No
MW-106								
Outliers	No	No	No	No	No	No	Yes (2)	No
Distribution	Normal	Normal	ND	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	11	2	12	12	12	11	12
Trend	No	No	No	No	No	No	No	No
MW-107								
Outliers	Yes	No	No	No	No	No	No	No
Distribution	Normal	Lognormal	ND	Normal	Normal	Normal	Normal	Normal
Detection Freq.	12	12	2	12	12	11	11	12
Trend	No	No	No	Decreasing	No	No	No	No

Footnotes:

Detection Freq. is the detection frequency.

If more than one outlier is found, the number is indicated in parentheses after "Yes."

NDs indicates that there was an insufficient number of detections to determine the distribution.

If the number of detections was 3 or fewer, any "outlier" reported by SANITAS was ignored, and the distribution was reported as ND, regardless of the findings of SANITAS.

If the Mann-Kendall test did not indicate a statistically significant trend, "No" was recorded for trend.

If the trend was statstically significant but decreasing, then "Decreasing" was indicated.

If the trend was statstically significant and increasing, then "**Increasing**" was indicated in **bold font**.

Table 11. Statistical Analysis of VOC Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	1,1-Dichloro-ethane	1,2-Dichloro-benzene	1,2-Dichloro-propane	1,3,5-Trimethyl-benzene	1,4-Dichloro-benzene	Benzene	CFC-12	Chloro-benzene	Chloro-ethane	cis-1,2-Dichloro-ethene	Ethylbenzene	Tetrachloro-ethene	Toluene	Total Xylenes	trans-1,2-Dichloro-ethene	Trichloro-ethene	Vinyl chloride
MW-4S																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-5																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	Lognormal	ND	ND	ND	ND	ND	Normal	ND
Detection Freq.	0	0	0	0	0	1	0	3	0	7	0	0	1	0	0	12	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-7S																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Unknown	ND	ND	ND	Normal	Normal	ND	Normal	Normal	Lognormal	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	9	1	3	0	12	12	1	12	10	6	0	0	1	0	0	0	0
Trend	No	No	No	No	No	No	No	**Increasing**	No	No	No	No	No	No	No	No	No
MW-13S																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	1	0	0	0	2	0	2	1	0	2	0	0	1	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-17																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-10S																	
Outliers	Yes	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	Normal	ND	ND	ND	Lognormal	Normal	Normal	Unknown	ND	Normal	ND	ND	ND	ND	ND	ND	Unknown
Detection Freq.	11	0	0	0	12	12	8	5	3	12	0	0	1	0	0	0	4
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-8																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-12S																	
Outliers	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	Normal	Lognormal	Normal	Lognormal	Lognormal	Normal	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	1	3	0	0	12	10	6	9	7	7	0	0	2	0	1	3	2
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-2S																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	Unknown	ND	ND	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	Lognormal
Detection Freq.	2	1	0	0	6	3	2	6	1	0	0	0	0	1	0	0	6
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Footnotes one page 2.

Table 11. Statistical Analysis of VOC Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	1,1-Dichloro-ethane	1,2-Dichloro-benzene	1,2-Dichloro-propane	1,3,5-Trimethyl-benzene	1,4-Dichloro-benzene	Benzene	CFC-12	Chloro-benzene	Chloro-ethane	cis-1,2-Dichloroethene	Ethylbenzene	Tetrachloro-ethene	Toluene	Total Xylenes	trans-1,2-Dichloroethene	Trichloro-ethene	Vinyl chloride
MW-14																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	Unknown	ND	ND	Normal	Normal	Lognormal	Lognormal	Normal	Lognormal	ND	ND	Unknown	ND	ND	ND	Unknown
Detection Freq.	1	8	0	0	12	12	11	12	10	8	0	0	6	2	2	2	4
Trend	No	No	No	No	Decreasing	No	No	No	No	No	No	No	No	No	No	No	No
MW-18																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	Normal	Normal	ND	Unknown	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	0	1	0	0	11	7	2	6	2	2	0	0	1	1	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-19																	
Outliers	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	No	No	No
Distribution	Normal	Unknown	Normal	Unknown	Normal	Normal	Normal	Normal	Normal	Normal	Unknown	ND	Normal	Unknown	Normal	ND	Unknown
Detection Freq.	12	10	9	6	12	12	11	12	11	12	8	0	11	7	11	3	6
Trend	No	Decreasing	No	Decreasing	No	No	No	**Increasing**	No	No	Decreasing	No	Decreasing	Decreasing	No	No	No
MW-20																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-105																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Normal	ND	ND	ND	ND	ND
Detection Freq.	0	0	0	0	0	0	1	0	0	0	0	4	1	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-106																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
MW-107																	
Outliers	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Distribution	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Detection Freq.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trend	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No

Footnotes:

Detection Freq. is the detection frequency.

If more than one outlier is found, the number is indicated in parentheses after "Yes."

NDs indicates that there was an insufficient number of detections to determine the distribution.

If the number of detections was 3 or fewer, any "outlier" reported by SANITAS was ignored, and the distribution was reported as ND, regardless of the findings of SANITAS.

If the Mann-Kendall test did not indicate a statistically significant trend, "No" was recorded for trend.

If the trend was statstically significant but decreasing, then "Decreasing" was indicated.

If the trend was statstically significant and increasing, then "**Increasing**" was indicated in **bold font**.

