SUPPLEMENTAL AST CHARACTERIZATION REPORT

AREA B: PARCEL B19 TANK FARM
TRADEPOINT ATLANTIC
SPARROWS POINT, MARYLAND

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Revision 0 – August 12, 2020

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1.0 INTRODUCTION

ARM Group LLC (ARM), on behalf of EnviroAnalytics Group, LLC (EAG), has completed a Supplemental Characterization Investigation of a portion of the Tradepoint Atlantic property (formerly Sparrows Point Terminal, LLC) that has been designated within Area B: Parcel B19 at the location of the historical Pennwood Storage Tank Farm (the Site). This investigation targeted the former locations of four aboveground storage tanks (ASTs) within the tank farm. Following the removal of the ASTs, the MDE requested that supplemental investigation work be conducted to evaluate the possibility of subsurface contamination associated with these historical ASTs.

Parcel B19 is located within the approximately 3,100-acre former steel making facility (**Figure 1**). This AST investigation supplemented the original Phase II Investigation of Parcel B19 completed in May 2017. The findings of the original Phase II Investigation were presented in the Phase II Investigation Report for Parcel B19 (Revision 0 dated April 9, 2018). The original Phase II Investigation was conducted in accordance with the approved Parcel B19 Phase II Investigation Work Plan (Revision 1 dated August 9, 2016).

The Supplemental Characterization Investigation was performed in accordance with procedures outlined in the approved AST Characterization Work Plan for Parcel B19 (dated May 8, 2020). This Work Plan was approved by the Maryland Department of the Environment (MDE) and the United States Environmental Protection Agency (USEPA) on May 12, 2020 in compliance with requirements pursuant to the following:

- Administrative Consent Order (ACO) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the MDE effective September 12, 2014; and
- Settlement Agreement and Covenant Not to Sue (SA) between Tradepoint Atlantic (formerly Sparrows Point Terminal, LLC) and the USEPA effective November 25, 2014.

Parcel B19 is part of the acreage that was removed (Carveout Area) from inclusion in the Multimedia Consent Decree between Bethlehem Steel Corporation, the USEPA, and the MDE (effective October 8, 1997) as documented in correspondence received from the USEPA on September 12, 2014. Based on this agreement, the USEPA determined that no further investigation or corrective measures will be required under the terms of the Consent Decree for the Carveout Area. However, the SA reflects that the property within the Carveout Area will remain subject to the USEPA's Resource Conservation and Recovery Act (RCRA) Corrective Action authorities.

An application to enter the full Tradepoint Atlantic property (3,100 acres) into the MDE's Voluntary Cleanup Program (MDE-VCP) was submitted to the MDE and delivered on June 27, 2014. The property's current and anticipated future use is Tier 3 (Industrial), and plans for the property include demolition and redevelopment over the next several years.

1.1. SITE HISTORY

From the late 1800s until 2012, the production and manufacturing of steel was conducted at Sparrows Point. Iron and steel production operations and processes at Sparrows Point included raw material handling, coke production, sinter production, iron production, steel production, and semi-finished and finished product preparation. In 1970, Sparrows Point was the largest steel facility in the United States, producing hot and cold rolled sheets, coated materials, pipes, plates, and rod and wire. The steel making operations at Sparrows Point ceased in fall 2012.

Four large ASTs made up the former Pennwood Storage Tank Farm, directly north of the Pennwood Power Station. The Pennwood Storage Tank Farm was identified as a Recognized Environmental Condition (REC) within the Phase I Environmental Site Assessment (ESA) prepared by Weaver Boos Consultants dated May 19, 2014. The Pennwood Power Station operated four boilers to generate electricity and steam for general plant use and was operated on a variety of fuels including blast furnace gas, No. 6 fuel oil, used oil or waste combustible fluids, and natural gas. The ASTs in the tank farm formerly held fuel oil and recycled oil. One additional fuel oil AST was formerly located directly east of the Pennwood Storage Tank Farm but had been removed prior to the original Phase II Investigation.

The four ASTs targeted by this Supplemental Characterization Investigation were present during the original Phase II Investigation of Parcel B19. The ASTs and their foundations were demolished and removed in 2019.

1.2. OBJECTIVES

The objective of this Supplemental Characterization Investigation was to characterize the nature and extent of contamination in the vicinity of the former ASTs within Parcel B19. A summary table of the site investigation locations, including the sample identification numbers and the analyses performed, is provided as **Appendix A**. This report includes a summary of the work performed, including the environmental setting, site investigation methods, analytical soil and groundwater results, and findings and recommendations.

2.0 ENVIRONMENTAL SETTING

2.1. LAND USE AND SURFACE FEATURES

The Tradepoint Atlantic property consists of the former Sparrows Point steel mill. According to the Phase I ESA prepared by Weaver Boos dated May 19, 2014, the property is zoned Manufacturing Heavy-Industrial Major (MH-IM). Surrounding property zoning classifications (beyond Tradepoint Atlantic) include the following: Manufacturing Light (ML); Resource Conservation (RC); Density Residential (DR); Business Roadside (BR); Business Major (BM); Business Local (BL); and Residential Office (RO). Light industrial and commercial properties are located northeast of the property and northwest of the property across Bear Creek. Residential areas of Edgemere and Fort Howard are located northeast of the property across Jones Creek and to the southeast across Old Road Bay, respectively. Residential and commercial areas of Dundalk are located northwest of the property across Bear Creek.

According to site observations, the former AST area is generally flat and low-lying. Areas of standing surface water had formed within the former ASTs foundations. Prior to completing this Supplemental Characterization Investigation, surface water was removed from the area using bypass pumping and minor regrading. The ground surface is generally made up of slag gravel.

2.2. REGIONAL GEOLOGY

The property is located within the Atlantic Coastal Plain Physiographic Province (Coastal Plain). The western boundary of the Coastal Plain is the "Fall Line", which separates the Coastal Plain from the Piedmont Plateau Province. The Fall Line runs from northeast to southwest along the western boundary of the Chesapeake Bay, passing through Elkton (MD), Havre de Grace (MD), Baltimore City (MD), and Laurel (MD). The eastern boundary of the Coastal Plain is the off-shore Continental Shelf.

The unconsolidated sediments beneath the property belong to the Talbot Formation (Pleistocene), which is then underlain by the Cretaceous formations which comprise the Potomac Group (Patapsco Formation, Arundel Formation, and the Patuxent Formation). The Potomac Group formations are comprised of unconsolidated sediments of varying thicknesses and types, which may be several hundred feet to several thousand feet thick. These unconsolidated formations may overlie deeper Mesozoic and/or Precambrian bedrock. Depth to bedrock is approximately 700 feet within the property.

2.3. SITE GEOLOGY

Groundcover within Parcel B19 is comprised of 84% natural soils and 16% slag fill based on the approximate shoreline of the Sparrows Point Peninsula in 1916, as shown on **Figure 2** (adapted from Figure 2-20 in the Description of Current Conditions (DCC) Report prepared by Rust

Environment and Infrastructure dated January 1998). However, the former Pennwood Storage Tank Farm is entirely within the 1916 peninsula outline, indicating that the local subsurface geology is comprised primarily of natural soils rather than non-native fill (i.e., slag).

In general, the encountered subsurface geology included slag gravel at the surface, with clay and sand below. Groundwater was observed in soil cores at depths of 1.7 to 8 feet below ground surface (bgs) across the Site, and was identified at every location. Soil boring observation logs are provided in **Appendix B**. Note that unless otherwise indicated, all Unified Soil Classification System (USCS) group symbols provided on the attached boring logs are from visual observations, and not from laboratory testing.

3.0 SITE INVESTIGATION

A total of 10 soil samples (from six boring locations) and four groundwater samples were collected for analysis between May 20, 2020 and May 28, 2020 as part of the Parcel B19 Supplemental Characterization Investigation. This investigation utilized methods and protocols that followed the procedures included in the Quality Assurance Project Plan (QAPP) dated April 5, 2016 which was approved by the agencies to support the investigation and remediation of the Tradepoint Atlantic property. Information regarding the project organization, field activities and sampling methods, sampling equipment, sample handling and management procedures, the selected laboratory and analytical methods, quality control and quality assurance procedures, investigation-derived waste (IDW) management methods, and reporting requirements are described in detail in the approved Parcel B19 AST Characterization Work Plan and the QAPP. All site characterization activities were conducted under the standard property-wide Health and Safety Plan (HASP).

3.1. SAMPLE TARGET IDENTIFICATION

Previous activities within and around the buildings and facilities located on the Tradepoint Atlantic property may have been historical sources of environmental contamination. Historical features within the Site were targeted during the original Parcel B19 Phase II Investigation.

After the completion of the original Phase II Investigation, the four ASTs in the Pennwood Storage Tank Farm were demolished and removed. The MDE subsequently requested that the former AST footprints be investigated. A total of six soil borings were completed during this investigation targeting the former ASTs. Each boring was completed within the original AST footprints, unless standing water made the locations inaccessible. The locations of the soil borings are shown on **Figure 3**. Locations B19-047-SB and B19-048-SB were shifted slightly to the northwest from their originally proposed locations due to standing water in the former AST foundations.

3.2. SOIL INVESTIGATION

Continuous core soil borings were advanced at six locations across the Site to assess the presence or absence of soil contamination, and to assess the vertical distribution of any encountered contamination (**Figure 3**). The continuous core soil borings were advanced to a maximum depth of 15 feet bgs using the Geoprobe® MC-7 Macrocore soil sampler (surface to 10 feet bgs) and the Geoprobe® D-22 Dual-Tube Sampler (depths >10 feet bgs). At each of the boring locations, each soil core was visually inspected and screened with a hand-held photoionization detector (PID) prior to logging soil types. Soil boring logs have been included as **Appendix B**, and the PID calibration log has been included as **Appendix C**. Unless otherwise indicated, all USCS group symbols provided on the attached boring logs are from visual observations.

One shallow sample was collected from the 0 to 1 foot depth interval, and a deeper sample was collected from the 4 to 5 foot depth interval from each continuous core soil boring. If groundwater

was observed at a depth shallower than 4 feet, only the 0 to 1 foot depth interval sample was collected. Deep soil samples (9 to 10 feet bgs) were not collected during this investigation because groundwater was always encountered prior to reaching 10 feet bgs.

Soil sampling activities were conducted in accordance with the procedures and methods referenced in **Field Standard Operating Procedure (SOP) Numbers 008, 009, 012, and 013** provided in Appendix A of the QAPP. Down-hole soil sampling equipment was decontaminated after soil sampling had been concluded at each location, according to the procedures and methods referenced in **Field SOP Number 016** provided in Appendix A of the QAPP.

The soil samples were analyzed for Target Compound List (TCL) semi-volatile organic compounds (SVOCs) via USEPA Methods 8270 and 8270 SIM, Oil & Grease via USEPA Methods 1664 and 9071, total petroleum hydrocarbon (TPH) diesel range organics (DRO) and gasoline range organics (GRO) via USEPA Methods 5030 and 8015, Target Analyte List (TAL) Metals via USEPA Methods 6010, 7470, and 7471, hexavalent chromium via USEPA Method 7196, and cyanide via USEPA Method 9012. Additionally, the shallow soil samples collected across the Site from the 0 to 1 foot bgs interval were analyzed for polychlorinated biphenyls (PCBs) via USEPA Method 8082. Sample containers, preservatives, and holding times for the sample analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times. Each soil sample collected during this investigation was submitted to Pace Analytical Services, Inc. (PACE) for analysis, with the exception that the 8270 SIM soil analysis was performed by Alpha Analytical.

The Work Plan stipulated that samples from any depth interval with a sustained PID reading of greater than 10 ppm would be analyzed for TCL volatile organic compounds (VOCs) via USEPA Method 8260. There were no instances of PID readings greater than 10 ppm, so VOCs were not analyzed for any of the collected soil samples.