Table 12. Statistical Analysis of SVOC Data - Upper Aquifer, Closed Sanitary Landfill, Fort Meade, MD

	1,4-Dichlorobenzene	Naphthalene
MW-4S		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	0	0
Trend	No	No
MW-7S		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	1	1
Trend	No	No
MW-10S		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	0	1
Trend	No	No
MW-8		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	0	1
Trend	No	No
MW-12S		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	1	1
Trend	No	No
MW-14		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	3	3
Trend	No	No
MW-19		
Outliers	No	No
Distribution	Unknown	Normal
Detection Freq.	8	12
Trend	No	No
MW-107		
Outliers	No	No
Distribution	ND	ND
Detection Freq.	0	1
Trend	No	No

Footnotes:

Detection Freq. is the detection frequency.

If more than one outlier is found, the number is indicated in parentheses after "Yes."

NDs indicates that there was an insufficient number of detections to determine the distribution.

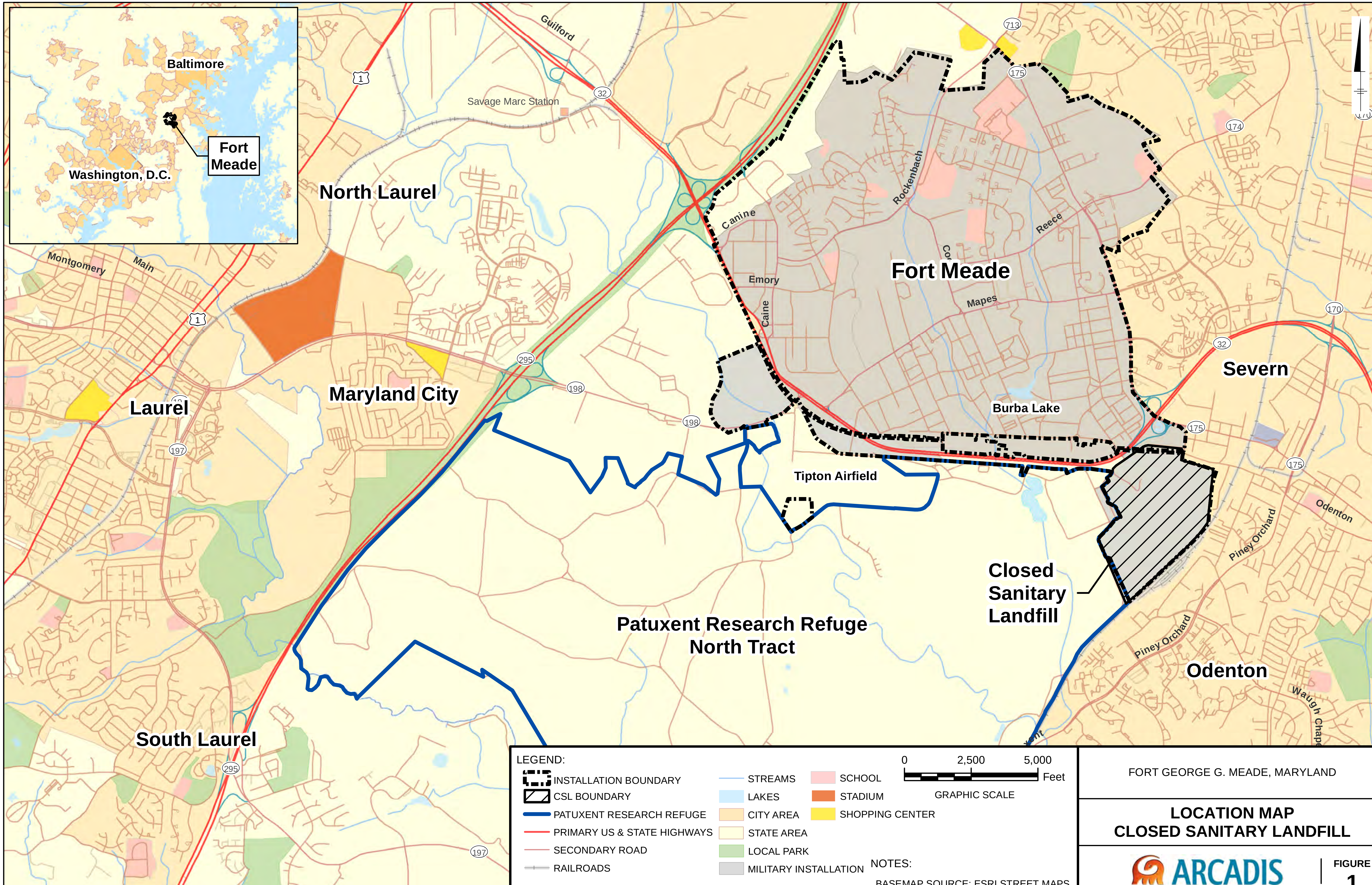
If the number of detections was 3 or fewer, any "outlier" reported by SANITAS was ignored, and the distribution was reported as ND, regardless of the findings of SANITAS.

If the Mann-Kendall test did not indicate a statistically significant trend, "No" was recorded for trend.

If the trend was statstically significant but decreasing, then "Decreasing" was indicated.

If the trend was statstically significant and increasing, then "**Increasing**" was indicated in **bold font**.

Figures



FORT GEORGE G. MEADE, MARYLAND

LOCATION MAP
CLOSED SANITARY LANDFILL

ARCADIS

FIGURE 1

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
FORT MEADE
Document Path: Z:\GISPROJECTS_ENV\Fort_Meade\ArcMap\CSL\2014-10\Fig1_CSL_Location_20141020.mxd

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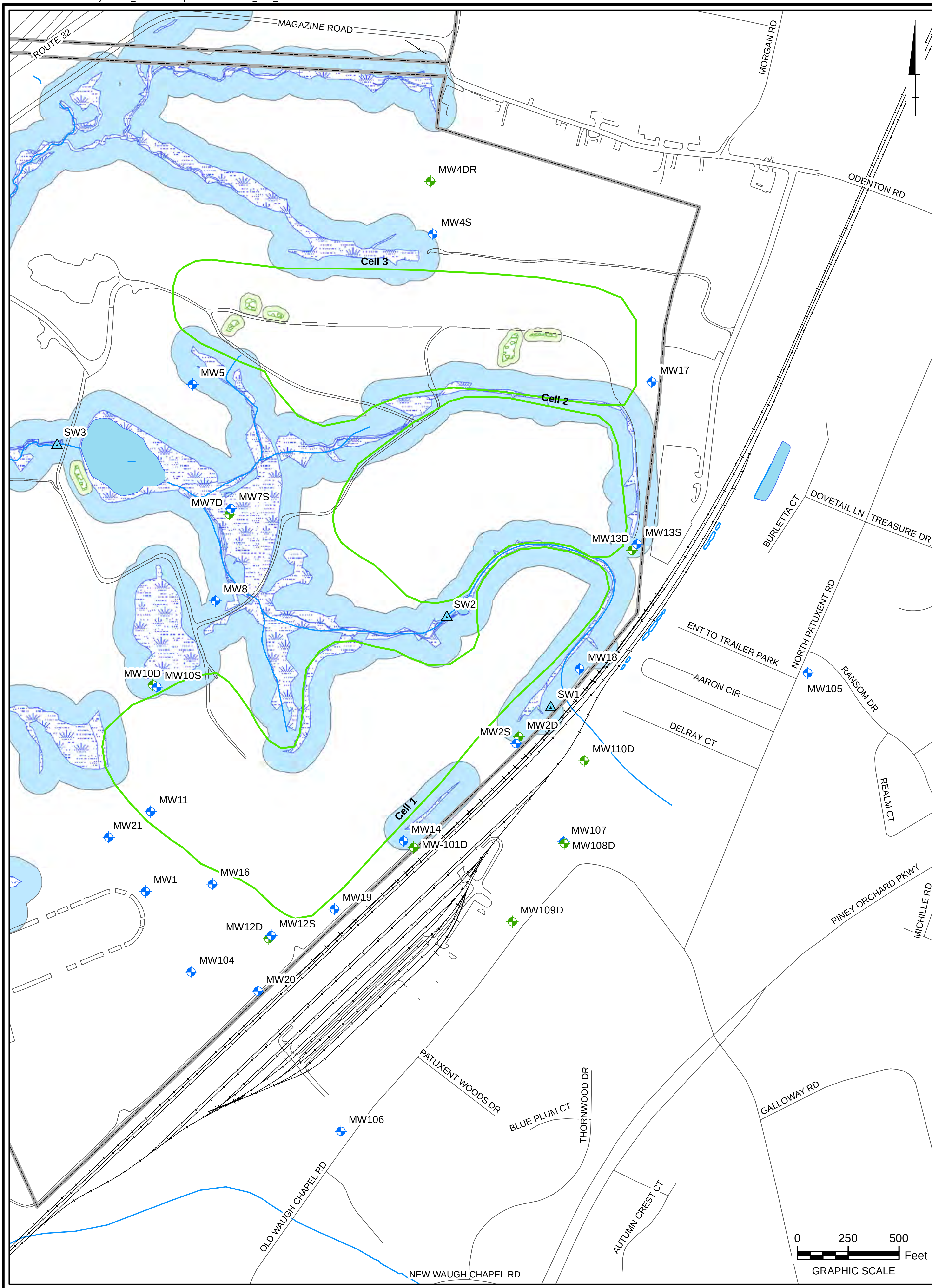


LEGEND:

- UPPER AQUIFER WELL
- LOWER AQUIFER WELL
- SURFACE WATER LOCATION
- CURB
- RAILROAD
- APPROXIMATE CELL BOUNDARIES
- DEMOLISHED STRUCTURES
- EXISTING STRUCTURES
- STREAM
- SURFACE WATER
- INSTALLATION BOUNDARY
- ISOLATED WETLAND (MDE)
- ISOLATED WETLAND BOUNDARY (25 FT MDE)
- JURISDICTIONAL WETLANDS & WATERS OF THE UNITED STATES
- CZM RIPARIAN & WETLAND BUFFER (100 FT BRAC)

NOTES:
MDE (MARYLAND DEPARTMENT OF THE ENVIRONMENT), FT (FEET),
CZM (COASTAL ZONE MANAGEMENT), BRAC (BASE REALIGNMENT AND CLOSURE)