3.3. GROUNDWATER INVESTIGATION

Four shallow temporary groundwater sample collection points (commonly referred to as piezometers) were included in the project-specific sampling plan. Piezometers were installed at B19-044-SB, B19-046-SB, B19-047-SB, and B19-048-SB to facilitate the collection of groundwater samples. **Figure 3** shows the locations where shallow piezometers were installed. The soil boring logs and the piezometer construction logs for these piezometers are included in **Appendix B**. Following the installation of each sample collection point, the 0-hour depth to water was documented and the collection point was checked for the presence of non-aqueous phase liquid (NAPL) using an oil-water interface probe in accordance with the methods referenced in **Field SOP Number 019** provided in Appendix A of the QAPP.

After the installation of each temporary groundwater sample collection point, down-hole equipment was decontaminated according to the procedures and methods referenced in **Field SOP Number 016** provided in Appendix A of the QAPP.

Groundwater samples were collected at each location in accordance with methods referenced in **Field SOP Number 006** provided in Appendix A of the QAPP; which employed the use of laboratory supplied sample containers and preservatives, a peristaltic pump, dedicated polyethylene tubing, and a water quality multiparameter meter with a flow-through cell. Groundwater samples submitted for analysis of dissolved metals were filtered in the field with an in-line 0.45 micron filter. The sampling and purge logs have been included in **Appendix D**. Calibration of the multiparameter meter was performed before the start of each day of the sampling event, and a calibration post-check was completed at the end of the day.

Groundwater samples collected during this investigation were submitted to PACE, and analyzed for TCL-VOCs via USEPA Method 8260, TCL-SVOCs via USEPA Methods 8270 and 8270 SIM, Oil & Grease via USEPA Method 1664, TPH-DRO/GRO via USEPA Methods 5030 and 8015, TAL-Dissolved Metals via USEPA Methods 6010 and 7470, dissolved hexavalent chromium via USEPA Method 7196, and total cyanide via USEPA Method 9012. Sample containers, preservatives, and holding times for the sample analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times.

3.4. MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)

In accordance with **Field SOP Number 005** provided in Appendix A of the QAPP, potentially impacted materials, or IDW, generated during this investigation was containerized in 55-gallon (DOT-UN1A2) drums. The types of IDW that were generated included the following:

- soil cuttings generated from soil borings or the installation of groundwater sample points;
- purged groundwater;
- decontamination fluids; and
- used personal protective equipment

Following the completion of field activities, a composite sample was gathered with aliquots from the IDW soil drum for waste characterization. Following this analysis, the waste soil was characterized as non-hazardous. A list of all results from the soil waste characterization procedure can be found in **Table 1**. IDW drums containing aqueous materials (including aqueous waste generated during this investigation) were characterized by preparing a composite sample from randomly selected drums. The composite sample included aliquots from several individual drums that were chosen as a subset of the aqueous drums being staged on-site at the date of collection. Following this analysis, the aqueous waste was characterized as non-hazardous. A list of all results from the aqueous waste characterization procedure can be found in **Table 2**.

The project-specific IDW drum log from this Supplemental Characterization Investigation is included as **Appendix E**. All IDW procedures were carried out in accordance with methods referenced in the QAPP Worksheet 21 – Field SOPs and Appendix A of the QAPP.

4.0 ANALYTICAL RESULTS

4.1. SOIL CONDITIONS

Soil analytical results were screened against Project Action Limits (PALs) established in the property-wide QAPP (or other direct guidance from the agencies; i.e., TPH/Oil & Grease) to determine PAL exceedances. PALs are generally based on the USEPA's Regional Screening Levels (RSLs) for the Composite Worker exposure to soil. The Composite Worker is defined by the USEPA as a long-term receptor exposed during the workday who is a full-time employee that spends most of the workday conducting maintenance activities (which typically involve on-site exposures to surface soils) outdoors.

The analytical results for the detected parameters in soil are summarized and compared to the PALs in **Table 3** (Organics) and **Table 4** (Inorganics). The laboratory Certificates of Analysis (including Chains of Custody) have been included as electronic attachments.

4.1.1. Soil Conditions: Organic Compounds

Soil samples were screened with a PID to determine if VOC sampling was necessary. No soil samples exceeded the 10 ppm threshold for VOC sampling, so none of the soil samples were analyzed for VOCs.

Table 3 provides the SVOCs detected above the laboratory's method detection limits (MDLs) in the soil samples collected at the Site. The PALs for relevant polynuclear aromatic hydrocarbons (PAHs) have been adjusted based on revised toxicity data published in the USEPA RSL Composite Worker Soil Table. Therefore, any soil exceedances for PAHs would be based on the adjusted PALs rather than those presented in the QAPP. There were no SVOCs detected above their respective PALs.

Shallow soil samples collected across the Site from the 0 to 1 foot bgs interval were analyzed for PCBs. As shown in **Table 3**, one shallow sample had a PCB detection of Aroclor 1254 above the MDL, but no detections of PCBs exceeded the applicable PALs.

Table 3 provides the TPH/Oil & Grease detections above the laboratory's MDLs in the soil samples. There were no PAL exceedances of DRO, GRO, or Oil & Grease in any of the soil samples. Additionally, no physical evidence of NAPL was observed in any soil cores completed during this investigation.

4.1.2. Soil Conditions: Inorganic Constituents

Table 4 provides the inorganic constituents detected above the laboratory's MDLs in the soil samples collected at the Site. Arsenic was the only inorganic constituent to exceed its PAL in soil,

with a maximum detected concentration of 25.2 mg/kg in B19-047-SB-1. Locations B19-046-SB and B19-047-SB exceeded the PAL for arsenic in the shallow and intermediate soil samples. Location B19-048-SB exceeded the PAL for arsenic in the intermediate soil sample. The inorganic PAL exceedance locations and results have been provided on **Figure 4**.

4.1.3. Soil Conditions: Results Summary

Table 3 and **Table 4** provide a summary of the detected organic compounds and inorganics in the soil samples submitted for laboratory analysis. There were no organic PAL exceedances among the soil samples. **Figure 4** presents the soil sample inorganic results that exceeded the PALs. Arsenic was the only constituent that was detected in soil above the PAL. The maximum detection of arsenic was 25.2 mg/kg in sample B19-047-SB-1.

4.2. GROUNDWATER CONDITIONS

The analytical results for the detected parameters in groundwater are summarized and compared to the PALs in **Table 5** (Organics) and **Table 6** (Inorganics). The laboratory Certificates of Analysis (including Chains of Custody) have been included as electronic attachments.

4.2.1. Groundwater Conditions: Organic Compounds

As provided on **Table 5**, two VOCs (2-butanone and acetone) were identified above the laboratory's MDLs in one groundwater sample (B19-048-PZ). No VOCs were detected above their respective PALs in groundwater.

Table 5 provides the SVOCs identified in the groundwater samples above the laboratory's MDLs. Similar to the evaluation of soil data, the PALs for relevant PAHs have been adjusted based on revised toxicity data published in the USEPA RSL Resident Tapwater Table. Naphthalene was the only SVOC detected above its PAL in groundwater. Naphthalene concentrations were identified above the PAL at locations B19-044-PZ, B19-047-PZ, and B19-048-PZ, with a maximum detected concentration of 0.59 ug/L at B19-048-PZ. These SVOC PAL exceedances are shown on **Figure 5**.

Table 5 provides the TPH/Oil & Grease detections in groundwater at the Site. DRO was detected above its PAL in each groundwater sample location, with a maximum detected concentration of 320 ug/L at B19-048-PZ. Oil & Grease was detected above the PAL at locations B19-044-PZ and B19-046-PZ, with a maximum (J flagged) detection of 1,500 ug/L at B19-044-PZ. The TPH/Oil & Grease PAL exceedances are shown on **Figure 6**. Each location was checked for the potential presence of NAPL using an oil-water interface probe prior to sampling. During these checks, NAPL was not detected in any of the groundwater sampling locations.

4.2.2. Groundwater Conditions: Inorganic Constituents

Table 6 provides the inorganic constituents detected above the MDLs in the groundwater samples collected at the Site. A total of four dissolved metals (arsenic, cobalt, iron, and manganese) were detected above their respective aqueous PALs. Each of the identified dissolved metals had one PAL exceedance, with detected concentrations of 14.9 ug/L of arsenic at B19-044-PZ; 76.6 ug/L of cobalt at B19-047-PZ; 19,800 ug/L of iron at B19-047-PZ; and 4,300 ug/L of manganese at B19-047-PZ. The inorganic PAL exceedances are shown on **Figure 7**.

4.2.3. Groundwater Conditions: Results Summary

Table 5 and **Table 6** provide summaries of the detected organic compounds and inorganics in the groundwater samples submitted for laboratory analysis, and **Figure 5** through **Figure 7** present the locations and aqueous results that exceeded the PALs. Aqueous PAL exceedances among the groundwater samples collected from the Site consisted of one SVOC (naphthalene), DRO, Oil & Grease, and four dissolved metals (arsenic, cobalt, iron, and manganese).

Groundwater data were screened to determine whether individual sample results may exceed the USEPA Vapor Intrusion (VI) Screening Levels (Target Cancer Risk (TCR) of 1E-5 and Target Hazard Quotient (THQ) of 1 as determined by the Vapor Intrusion Screening Level (VISL) Calculator version 3.5 (https://www.epa.gov/vaporintrusion/vapor-intrusion-screening-levels-visls). The PALs specified in the QAPP are based upon drinking water use, which is not a potential exposure pathway for groundwater at the Site.

None of the aqueous results exceeded the individual VI TCR or THQ criteria as specified by the VISL Calculator. Following the initial screening, a cumulative VI risk assessment was also performed for each individual sample location, with the results separated by cancer risk versus non-cancer hazard. All compounds with detections were included in the computation of the cumulative cancer risk, and all compounds with detections exceeding 10% of the THQ level were included in the evaluation of non-cancer hazard. None of the cumulative VI cancer risks were greater than 1E-5. No constituents were identified with detections above the 10% THQ level to be included in a non-cancer Hazard Index (HI) assessment. The results of the cumulative VI comparisons are provided in **Table 7**.

The presence and absence of groundwater impacts within the Site boundaries have been adequately described. There are no concerns related to potential VI risks at the Site. Based on the relatively low-level analytical results identified during this investigation, there do not appear to be significant ongoing sources of groundwater contamination present.

5.0 QUALITY ASSURANCE & QUALITY CONTROL

The goal of the Supplemental Characterization Investigation was to determine if potentially hazardous substances or petroleum products (VOCs, SVOCs, PCBs, metals, cyanide, or TPH/Oil & Grease) are present in Site media (soil and groundwater) at concentrations that could pose an unacceptable risk to future Site receptors. Individual results are compared to the PALs established in the QAPP (i.e., the USEPA RSLs) or based on other direct guidance from the agencies, to identify the presence of exceedances in each environmental medium.

Quality assurance and quality control (QA/QC) samples were collected during the field study to evaluate field/laboratory variability. A summary of QA/QC samples associated with this investigation has been included as **Appendix F**. Independent third-party data validation was not performed for the soil or groundwater data obtained during this investigation. The following QA/QC samples were submitted for analysis:

- Trip Blank – at a rate of one per cooler with VOC samples per day
  - Soil – VOCs only
  - Water – VOCs only
- Blind Field Duplicate – at a rate of one per twenty samples
  - Soil – VOCs, SVOCs, Metals, TPH-DRO, TPH-GRO, Oil & Grease, PCBs, hexavalent chromium, and cyanide
  - Water – VOCs, SVOCs, Metals, TPH-DRO, TPH-GRO, Oil & Grease, hexavalent chromium, and cyanide
- Matrix Spike/Matrix Spike Duplicate – at a rate of one per twenty samples
  - Soil – VOCs, SVOCs, Metals, TPH-DRO, TPH-GRO, Oil & Grease, PCBs, hexavalent chromium, and cyanide
  - Water – VOCs, SVOCs, Metals, TPH-DRO, TPH-GRO, Oil & Grease, hexavalent chromium, and cyanide
- Field Blank and Equipment Blank – at a rate of one per twenty samples
  - Soil – VOCs, SVOCs, Metals, TPH-DRO, TPH-GRO, Oil & Grease, PCBs, hexavalent chromium, and cyanide
  - Water – VOCs, SVOCs, Metals, TPH-DRO, TPH-GRO, Oil & Grease, hexavalent chromium, and cyanide

The QA/QC samples were collected and analyzed in accordance with the QAPP Worksheet 12 – Measurement Performance Criteria, QAPP Worksheet 20 – Field Quality Control, and QAPP Worksheet 28 – Analytical Quality Control and Corrective Action.