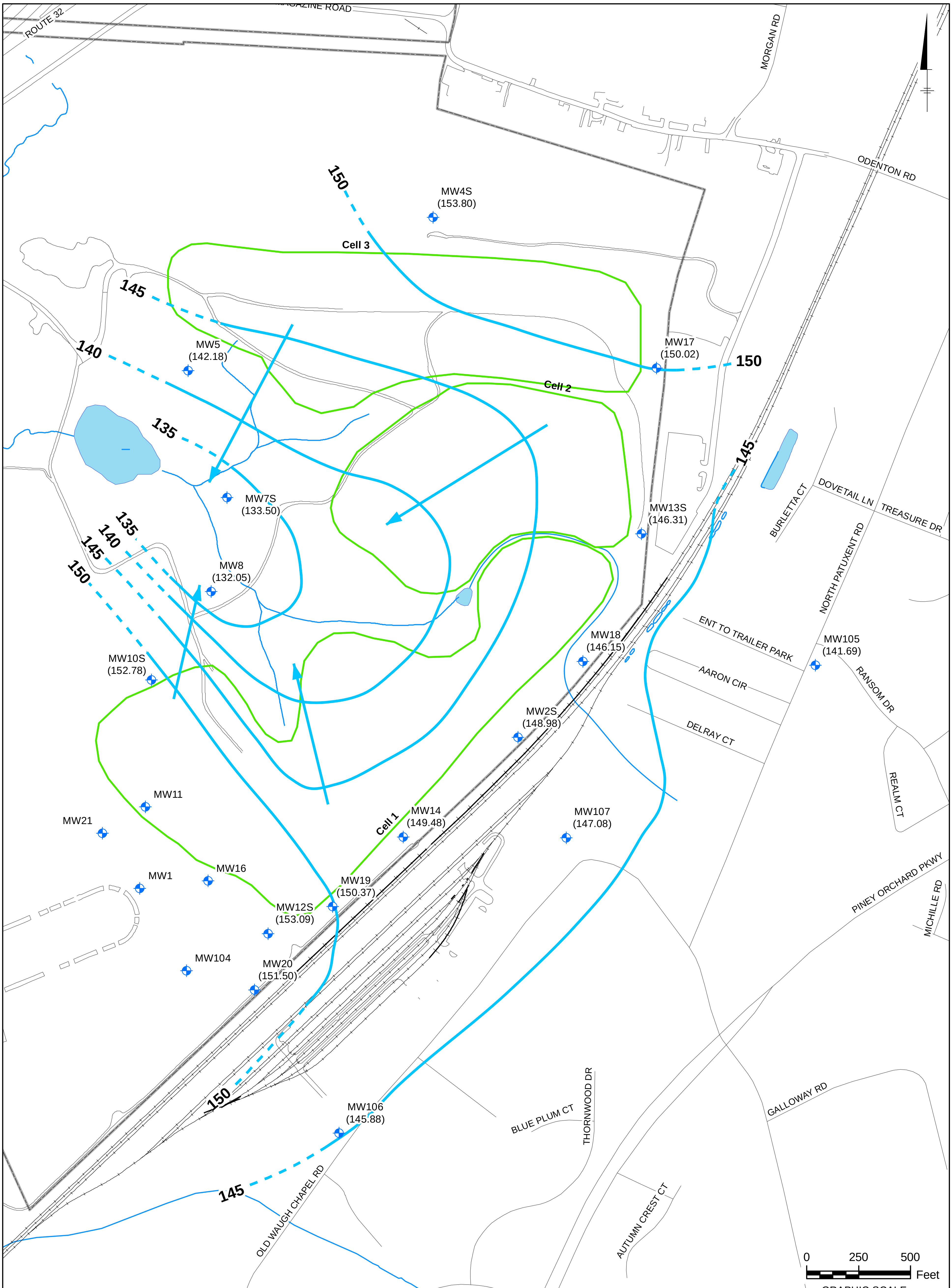
FORT GEORGE G. MEADE, MARYLAND

SITE MAP
CLOSED SANITARY LANDFILL

ARCADIS

FIGURE
2

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
Path: Z:\GISPROJECTS_ENV\Fort_Meade\ArcMap\CSL\2014-09\CSL_UPA_GWELEV_August2014.mxd



LEGEND:

- UPPER AQUIFER WELL
- CURB
- APPROXIMATE CELL BOUNDARIES
- ELEVATION CONTOUR (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION
- RAILROAD
- STREAM
- SURFACE WATER
- INSTALLATION BOUNDARY

NOTE:
ELEVATIONS PROVIDED IN FT AMSL
(FEET ABOVE MEAN SEA LEVEL)