6.0 FINDINGS & RECOMMENDATIONS

The objective of this Supplemental Characterization Investigation was to characterize the nature and extent of contamination in the vicinity of the former ASTs in Parcel B19. During the investigation, a total of 10 soil samples (from six boring locations) and four groundwater samples were collected and analyzed to define the nature and extent of contamination. The sampling and analysis plan for this project was developed to target the former Pennwood Storage Tank Farm, an area potentially contaminated with hazardous substances and/or petroleum products. Soil samples were analyzed for SVOCs, TPH/Oil & Grease, TAL-Metals, hexavalent chromium, and cyanide. Shallow soil samples (0 to 1 foot bgs) were additionally analyzed for PCBs. Groundwater samples were analyzed for VOCs, SVOCs, TPH/Oil & Grease, TAL-Dissolved Metals, dissolved hexavalent chromium, and total cyanide.

6.1. SOIL

The concentrations of constituents in the soil have been characterized by this investigation to provide estimates of exposure point concentrations to support future risk assessment. Arsenic was the only constituent found to exceed its applicable soil PAL, with a maximum detected arsenic concentration of 25.2 mg/kg in B19-047-SB-1. There were no soil PAL exceedances identified for organic compounds (SVOCs, PCBs, or TPH/Oil & Grease), indicating that these compounds are not significant contaminants in soil at the Site. No soil samples exceeded the 10 ppm PID threshold for VOC sampling, so none of the soil samples were analyzed for VOCs. No physical evidence of NAPL was observed in any soil cores completed during this investigation.

6.2. GROUNDWATER

The concentrations of constituents in the groundwater have also been characterized by this investigation to provide estimates of exposure point concentrations to support future risk assessment. There were no aqueous PAL exceedances identified in groundwater for VOCs or GRO, indicating that these compounds are not significant contaminants in groundwater at the Site. Exceedances of the PALs in groundwater within the former tank farm consisted of four dissolved metals (arsenic, cobalt, iron, and manganese), DRO, Oil & Grease, and naphthalene. Each of the identified dissolved metals had one PAL exceedance, with detected concentrations of 14.9 ug/L of arsenic at B19-044-PZ; 76.6 ug/L of cobalt at B19-047-PZ; 19,800 ug/L of iron at B19-047-PZ; and 4,300 ug/L of manganese at B19-047-PZ. DRO exceeded the PAL in all four groundwater sample locations, with a maximum concentration of 320 ug/L at B19-048-PZ. Oil & Grease was detected above the PAL at locations B19-044-PZ and B19-046-PZ, with a maximum (J flagged) detection of 1,500 ug/L at B19-044-PZ. Naphthalene exceeded its aqueous PAL in three of the four groundwater sample locations (all except for B19-046-PZ), with a maximum concentration of 0.59 ug/L at B19-048-PZ.

Each temporary groundwater sample collection point was checked for the potential presence of NAPL using an oil-water interface probe prior to sampling. During these checks, NAPL was not detected at any of the groundwater sampling locations. All temporary groundwater sample collection points were properly abandoned on June 1, 2020 by a Maryland-licensed driller. Each piezometer was gauged a final time with the oil-water interface probe on the abandonment date to confirm that NAPL was not present. The abandonment forms are included as **Appendix G**.

Groundwater is not used on the Tradepoint Atlantic property (and is not proposed to be utilized); therefore, there is no potential for direct human exposure for a Composite Worker. In the event that future construction/excavation leads to a potential Construction Worker exposure to groundwater, health and safety plans should be implemented to limit exposure risk. The groundwater data were screened to determine whether any cumulative (or individual) sample results exceeded the USEPA VI TCR (carcinogen) or THQ (non-carcinogen) Screening Levels. None of the individual sample results exceeded the VI TCR or THQ criteria. When the aqueous results were summed by sample location, none of the cumulative VI cancer risks or non-cancer risks were greater than the acceptable regulatory limits. There do not appear to be any concerns related to potential VI risks at the Site.

6.3. RECOMMENDATIONS

Sufficient investigation data has been collected to characterize the nature and extent of constituents of potential concern at the Pennwood Storage Tank Farm. The presence and absence of soil and groundwater impacts within the former tank farm have been adequately described and further investigation is not warranted. No further action is recommended at this time.

The results of this Supplemental Characterization Investigation (as well as the results obtained during the original Parcel B19 Phase II Investigation) will be incorporated into one or more project-specific Response and Development Work Plans, as applicable, if future development is proposed in this area.

FIGURES


Site Boundary
Parcel Boundaries
Private Property
Parcel A9
Parcel A5
Parcel A13
Parcel A7
Parcel A14
Parcel A11
Parcel A8
Parcel A12
Parcel A15
Parcel A2
Parcel A17
Parcel A18
Parcel A16
Parcel A6
Parcel A4
Parcel A10
Parcel A3
Parcel A1
Parcel B6
Parcel B8
Parcel B14
Parcel B22
Parcel B16
Parcel B21
Parcel B15
Parcel B24
Parcel B23
Parcel B25
Parcel B7
Parcel B1
Parcel B2
Parcel B3
Parcel B17
Parcel B19
Parcel B4
Parcel B5
Parcel B9
Parcel B18
Parcel B10
Parcel B13
Parcel B20
Parcel B11
Parcel B12
Tradepoint Atlantic
Area A and Area B Parcels
March 4, 2020
Figure
1
ARM Group LLC
Engineers and Scientists
0 500 1,000 2,000
Feet
Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
Area A: Project 200101
Area B: Project 200102

Site Boundary

Parcel Boundaries

1916 Shoreline:

Land

Marsh

Water

Parcel A9

Parcel A5

Parcel A13

Parcel A7

Parcel A14

Greys Creek

Bear Creek

Parcel A11

Parcel A8

Parcel A12

Parcel A2

Parcel A15

Parcel A17

Parcel A18

Parcel A16

Parcel A6

Parcel A3

Parcel A4

Parcel A10

Parcel A1

Parcel B6

Humphrey Creek

Parcel B8

Parcel B14

Parcel B21

Parcel B22

Parcel B16

Parcel B15

Parcel B24

Parcel B23

Parcel B25

Old Road Bay

Block House Cove

Parcel B7

Jones Creek

Parcel B1

Parcel B2

Parcel B3

Parcel B17

Parcel B19

Parcel B4

Parcel B5

Parcel B9

Parcel B18

Parcel B10

Parcel B13

Parcel B20

Parcel B11

Parcel B12

Patapsco River

Approximate Shoreline 1916

March 4, 2020

Adapted from Figure 2-20 of the Description of Current Conditions Report prepared by Rust Environmental and Infrastructure, dated January 1998

Figure 2

ARM Group LLC
Engineers and Scientists

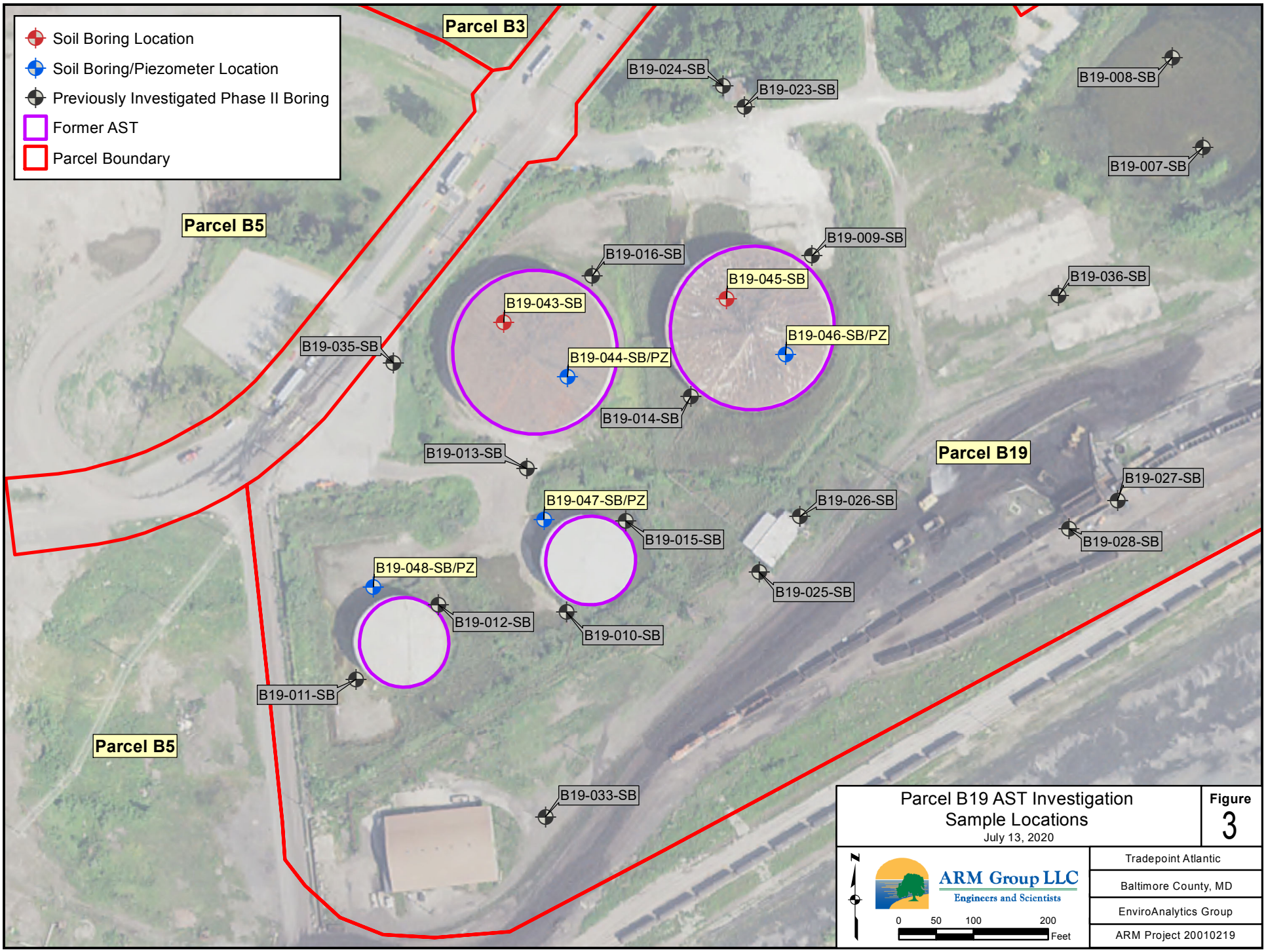
0 500 1,000 2,000 Feet

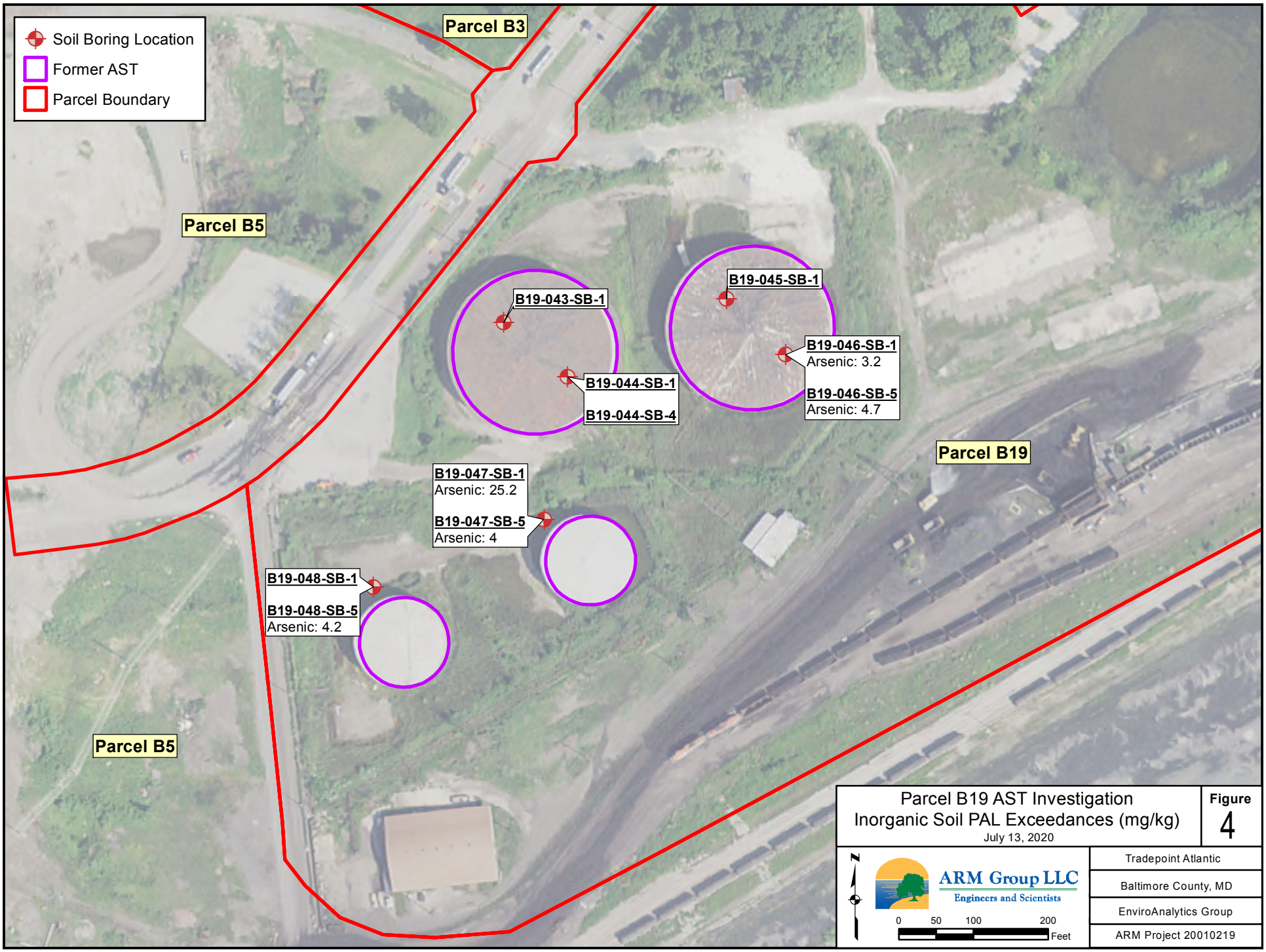
Tradepoint Atlantic

Baltimore County, MD

EnviroAnalytics Group

Area A: Project 200101
Area B: Project 200102


Soil Boring Location
Soil Boring/Piezometer Location
Previously Investigated Phase II Boring
Former AST
Parcel Boundary
Parcel B3
Parcel B5
Parcel B19
Parcel B5
B19-024-SB
B19-023-SB
B19-008-SB
B19-007-SB
B19-009-SB
B19-016-SB
B19-045-SB
B19-036-SB
B19-043-SB
B19-035-SB
B19-046-SB/PZ
B19-044-SB/PZ
B19-014-SB
B19-013-SB
B19-027-SB
B19-047-SB/PZ
B19-026-SB
B19-015-SB
B19-028-SB
B19-048-SB/PZ
B19-025-SB
B19-012-SB
B19-010-SB
B19-011-SB
B19-033-SB
Parcel B19 AST Investigation
Sample Locations
July 13, 2020
Figure
3
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
ARM Project 20010219



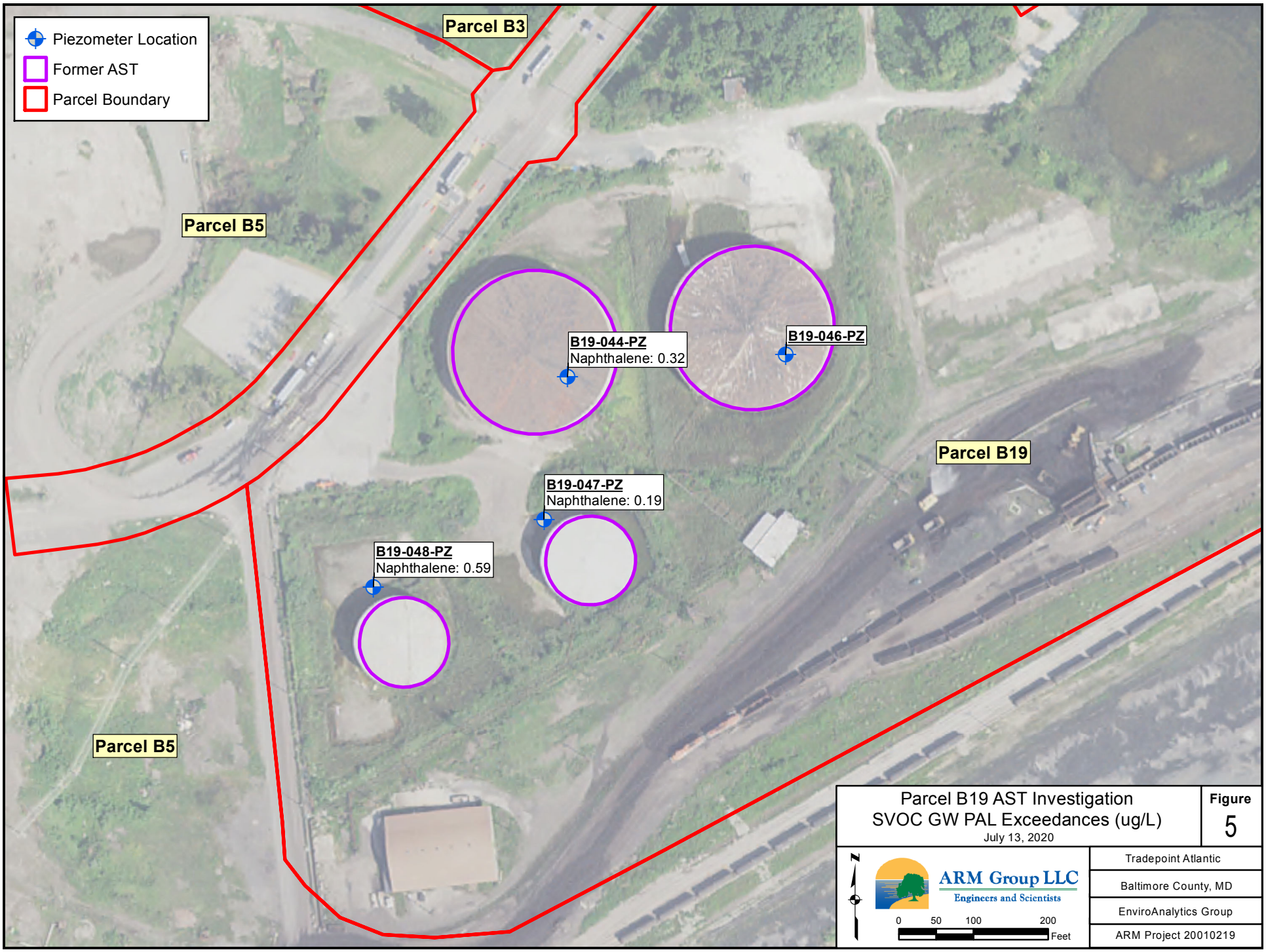
Parcel B19 AST Investigation
Inorganic Soil PAL Exceedances (mg/kg)
July 13, 2020