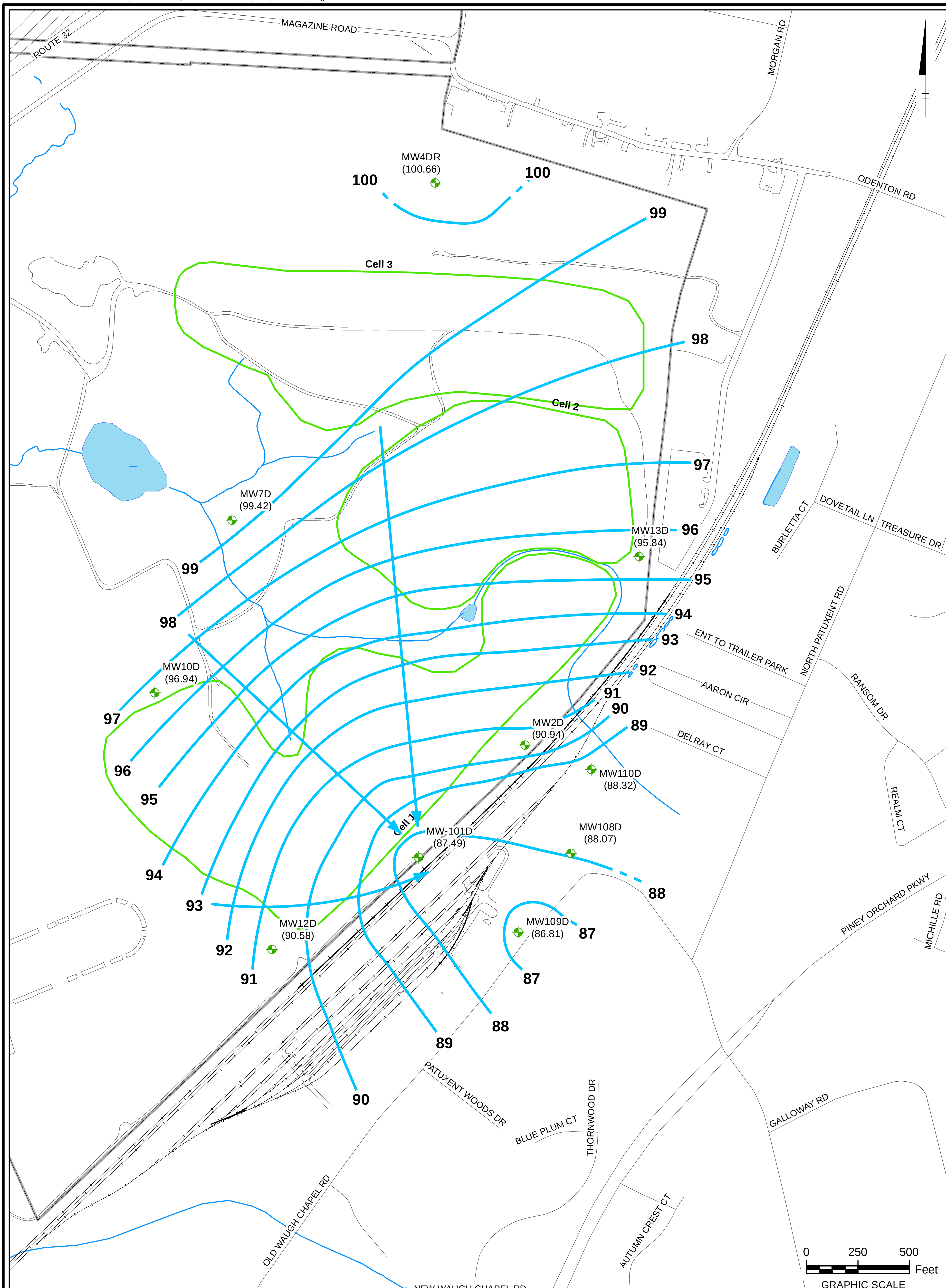
CLOSED SANITARY LANDFILL
FORT GEORGE G. MEADE, MARYLAND

GROUNDWATER ELEVATIONS
UPPER PATAPSCO AQUIFER - AUGUST 2014
CLOSED SANITARY LANDFILL

ARCADIS

FIGURE
3

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
Path: Z:\GISPROJECTS_ENV\Fort_Meade\ArcMap\CSL\2014-09\CSL_LPA_GWELEV_August2014.mxd



LEGEND:

- LOWER AQUIFER WELL
- CURB
- APPROXIMATE CELL BOUNDARIES
- ELEVATION CONTOUR (DASHED WHERE INFERRED)
- GROUNDWATER FLOW DIRECTION
- RAILROAD
- STREAM
- SURFACE WATER
- INSTALLATION BOUNDARY

NOTE:
ELEVATIONS PROVIDED IN FT AMSL (FEET ABOVE MEAN SEA LEVEL)