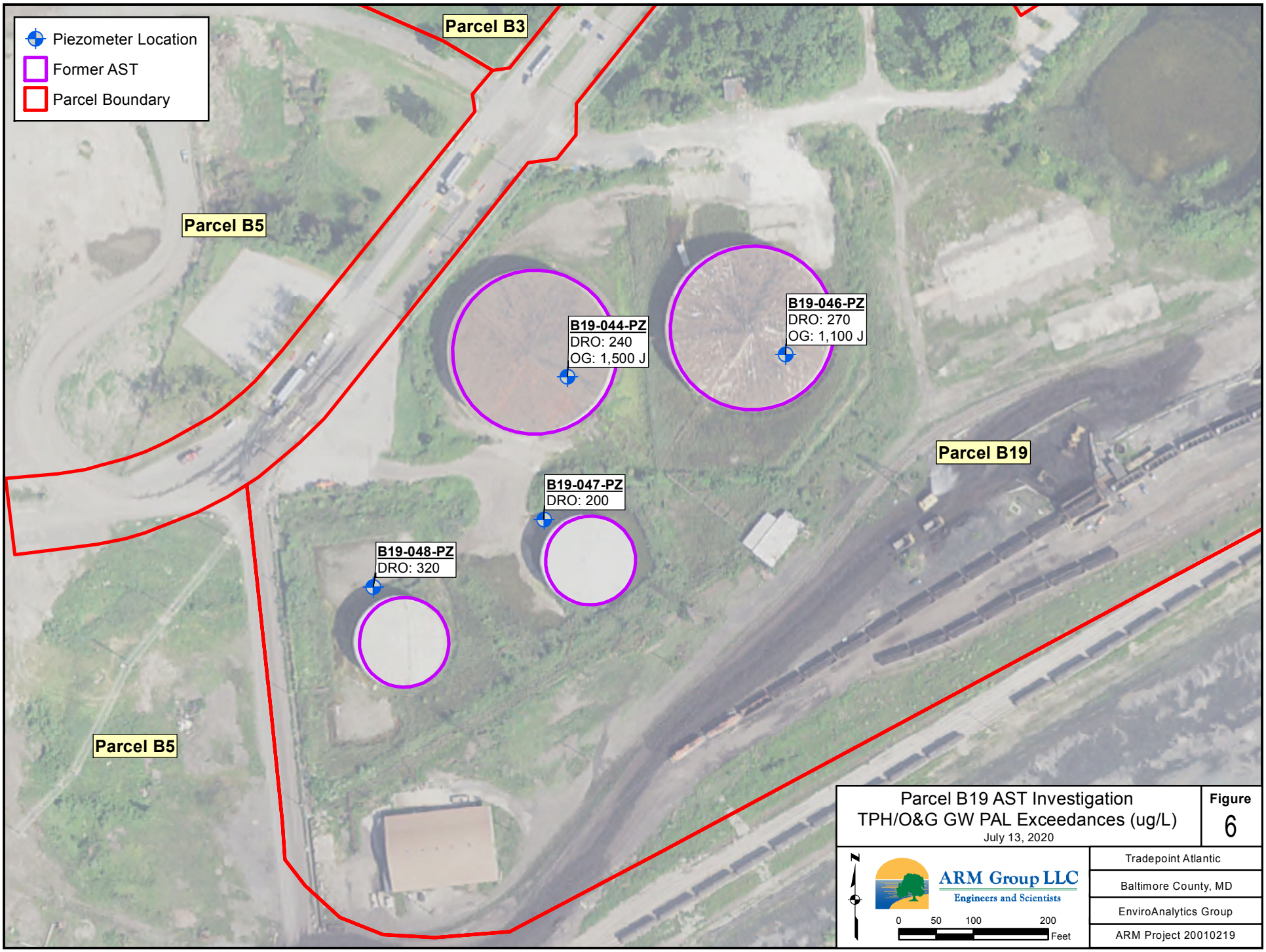
Figure 4

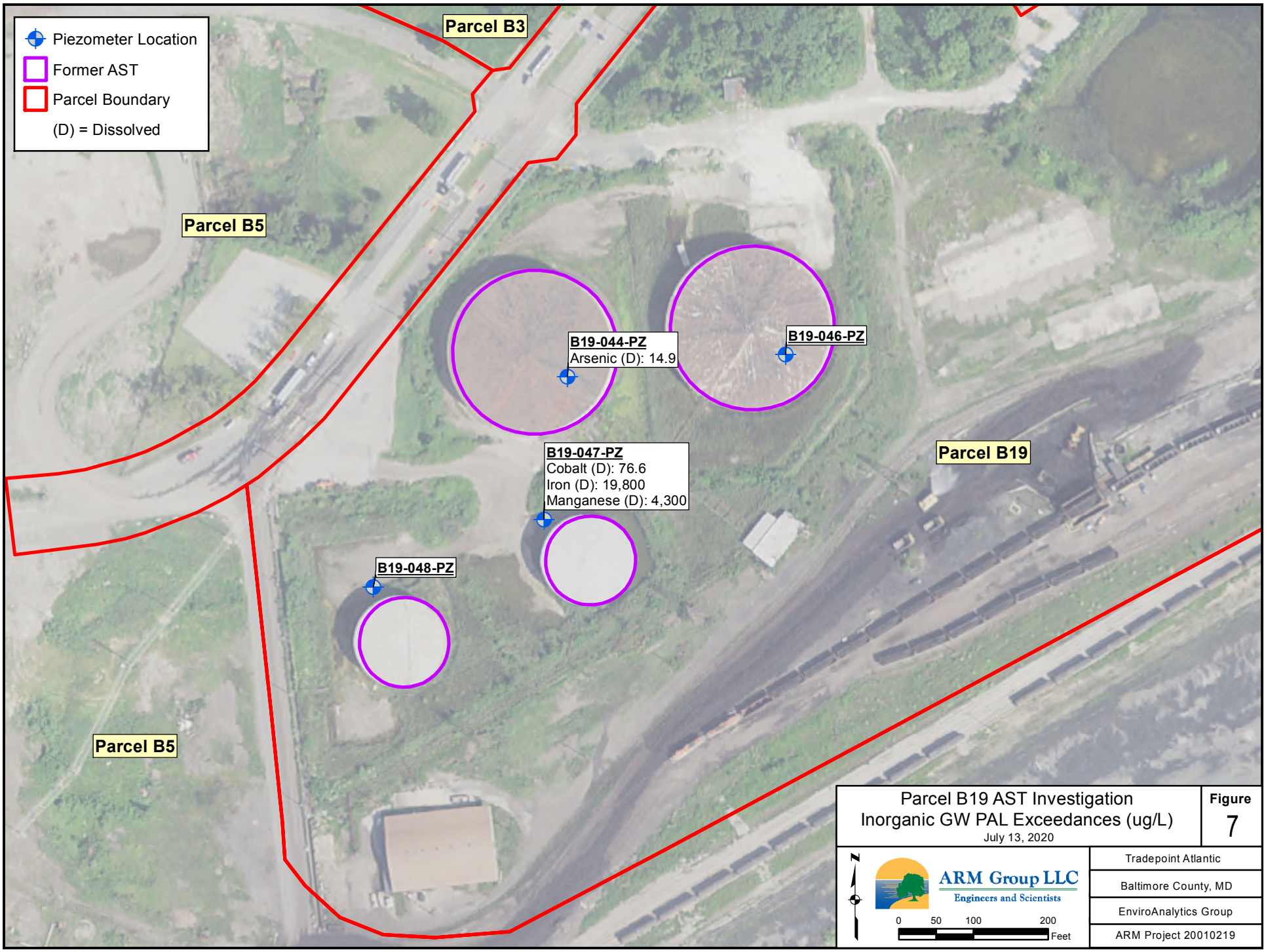
ARM Group LLC
Engineers and Scientists

0 50 100 200 Feet

Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
ARM Project 20010219


Piezometer Location
Former AST
Parcel Boundary
Parcel B3
Parcel B5
Parcel B19
Parcel B5
B19-044-PZ
Naphthalene: 0.32
B19-046-PZ
B19-047-PZ
Naphthalene: 0.19
B19-048-PZ
Naphthalene: 0.59
Parcel B19 AST Investigation
SVOC GW PAL Exceedances (ug/L)
July 13, 2020
Figure
5
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
ARM Project 20010219


Piezometer Location
Former AST
Parcel Boundary
Parcel B3
Parcel B5
Parcel B19
Parcel B5
B19-044-PZ
DRO: 240
OG: 1,500 J
B19-046-PZ
DRO: 270
OG: 1,100 J
B19-047-PZ
DRO: 200
B19-048-PZ
DRO: 320
Parcel B19 AST Investigation
TPH/O&G GW PAL Exceedances (ug/L)
July 13, 2020
Figure
6
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
ARM Project 20010219


Piezometer Location
Former AST
Parcel Boundary
(D) = Dissolved
Parcel B3
Parcel B5
Parcel B5
Parcel B19
B19-044-PZ
Arsenic (D): 14.9
B19-046-PZ
B19-047-PZ
Cobalt (D): 76.6
Iron (D): 19,800
Manganese (D): 4,300
B19-048-PZ
Parcel B19 AST Investigation
Inorganic GW PAL Exceedances (ug/L)
July 13, 2020
Figure
7
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
ARM Project 20010219

TABLES

Table 1 - Parcel B19 AST Characterization
Characterization Results for Solid IDW

Sample ID	Parameter	Result (mg/L)	Laboratory Flag	TCLP Limit (mg/L)	TCLP Exceedance	Laboratory LOQ (mg/L)
B19 Waste (5/20/2020)	1,1-Dichloroethene	0.05	U	0.7	no	0.05
	1,2-Dichloroethane	0.05	U	0.5	no	0.05
	1,4-Dichlorobenzene	0.5	U	7.5	no	0.5
	2,4,5-Trichlorophenol	5	U	400	no	5
	2,4,6-Trichlorophenol	0.1	U	2	no	0.1
	2,4-Dinitrotoluene	0.1	U	0.13	no	0.1
	2-Butanone (MEK)	0.1	U	200	no	0.1
	2-Methylphenol	2	U	200	no	2
	3&4-Methylphenol(m&p Cresol)	2	U	200	no	2
	Arsenic	0.025	U	5	no	0.025
	Barium	0.11		100	no	0.05
	Benzene	0.05	U	0.5	no	0.05
	Cadmium	0.015	U	1	no	0.015
	Carbon tetrachloride	0.05	U	0.5	no	0.05
	Chlorobenzene	0.05	U	100	no	0.05
	Chloroform	0.05	U	6	no	0.05
	Chromium	0.0037	B	5	no	0.025
	Hexachlorobenzene	0.1	U	0.13	no	0.1
	Hexachloroethane	0.2	U	3	no	0.2
	Lead	0.05	U	5	no	0.05
	Mercury	0.001	U	0.2	no	0.001
	Nitrobenzene	0.1	U	2	no	0.1
	Pentachlorophenol	5	U	100	no	5
	Selenium	0.04	U	1	no	0.04
	Silver	0.03	U	5	no	0.03
	Tetrachloroethene	0.05	U	0.7	no	0.05
	Trichloroethene	0.05	U	0.5	no	0.05
	Vinyl chloride	0.05	U	0.2	no	0.05

U: The analyte was not detected in the sample. The numeric value represents the sample LOQ.
B: The analyte was not detected substantially above the level of the associated method blank or field blank.
TCLP: Toxicity Characteristic Leaching Procedure
LOQ: Limit of Quantitation

Table 2 - Parcel B19 AST Characterization
Characterization Results for Liquid IDW

Sample ID	Parameter	Result (mg/L)	Laboratory Flag	TCLP Limit (mg/L)	TCLP Exceedance	Laboratory LOQ (mg/L)
Water IDW (7/1/2020)	1,1-Dichloroethene	0.001	U	0.7	no	0.001
	1,2-Dichloroethane	0.001	U	0.5	no	0.001
	1,4-Dichlorobenzene	0.001	U	7.5	no	0.001
	2,4,5-Trichlorophenol	0.0025	U	400	no	0.0025
	2,4,6-Trichlorophenol	0.00098	U	2	no	0.00098
	2,4-Dinitrotoluene	0.00098	U	0.13	no	0.00098
	2-Butanone (MEK)	0.01	U	200	no	0.01
	2-Methylphenol	0.00098	U	200	no	0.00098
	3&4-Methylphenol(m&p Cresol)	0.002	U	200	no	0.002
	Arsenic	0.005	U	5	no	0.005
	Benzene	0.00069	J	0.5	no	0.001
	Cadmium	0.0293		1	no	0.003
	Carbon tetrachloride	0.001	U	0.5	no	0.001
	Chlorobenzene	0.001	U	100	no	0.001
	Chloroform	0.001	U	6	no	0.001
	Chromium	0.0047	J	5	no	0.005
	Hexachlorobenzene	0.00098	U	0.13	no	0.00098
	Hexachloroethane	0.00098	U	3	no	0.00098
	Lead	0.005	U	5	no	0.005
	Mercury	0.0002	U	0.2	no	0.0002
	Nitrobenzene	0.00098	U	2	no	0.00098
	Pentachlorophenol	0.0025	U	100	no	0.0025
	Selenium	0.008	U	1	no	0.008
	Silver	0.006	U	5	no	0.006
	Tetrachloroethene	0.001	U	0.7	no	0.001
	Trichloroethene	0.00038	J	0.5	no	0.001
	Vinyl chloride	0.001	U	0.2	no	0.001

U: The analyte was not detected in the sample. The numeric value represents the sample LOQ.
J: The positive result for this analyte is a quantitative estimate below the laboratory LOQ.
TCLP: Toxicity Characteristic Leaching Procedure
LOQ: Limit of Quantitation

Table 3 - Parcel B19 AST Characterization
Summary of Organics Detected in Soil

Parameter	Units	PAL	B19-043-SB-1* 5/20/2020	B19-044-SB-1* 5/20/2020	B19-044-SB-4* 5/20/2020	B19-045-SB-1* 5/20/2020	B19-046-SB-1* 5/20/2020	B19-046-SB-5* 5/20/2020	B19-047-SB-1* 5/20/2020	B19-047-SB-5* 5/20/2020	B19-048-SB-1* 5/20/2020	B19-048-SB-5* 5/20/2020
Semi-Volatile Organic Compounds^												
2-Methylnaphthalene	mg/kg	3,000	**0.02**	**0.0086**	**0.0077**	**0.0082**	0.0078 U	0.0082 U	**0.041**	**0.0045 J**	**0.01**	0.0082 U
Acenaphthene	mg/kg	45,000	0.0077 U	0.0074 U	0.0075 U	0.0075 U	0.0078 U	0.0082 U	**0.0036 J**	0.0082 U	0.0075 U	0.0082 U
Acenaphthylene	mg/kg	45,000	0.0077 U	**0.00097 J**	**0.0017 J**	**0.0012 J**	0.0078 U	0.0082 U	**0.0059 J**	**0.0012 J**	**0.0028 J**	0.0082 U
Anthracene	mg/kg	230,000	**0.0013 J**	**0.0011 J**	**0.0011 J**	**0.0018 J**	**0.0007 J**	0.0082 U	**0.0084**	**0.0029 J**	**0.004 J**	0.0082 U
Benz[a]anthracene	mg/kg	21	**0.0024 J**	**0.0054 J**	**0.0053 J**	**0.013**	**0.0017 J**	**0.0013 J**	**0.043**	**0.018**	**0.015**	0.0082 U
Benzo[a]pyrene	mg/kg	2.1	**0.0017 J**	**0.0049 J**	**0.0064 J**	**0.013**	**0.002 J**	**0.0011 J**	**0.051**	**0.018**	**0.017**	0.0082 U
Benzo[b]fluoranthene	mg/kg	21	**0.0024 J**	**0.0072 J**	**0.0086**	**0.011**	**0.0024 J**	**0.0012 J**	**0.062**	**0.022**	**0.022**	0.0082 U
Benzo[g,h,i]perylene	mg/kg		**0.0016 J**	**0.0041 J**	**0.0048 J**	**0.0095**	**0.0015 J**	**0.00074 J**	**0.042**	**0.0098**	**0.023**	0.0082 U
Benzo[k]fluoranthene	mg/kg	210	0.0077 U	**0.0024 J**	**0.0025 J**	**0.0023 J**	**0.0007 J**	0.0082 U	**0.018**	**0.0068 J**	**0.0078**	0.0082 U
bis(2-Ethylhexyl)phthalate	mg/kg	160	**0.019 J**	**0.021 J**	**0.021 J**	**0.032 J**	**0.026 J**	**0.03 J**	0.74 U	**0.02 J**	**0.032 J**	**0.023 J**
Caprolactam	mg/kg	400,000	0.19 U	0.19 U	0.18 U	**0.023 J**	0.18 U	0.2 U	1.9 U	0.21 U	0.18 U	0.2 U
Chrysene	mg/kg	2,100	**0.0059 J**	**0.0062 J**	**0.0051 J**	**0.032**	**0.0013 J**	**0.00082 J**	**0.048**	**0.016**	**0.017**	0.0082 U
Dibenz[a,h]anthracene	mg/kg	2.1	0.0077 U	**0.0015 J**	**0.0012 J**	**0.0033 J**	0.0078 U	0.0082 U	**0.0096**	**0.0025 J**	**0.0032 J**	0.0082 U
Diethylphthalate	mg/kg	660,000	0.076 U	0.075 U	0.074 U	0.073 U	0.073 U	0.081 U	0.74 U	0.082 U	**0.016 J**	0.078 U
Di-n-butylphthalate	mg/kg	82,000	0.12 B	**0.17**	0.16 B	**0.2**	**0.17**	**0.23**	0.74 U	0.13 B	**0.21**	**0.17**
Fluoranthene	mg/kg	30,000	**0.0038 J**	**0.0088**	**0.0082**	**0.0098**	**0.0031 J**	**0.0012 J**	**0.058**	**0.032**	**0.028**	0.0082 U
Fluorene	mg/kg	30,000	**0.0015 J**	0.0074 U	**0.00093 J**	0.0075 U	0.0078 U	0.0082 U	**0.0036 J**	**0.0014 J**	0.0075 U	0.0082 U
Indeno[1,2,3-c,d]pyrene	mg/kg	21	**0.0011 J**	**0.0041 J**	**0.0053 J**	**0.0041 J**	**0.0018 J**	0.0082 U	**0.036**	**0.011**	**0.014**	0.0082 U
Naphthalene	mg/kg	8.6	**0.0054 J**	**0.0072 J**	**0.0059 J**	**0.0046 J**	**0.0037 J**	0.0082 U	**0.03**	**0.0035 J**	**0.0093**	0.0082 U
Phenanthrene	mg/kg		**0.014**	**0.0063 J**	**0.0073 J**	**0.011**	**0.0041 J**	**0.00086 J**	**0.04**	**0.011**	**0.023**	**0.00078 J**
Pyrene	mg/kg	23,000	**0.0084**	**0.007 J**	**0.0065 J**	**0.054**	**0.0024 J**	**0.0011 J**	**0.058**	**0.026**	**0.024**	0.0082 U
PCBs												
Aroclor 1254	mg/kg	0.97	0.094 U	0.019 U	N/A	0.018 U	0.018 U	N/A	**0.26**	N/A	0.09 U	N/A
TPH/Oil and Grease												
Diesel Range Organics	mg/kg	6,200	**15.5**	**11.8**	**25.4**	**34.9**	**8.2**	**8.9**	**91.7**	**37.4**	**20.7**	**12.1**
Oil and Grease	mg/kg	6,200	**92.6 J**	**63.2 J**	**67.2 J**	**62.2 J**	**90.2 J**	**101 J**	**477**	**491**	**49.7 J**	241 U

Detections in bold
Values in red indicate an exceedance of the Project Action Limit (PAL)
* indicate non-validated data
^ PAH compounds were analyzed via SIM
U: This analyte was not detected in the sample. The numeric value represents the sample quantitation/detection limit.
J: The positive result reported for this analyte is a quantitative estimate.
B: This analyte was not detected substantially above the level of the associated method blank or field blank.
N/A indicates that the parameter was not analyzed for this sample

Table 4 - Parcel B19 AST Characterization
Summary of Inorganics Detected in Soil

Parameter	Units	PAL	B19-043-SB-1* 5/20/2020	B19-044-SB-1* 5/20/2020	B19-044-SB-4* 5/20/2020	B19-045-SB-1* 5/20/2020	B19-046-SB-1* 5/20/2020	B19-046-SB-5* 5/20/2020	B19-047-SB-1* 5/20/2020	B19-047-SB-5* 5/20/2020	B19-048-SB-1* 5/20/2020	B19-048-SB-5* 5/20/2020
Metals												
Aluminum	mg/kg	1,100,000	**52,000**	**49,100**	**38,400**	**37,900**	**50,700**	**21,100**	**13,800**	**15,000**	**10,000**	**14,700**
Arsenic	mg/kg	3	2.2 U	**2.5**	2.3 U	**2.5**	**3.2**	**4.7**	**25.2**	**4**	2.2 U	**4.2**
Barium	mg/kg	220,000	**524**	**538**	**320**	**418**	**705**	**117**	**109**	**80.4**	**59.8**	**49.1**
Beryllium	mg/kg	2,300	**7**	**7**	**5.2**	**6.4**	**7**	**1.4**	**1.2**	**0.55 J**	**0.32 J**	**0.48 J**
Cadmium	mg/kg	980	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.5 U	**0.77 J**	1.5 U	**0.48 J**	1.4 U
Chromium	mg/kg	120,000	**6.1**	**16.1**	**11.9**	**7.7**	**45.7**	**29.7**	**134**	**35**	**994**	**18.4**
Chromium VI	mg/kg	6.3	1.2 U	1.2 U	1.1 U	1.1 U	1.1 U	1.2 U	1.2 U	1.3 U	**1.2**	1.2 U
Cobalt	mg/kg	350	4.5 U	**0.51 J**	**0.94 J**	**0.58 J**	**0.56 J**	**10.4**	**6.6**	**4.4 J**	**2 J**	**3.9 J**
Copper	mg/kg	47,000	4.5 U	4.5 U	**3.2 J**	4.5 U	4.5 U	**12.9**	**45**	**12.8**	**25.6**	**8**
Iron	mg/kg	820,000	**4,930**	**9,820**	**27,100**	**12,300**	**7,160**	**24,900**	**45,300**	**18,500**	**185,000**	**14,300**
Lead	mg/kg	800	**17.3**	**5.2**	**2.6**	**27.8**	**3.8**	**10.6**	**159**	**34**	**5.7**	**8.5**
Manganese	mg/kg	26,000	**2,870**	**3,010**	**1,560**	**1,750**	**4,270**	**166**	**2,550**	**589**	**21,200**	**121**
Mercury	mg/kg	350	0.12 U	0.11 U	0.11 U	0.1 U	0.11 U	**0.033 J**	**0.028 J**	**0.037 J**	**0.0069 J**	**0.025 J**
Nickel	mg/kg	22,000	8.9 U	**1.6 J**	**2.5 J**	**1.5 J**	8.9 U	**17.4**	**25.8**	**10.3 J**	**19.7**	**10.9**
Selenium	mg/kg	5,800	**3.9**	**3.3 J**	**4.4**	**3.6 J**	3.6 U	3.9 U	3.5 U	4.1 U	3.6 U	3.7 U
Thallium	mg/kg	12	8.9 U	9 U	9.2 U	9 U	8.9 U	9.8 U	**3.1 J**	10.3 U	**8.9**	9.2 U
Vanadium	mg/kg	5,800	**12.4**	**52.8**	**27**	**12.2**	**72.8**	**39**	**222**	**186**	**536**	**27.4**
Zinc	mg/kg	350,000	**2.3 J**	**7.1**	**4.7**	**1.6 J**	**3.4 J**	**77.2**	**299**	**59.5**	**150**	**29.8**
Other												
Cyanide	mg/kg	150	**0.33 J**	**0.38 J**	**1.1**	**0.28 J**	**0.54 J**	**0.23 J**	**1.2**	**0.3 J**	**0.34 J**	**0.2 J**

Detections in bold
Values in red indicate an exceedance of the Project Action Limit (PAL)
* indicates non-validated data
U: This analyte was not detected in the sample. The numeric value represent the sample quantitation/detection limit.
J: The positive value reported for this analyte is a quantitative estimate.

Table 5 - Parcel B19 AST Characterization
Summary of Organics Detected in Groundwater

Parameter	Units	PAL	B19-044-PZ* 5/26/2020	B19-046-PZ* 5/28/2020	B19-047-PZ* 5/26/2020	B19-048-PZ* 5/26/2020
Volatile Organic Compounds						
2-Butanone (MEK)	µg/L	5,600	10 U	10 U	10 U	**5.6 J**
Acetone	µg/L	14,000	10 U	10 U	10 U	**67.5**
Semi-Volatile Organic Compounds^						
1,4-Dioxane	µg/L	0.46	0.099 U	0.1 U	**0.14**	0.098 U
2-Methylnaphthalene	µg/L	36	**0.028 J**	**0.016 J**	**0.021 J**	**0.15**
2-Methylphenol	µg/L	930	0.99 U	1 U	0.98 U	**0.6 J**
Acenaphthene	µg/L	530	**0.027 J**	**0.0084 J**	0.095 U	**0.36**
Acenaphthylene	µg/L	530	0.095 U	**0.0041 J**	0.095 U	0.095 U
Anthracene	µg/L	1,800	0.095 U	**0.013 J**	0.095 U	**0.027 J**
Benzo[a]pyrene	µg/L	0.2	0.095 U	**0.0034 J**	0.095 U	0.095 U
bis(2-Ethylhexyl)phthalate	µg/L	6	0.99 U	**0.49 J**	0.98 U	0.98 U
Caprolactam	µg/L	9,900	2.5 U	**0.34 J**	2.5 U	**1 J**
Chrysene	µg/L	25	0.095 U	**0.0041 J**	0.095 U	0.095 U
Dibenz[a,h]anthracene	µg/L	0.025	0.095 U	**0.0035 J**	0.095 U	0.095 U
Di-n-butylphthalate	µg/L	900	0.85 B	1.9 B	**1.2**	**1.2**
Fluoranthene	µg/L	800	0.095 U	**0.0097 J**	0.095 U	0.095 U
Fluorene	µg/L	290	**0.033 J**	**0.0063 J**	0.095 U	**0.054 J**
Indeno[1,2,3-c,d]pyrene	µg/L	0.25	0.095 U	**0.0038 J**	0.095 U	0.095 U
Naphthalene	µg/L	0.12	**0.32**	**0.029 J**	**0.19**	**0.59**
Phenanthrene	µg/L		**0.026 J**	**0.016 J**	0.095 U	**0.055 J**
Phenol	µg/L	5,800	0.99 U	1 U	**0.22 J**	**1.6**
Pyrene	µg/L	120	0.095 U	**0.0075 J**	0.095 U	0.095 U
TPH/Oil and Grease						
Diesel Range Organics	µg/L	47	**240**	**270**	**200**	**320**
Oil and Grease	µg/L	47	**1,500 J**	**1,100 J**	4,750 U	4,750 U

Detections in bold

Values in red indicate an exceedance of the Project Action Limit (PAL)

* indicates non-validated data

^ PAH compounds were analyzed via SIM

U: This analyte was not detected in the sample. The numeric value represents the sample quantitation/detection limit

J: The positive result reported for this analyte is a quantitative estimate.

B: This analyte was not detected substantially above the level of the associated method blank or field blank.