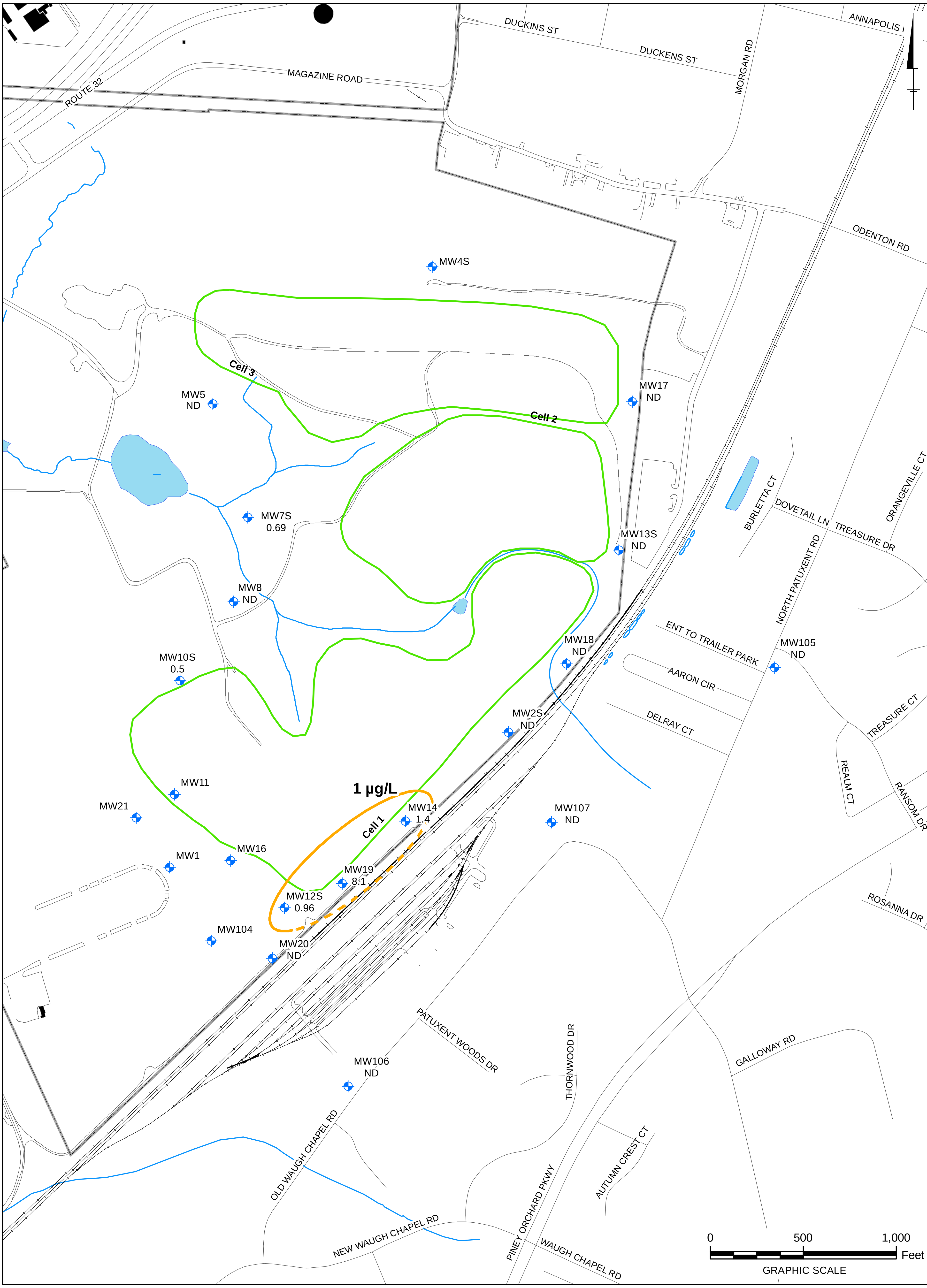
CLOSED SANITARY LANDFILL
FORT GEORGE G. MEADE, MARYLAND

GROUNDWATER ELEVATIONS
LOWER PATAPSCO AQUIFER - AUGUST 2014
CLOSED SANITARY LANDFILL

ARCADIS

FIGURE
4

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
Path: Z:\GISPROJECTS_ENV\Fort_Meade\ArcMap\CSL\2014-10\Fig5_CSL_UPA_Benzene_201410.mxd



LEGEND:

- UPPER AQUIFER WELL
- CURB
- APPROXIMATE CELL BOUNDARIES
- BENZENE CONTOUR
- RAILROAD
- STREAM
- SURFACE WATER
- INSTALLATION BOUNDARY