Table 6 - Parcel B19 AST Characterization
Summary of Inorganics Detected in Groundwater

Parameter	Units	PAL	B19-044-PZ*	B19-046-PZ*	B19-047-PZ*	B19-048-PZ*
			5/26/2020	5/28/2020	5/26/2020	5/26/2020
Dissolved Metals						
Aluminum, Dissolved	µg/L	20,000	**338**	**316**	**242**	**2,970**
Arsenic, Dissolved	µg/L	10	**14.9**	**2.2 J**	5 U	**4.5 J**
Barium, Dissolved	µg/L	2,000	**83**	**48.4**	**17.6**	**86.1**
Beryllium, Dissolved	µg/L	4	1 U	1 U	**1.1**	1 U
Cadmium, Dissolved	µg/L	5	3 U	3 U	**0.52 J**	3 U
Chromium, Dissolved	µg/L	100	**0.94 J**	**0.81 J**	**1.4 J**	**0.87 J**
Cobalt, Dissolved	µg/L	6	5 U	5 U	**76.6**	5 U
Copper, Dissolved	µg/L	1,300	5 U	5 U	5 U	**10**
Iron, Dissolved	µg/L	14,000	**45.2 J**	70 U	**19,800**	70 U
Manganese, Dissolved	µg/L	430	**51.3**	**17.7**	**4,300**	5 U
Nickel, Dissolved	µg/L	390	10 U	10 U	**64.9**	**2.9 J**
Selenium, Dissolved	µg/L	50	**5.5 J**	**13**	8 U	8 U
Vanadium, Dissolved	µg/L	86	**26.2**	**61.5**	5 U	**1.1 J**
Zinc, Dissolved	µg/L	6,000	10 U	10 U	**133**	10 U
Other						
Cyanide	µg/L	200	**11**	10 U	**6.5 J**	**5.9 J**

Detections in bold

Values in red indicate an exceedance of the Proejct Action Limit (PAL)

* indicates non-validated data

U: This analyte was not detected in the sample. The numeric value represents the sample quantitation/detection limit.

J: The positive value reported for this analyte is a quantitative estimate.

Table 7 - Parcel B19 AST Characterization
Cumulative Vapor Intrusion Comparison

				B19-044-PZ		B19-046-PZ		B19-047-PZ		B19-048-PZ	
				5/26/2020		5/28/2020		5/26/2020		5/26/2020	
Parameter	Type	Organ Systems	VI Screening Criteria (ug/L)	Conc. (ug/L)	Risk/ Hazard	Conc. (ug/L)	Risk/ Hazard	Conc. (ug/L)	Risk/ Hazard	Conc. (ug/L)	Risk/ Hazard
Cancer Risk											
1,4-Dioxane	SVOC		130,000	0.099 U	0	0.1 U	0	0.14	1.1E-11	0.098 U	0
Naphthalene	SVOC		200	0.32	1.6E-08	0.029 J	1.5E-09	0.19	9.5E-09	0.59	3.0E-08
Cumulative Vapor Intrusion Cancer Risk					2E-08		1E-09		1E-08		3E-08
Non-Cancer Hazard											
Cumulative Vapor Intrusion Non-Cancer Hazard					0		0		0		0

Highlighted values indicate exceedances of the cumulative vapor intrusion criteria: TCR>1E-05 or THI>1
Conc. = Concentration
U: This analyte was not detected in the sample. The numeric value represents the sample quantitation/detection limit.
J: The positive result reported for this analyte is a quantitative estimate.

APPENDIX A

Parcel B19 AST Characterization Sampling Plan Summary
Former Sparrows Point Steel Mill
Sparrows Point, Maryland

Table 1 - Soil Sampling Summary

Source Area/ Description	REC & Finding/ SWMU/ AOC	Figure or Drawing of Reference	Rationale	Number of Locations	Sample Locations	Boring Depth	Sample Depth	Analytical Parameters: Soil Samples
Former ASTs		Site Visit	Investigate potential impacts related to former aboveground storage tanks (potential leaks or releases).	6	B19-043 through B19-048	Total depth of 20 feet or groundwater.	0-1', 4-5', 9-10' bgs. 4-5' interval may be adjusted in the field based on observations or field screening.	VOC^, SVOC, Metals, DRO/GRO, O&G, PCBs (0-1')
			Total:	6				

VOCs - Volatile Organic Compounds (Target Compound List)
^VOCs are only collected if the PID reading exceeds 10 ppm
SVOCs - Semivolatile Organic Compounds (Target Compound List)
Metals - (Target Analyte List plus Hexavalent Chromium and Cyanide)
O&G - Oil and Grease
DRO/GRO - Diesel Range Organics/Gasoline Range Organics
PCBs - Polychlorinated Biphenyls
bgs - Below Ground Surface

Parcel B19 AST Characterization Sampling Plan Summary
Former Sparrows Point Steel Mill
Sparrows Point, Maryland

Table 2 - Groundwater Sampling Summary

Source Area/ Description	REC & Finding/ SWMU/ AOC	Figure or Drawing of Reference	Condition of Existing Well	Number of Locations	Sample Locations	Boring Depth	Screen Interval	Analytical Parameters: Groundwater Samples
Former ASTs		Site Visit	N/A	4	B19-044, B19-046 through B19-048	Total depth of 7 feet below water table.	7 feet below water table to 3 feet above water table.	VOC, SVOC, Metals (dissolved), Cyanide (total), O&G, DRO/GRO
			Total:	4				

Field measurements include pH, DO, ORP, conductivity, temperature.
Metals analysis will include dissolved hexavalent chromium

VOCs - Volatile Organic Compounds (Target Compound List)
SVOCs - Semivolatile Organic Compounds (Target Compound List)
Metals - (Target Analyte List plus Hexavalent Chromium and Cyanide)
O&G - Oil and Grease
DRO/GRO - Diesel Range Organics/Gasoline Range Organics

APPENDIX B

ARM Group LLC
Engineers and Scientists

Boring ID: B19-043-SB

Client	: EnviroAnalytics Group
ARM Project No.	: 20010219
Project Description	: Sparrows Point - Parcel B19
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT
Date	: 05/20/2020
Weather	: Cloudy, 50s
Northing (US ft)	: 565345.81
Easting (US ft)	: 1461996.61

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0						
		-	B19-043-SB-1	(0-2') SLAG, SAND and GRAVEL-sized, medium dense, grayish brown and gray, very moist, non-plastic, non-cohesive	SW/GW	
		-				
	60	0.0		(2-5') SLAG GRAVEL, fine to coarse, medium dense to dense, light gray to gray, wet, non-plastic, non-cohesive	GW	Wet at 3' bgs
		0.0				
		0.0				
5				End of Boring		

Boring terminated at 5' bgs due to water and refusal.

ARM Group LLC
Engineers and Scientists

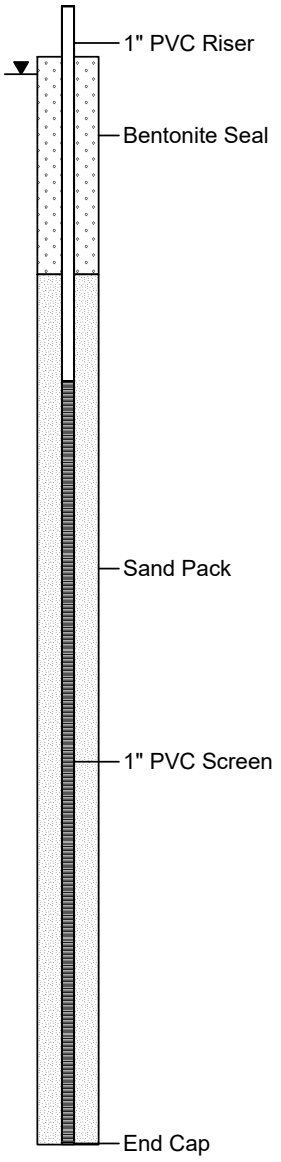
Boring ID: B19-044-SB/PZ

Client	: EnviroAnalytics Group
ARM Project No.	: 20010219
Project Description	: Sparrows Point - Parcel B19
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 05/20/2020
Piezometer Installation Date	: 05/20/2020
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 565272.81
Easting (US ft)	: 1462081.63
48-Hr DTW	: 3.33' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0						
		-	B19-044-SB-1			
		4.7		(0-4') SLAG GRAVEL, fine to coarse, medium dense, light grayish brown to light gray, moist to very moist, no plasticity, no cohesion, trace cobbles	GW	
	86	0.1				
		3.7	B19-044-SB-4			
		0.0		(4-5') SLAG GRAVEL, fine to coarse, with some SILT, medium dense, black with gray, wet, no plasticity, no cohesion	GW	Wet at 4' bgs
5		-		(5-10') core stuck, soft clay apparent at both ends of core		
		-				
	0	-			CL	
		-				
		-				
10				End of Boring		



Boring terminated at 10' bgs due to water and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface

Riser Stickup: 3.17' ags
Riser: 0 - 3' bgs
Screen: 2 - 10' bgs [Slot Size: 0.010"]
Sand Pack: 2 - 10' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 2' bgs [Grain Size: bentonite chips]

ARM Group LLC
Engineers and Scientists

Boring ID: B19-045-SB

Client	: EnviroAnalytics Group	Date	: 05/20/2020
ARM Project No.	: 20010219	Weather	: Cloudy, 50s
Project Description	: Sparrows Point - Parcel B19		
Site Location	: Sparrows Point, MD		
ARM Representative	: L. Perrin		
Checked by	: M. Replogle, E.I.T.	Northing (US ft)	: 565378.15
Drilling Company	: GSI	Easting (US ft)	: 1462294.78
Driller	: Don Marchese		
Drilling Equipment	: Geoprobe 7822DT		

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0						
		-	B19-045-SB-1	(0-1.2') SLAG, SAND and GRAVEL-sized, loose to medium dense, grayish brown and light gray, very moist, non-plastic, non-cohesive	SW/GW	
		0.0		(1.2-3.7') SLAG GRAVEL, fine to coarse, medium dense to dense, light gray, wet, non-plastic, non-cohesive, trace SILT	GW	Wet at 1.7' bgs
	86	0.0				
		0.0				
				(3.7-5') SILTY SAND, very fine to fine, dense, black then light brownish gray with yellowish brown, wet, non-plastic, non-cohesive	SM	
		0.0				
5				End of Boring		

Boring terminated at 5' bgs due to water.

ARM Group LLC
Engineers and Scientists

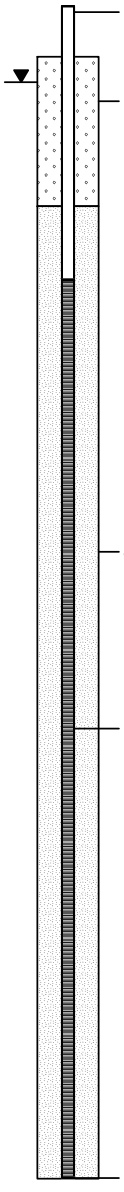
Boring ID: B19-046-SB/PZ

Client	: EnviroAnalytics Group
ARM Project No.	: 20010219
Project Description	: Sparrows Point - Parcel B19
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 05/20/2020
Piezometer Installation Date	: 05/20/2020
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 565302.60
Easting (US ft)	: 1462373.73
48-Hr DTW	: 3.51' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS
0		-	B19-046-SB-1	(0-3') SLAG GRAVEL, fine to coarse, medium dense, gray, moist grading to very moist, no plasticity, no cohesion, trace cobbles	GW
	88	0.0			
		0.0			
		0.0		(3-8') CLAY, very firm to hard, pale brown with reddish yellow mottling, dry to moist, low plasticity, cohesive, trace SAND	
		0.0	B19-046-SB-5		
5		0.0			CL
	90	0.0			
		0.0			
		0.0		(8-10.2') SAND with CLAY, very fine to fine, dense, light grayish brown with reddish yellow mottling, wet, non-plastic, non-cohesive	SW-SC
		0.0			
10		-		(10.2-11') SANDY CLAY, soft, reddish yellow, very moist, low plasticity, cohesive	CL
		0.0		(11-15') CLAY, soft, gray, very moist, low plasticity, cohesive	
	86	0.0			CL
		0.0			
		0.0			
15				End of Boring	



REMARKS: Wet at 8' bgs

Boring terminated at 15' bgs due to water and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface

Riser Stickup: 3.10' ags
Riser: 0 - 3' bgs
Screen: 3 - 15' bgs [Slot Size: 0.010"]
Sand Pack: 2 - 15' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 2' bgs [Grain Size: bentonite chips]