NOTE:
ND = NOT DETECTED
J=ESTIMATED CONCENTRATION
µg/L=MICROGRAMS PER LITER

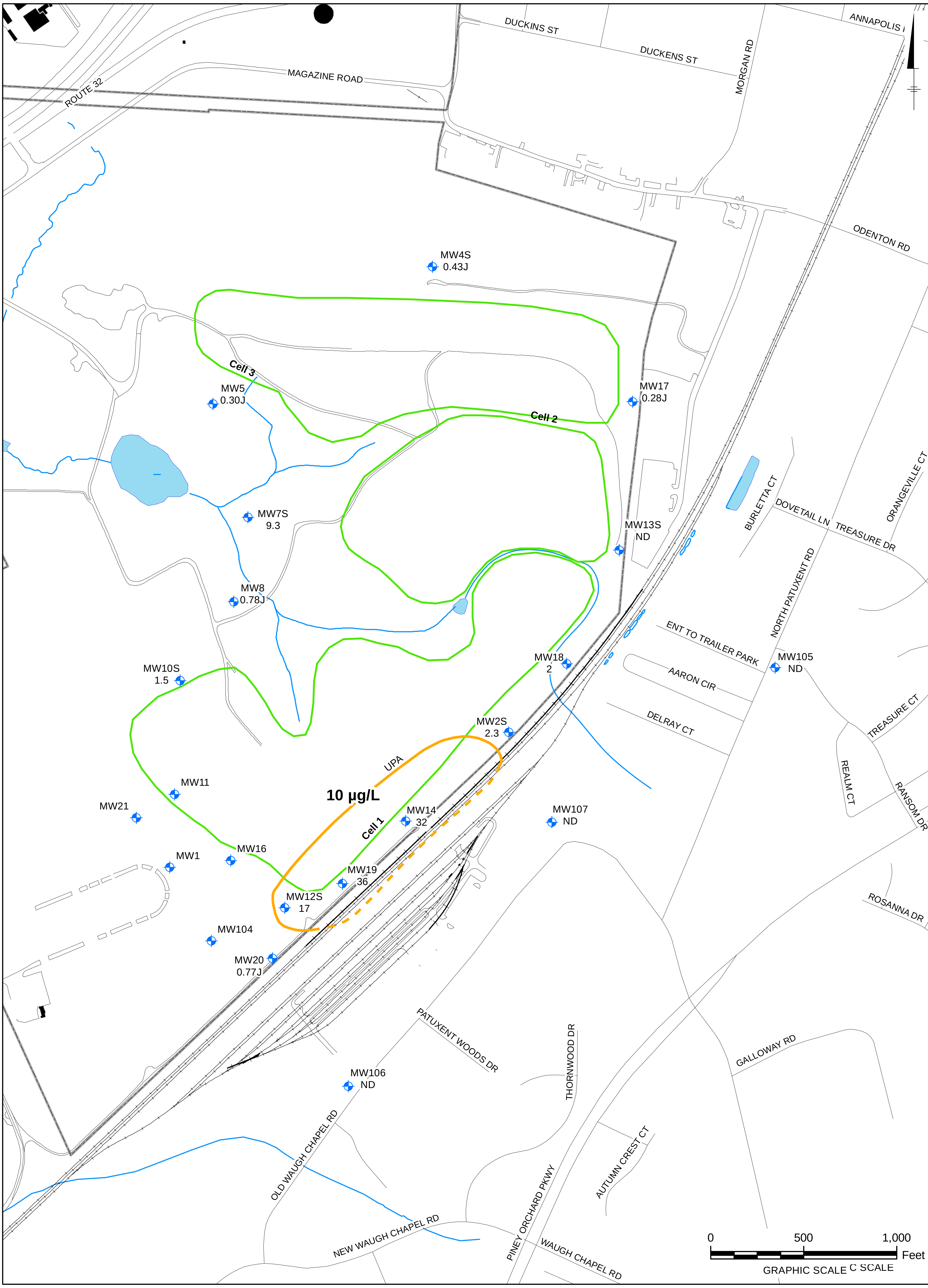
CLOSED SANITARY LANDFILL
FORT GEORGE G. MEADE, MARYLAND

BENZENE DETECTIONS (µg/L)
UPPER PATAPSCO AQUIFER - AUGUST 2014
CLOSED SANITARY LANDFILL

ARCADIS

FIGURE
5

CITY: MPLS DIV/GROUP: IM DB: MG LD: RK
FORT MEADE
Path: Z:\GISPROJECTS_ENV\Fort_Meade\ArcMap\CSL\2014-10\Fig6_CSL_UPA_Arsenic_201410.mxd



LEGEND:

- UPPER AQUIFER WELL
- CURB
- APPROXIMATE CELL BOUNDARIES
- ARSENIC CONTOUR
- RAILROAD
- STREAM
- SURFACE WATER
- INSTALLATION BOUNDARY

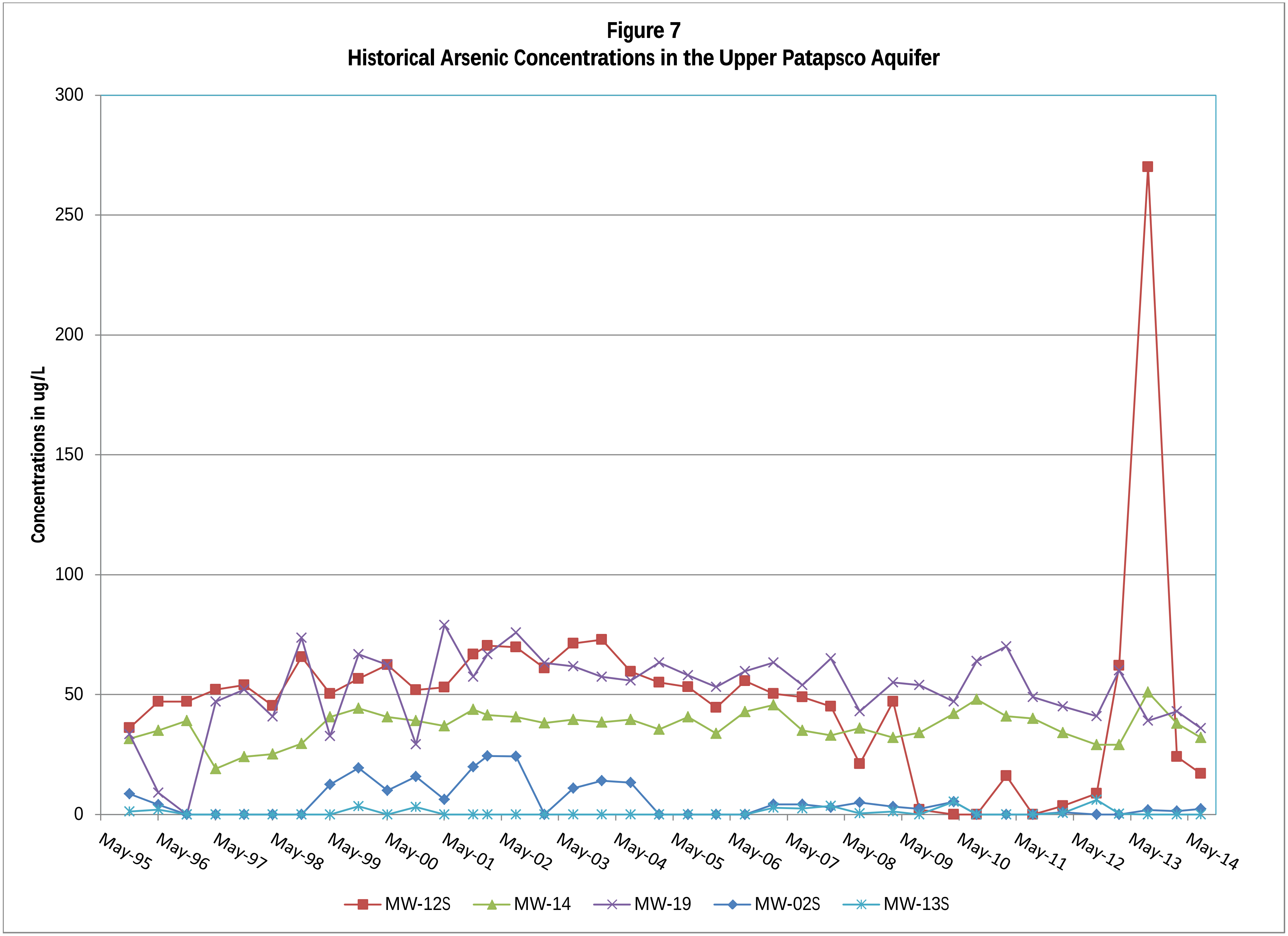
NOTE:
ND = NOT DETECTED
J=ESTIMATED CONCENTRATION
µg/L=MICROGRAMS PER LITER

CLOSED SANITARY LANDFILL
FORT GEORGE G. MEADE, MARYLAND

ARSENIC CONCENTRATIONS (µg/L)
UPPER PATAPSCO AQUIFER - AUGUST 2014
CLOSED SANITARY LANDFILL

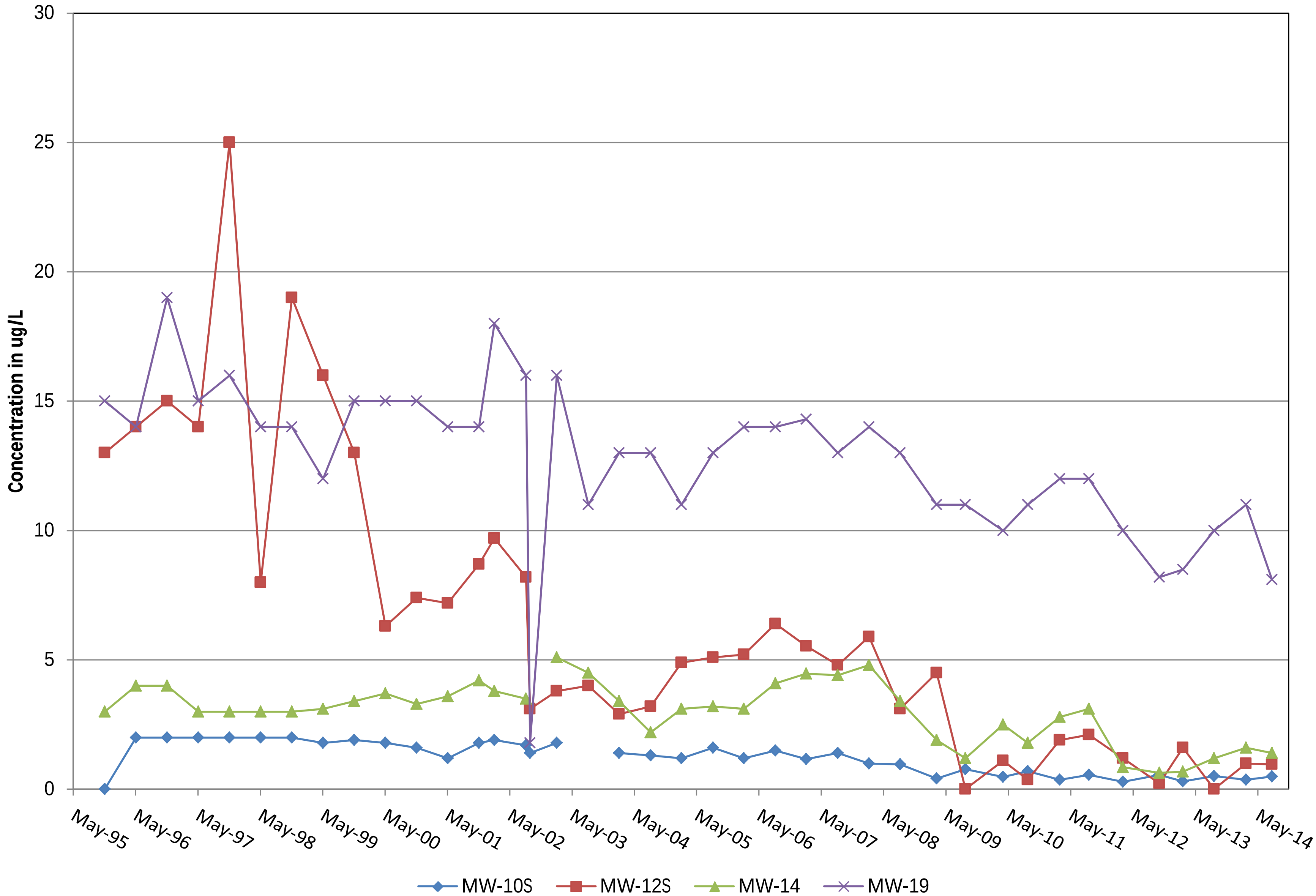
ARCADIS

FIGURE
6



Recent data at MW12S is a historic maximum and this concentration appears to be an outlier.

Figure 8
Historical Benzene Concentrations in the Upper Patapsco Aquifer



Appendix H

Complete CSL Monitoring Results, 1994-2014

(Provided on CD)