ARM Group LLC
Engineers and Scientists

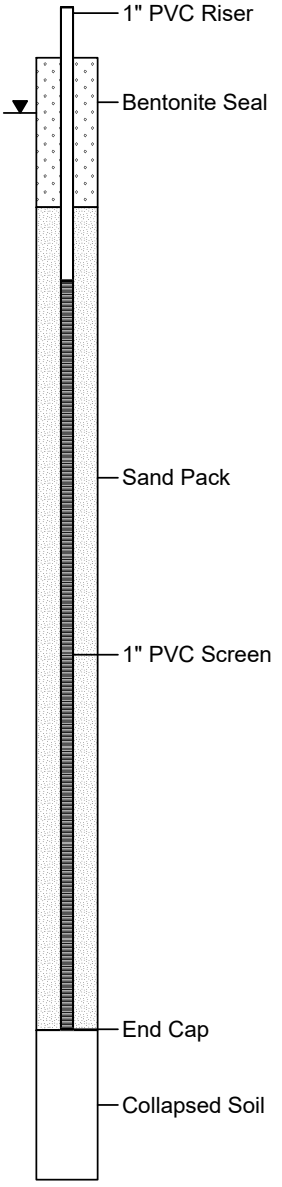
Boring ID: B19-047-SB/PZ

Client	: EnviroAnalytics Group
ARM Project No.	: 20010219
Project Description	: Sparrows Point - Parcel B19
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 05/20/2020
Piezometer Installation Date	: 05/20/2020
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 565081.89
Easting (US ft)	: 1462050.08
48-Hr DTW	: 3.91' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	92	0.0	B19-047-SB-1	(0-1.2') SLAG GRAVEL with some SAND-sized SLAG and CLAY, loose to medium dense, gray with red, dry, no plasticity, no cohesion	GW	
		0.0		(1.2-2.7') CLAY with trace very fine SAND, hard, brown, dry, low plasticity, cohesive	CL	
		0.0				
		0.0		(2.7-5.4') CLAY, very firm then soft at 4.5' bgs, light brown and light grayish brown with green and reddish yellow then brown with black at 4.5' bgs, moist, low plasticity, cohesive	CL	
		0.0	B19-047-SB-5			
5	100	0.0		(5.4-6') CLAY with SAND, very firm, light brown with reddish yellow mottling, moist, low plasticity, cohesive	CL	Wet at 6' bgs
		0.0		(6-8.3') SAND with CLAY, dense, reddish yellow and light brownish gray, moist, low plasticity, cohesive	SW-SC	
		0.0				
		0.0		(8.3-10') CLAY, hard, reddish yellow and light brownish gray, moist, low plasticity, cohesive, trace SAND	CL	
10	0	-		(10-15') No Recovery		
		-				
		-				
		-				
15				End of Boring		



Boring terminated at 13' bgs due to water and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface

Riser Stickup: 3.18' ags
Riser: 0 - 3' bgs
Screen: 3 - 13' bgs [Slot Size: 0.010"]
Sand Pack: 2 - 13' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 2' bgs [Grain Size: bentonite chips]

ARM Group LLC
Engineers and Scientists

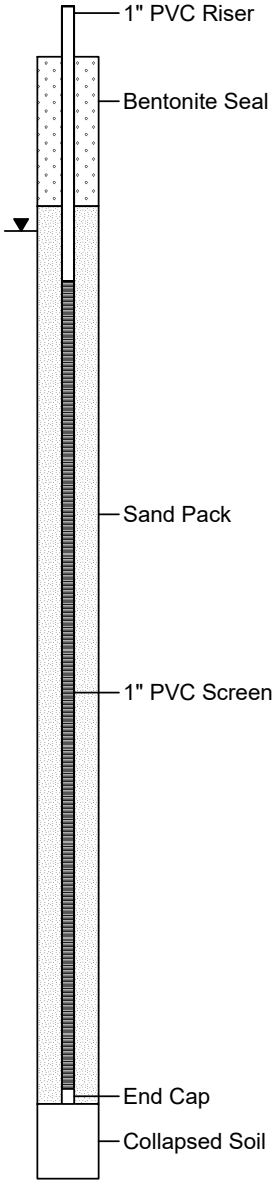
Boring ID: B19-048-SB/PZ

Client	: EnviroAnalytics Group
ARM Project No.	: 20010219
Project Description	: Sparrows Point - Parcel B19
Site Location	: Sparrows Point, MD
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 05/20/2020
Piezometer Installation Date	: 05/20/2020
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 564991.63
Easting (US ft)	: 1461821.83
48-Hr DTW	: 5.46' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0		0.0	B19-048-SB-1	(0-2.9') Non-native SAND and SLAG, SAND and GRAVEL sized, medium dense, dark brown, dry, no plasticity, no cohesion	SW/GW	trace organics and clay at surface
		0.0				
	100	0.0				
		0.0		(2.9-7') CLAY with trace very fine SAND, hard grading to very firm, brown gradinig to yellowish bown and light grayish brown, dry grading to moist, low plasticity, cohesive	CL	
		0.0	B19-048-SB-5			
5		0.0				
		0.0				
	78	0.0		(7-8.4') CLAYEY SAND, dense, reddish yellow and light grayish brown, wet, low plasticity, cohesive	SC	Wet at 7' bgs
		0.0		(8.4-9.6') CLAY with SAND, very firm, reddish yellow and light grayish brown, moist, low plasticity, cohesive	CL	
		0.0				
10		-		(9.6-12.5') SAND, very fine to medium, dense, light gray, then reddish yellow at 10.4' bgs, wet, no plasticity, no cohesion	SW	
		0.0				
	92	0.0		(12.5-15') CLAY, soft to firm, light grayish brown, very moist, low plasticity, cohesive	CL	
		0.0				
		0.0				
15				End of Boring		



Boring terminated at 15' bgs due to water and piezometer installation
Piezometer installed to 14' bgs
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface

Riser Stickup: 3.13' ags
Riser: 0 - 3' bgs
Screen: 3 - 14' bgs [Slot Size: 0.010"]
Sand Pack: 2 - 14' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 2' bgs [Grain Size: bentonite chips]

APPENDIX C

PID CALIBRATION LOG

PROJECT NAME: Area B, Parcel B19 AST Characterization				SAMPLER NAME: L. Parker			
PROJECT NUMBER: 20010219				DATE: May 20, 2020		PAGE 1 of 1	
DATE/TIME	SAMPLER INITIALS	PID SERIAL #	FRESH AIR CAL	STANDARD	STANDARD CONCENTRATION	METER READING	COMMENTS
5/20/2020 8:30	LLP	592-913262	0.0	Isobutylene	100 ppm	100.0	-

APPENDIX D

Low Flow Sampling Permanent Wells

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: B19 P2	Project Number:
Well Number: B19-044-P2	Date: 5/26/2020
Well Diameter (in): 1	One Well Volume (gal):
Depth to Product (ft): none	QED Controller Settings:
Depth to Water (ft): 3.33	Flow Rate (mL/min): 450
Product Thickness (ft): -	Length of time Purged (min)
Depth to Bottom (ft): 13.11	Condition of Pad/Cover: /

PURGING RECORD

Time	Volume Purged (gallons)	DTW (feet)	Temp (°C)	pH (s.u.) ± 0.1	Specific Conductance (ms/cm) ± 3%	Dissolved Oxygen (mg/L) ± 0.3	ORP (mV) ± 10	Turbidity (NTU) ± 10% or < 5	Comments
1050	1.5		17.9	9.67	1.710	4.15	-138.3	64.8	
1055	2.1		18.5	9.64	1.673	2.88	-172.7	29.1	
1100	2.7		18.2	10.08	1.648	2.41	-215.5	15.4	
1105	3.3		18.0	10.50	1.638	2.15	-254.3	11.4	
1110	3.9		18.3	10.59	1.631	1.90	-275.0	5.66	
1115	4.5		17.9	10.62	1.625	1.78	-284.8	2.61	
1120	5.1		18.1	10.68	1.625	1.71	-291.4	3.26	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
B19-044-P2	1125	TCL-VOCs	3 - 40 mL VOA	HCl	
		TPH-GRO	3 - 40 mL VOA	HCl	
		TPH-DRO	2 - 1 L Amber	none	
		TCL-SVOCs	2- 1 L Amber	none	
		Oil & Grease	2- 1 L Amber	HCl	
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (total)	1 - 250 mL Plastic	none	
		Total Cyanide	1 - 250 mL Plastic	NaOH	
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
		Matrix Spike			
		Duplicate			

Sampled By: LMH

Comments:

Casing Volume: **1" I.D.** = 0.041 gal/ft - **2" I.D.** = 0.163 gal/ft - **4" I.D.** = 0.653 gal/ft - **6" I.D.** = 1.47 gal/ft

_____ ft x _____ gal/ft = _____ (gal)

Low Flow Sampling Permanent Wells

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: BP PZ	Project Number:
Well Number: B19-0416-PZ	Date: 05/18/2020
Well Diameter (in): 1	One Well Volume (gal):
Depth to Product (ft): none	QED Controller Settings:
Depth to Water (ft): 3.91	Flow Rate (mL/min) 315
Product Thickness (ft): -	Length of time Purged (min)
Depth to Bottom (ft): 16.04	Condition of Pad/Cover: /

PURGING RECORD

Time	Volume Purged (gallons)	DTW (feet)	Temp (°C)	pH (s.u.) ± 0.1	Specific Conductance (ms/cm) ± 3%	Dissolved Oxygen (mg/L) ± 0.3	ORP (mV) ± 10	Turbidity (NTU) ± 10% or < 5	Comments
1315	1		19.3	10.35	1.623	2.69	-166.0	11.9	
1320	1.3		19.4	10.58	1.629	2.40	-166.0	5.92	
1325	1.6		18.9	10.70	1.631	2.19	-169.3	8.62	
1330	1.9		18.9	10.74	1.630	1.92	-177.0	2.11	
1335	2.3		19.0	10.73	1.629	1.82	-182.1	4.46	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
	1345	TCL-VOCs	3 - 40 mL VOA	HCl	
		TPH-GRO	3 - 40 mL VOA	HCl	
		TPH-DRO	2 - 1 L Amber	none	
		TCL-SVOCs	2- 1 L Amber	none	
		Oil & Grease	2- 1 L Amber	HCl	
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (total)	1 - 250 mL Plastic	none	
		Total Cyanide	1 - 250 mL Plastic	NaOH	
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
		Matrix Spike			
		Duplicate			

Sampled By: LMG

Comments:

Casing Volume: **1" I.D.** = 0.041 gal/ft - **2" I.D.** = 0.163 gal/ft - **4" I.D.** = 0.653 gal/ft - **6" I.D.** = 1.47 gal/ft

_____ft x _____gal/ft = _____(gal)

Low Flow Sampling
Permanent Wells

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: B19 P2	Project Number:
Well Number: B19-047-PZ	Date: 05/26/2020
Well Diameter (in): 1	One Well Volume (gal):
Depth to Product (ft): none	QED Controller Settings:
Depth to Water (ft): 3.91	Flow Rate (mL/min) 450
Product Thickness (ft): –	Length of time Purged (min)
Depth to Bottom (ft): 15.02	Condition of Pad/Cover: /

PURGING RECORD

Time	Volume Purged (gallons)	DTW (feet)	Temp (°C)	pH (s.u.) ± 0.1	Specific Conductance (ms/cm) ± 3%	Dissolved Oxygen (mg/L) ± 0.3	ORP (mV) ± 10	Turbidity (NTU) ± 10% or < 5	Comments
0940	2	.96	16.0	5.94	0.846	1.94	-12.3	77.4	
0945	2.6	.97	15.9	5.83	0.826	2.55	-4.3	61.8	
0950	3.2	.96	16.1	5.82	0.868	2.32	-3.5	46.2	
0955	4.8		16.1	5.75	0.819	2.15	2.6	33.3	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
B19-047-PZ	1000	TCL-VOCs	3 - 40 mL VOA	HCl	
		TPH-GRO	3 - 40 mL VOA	HCl	
		TPH-DRO	2 - 1 L Amber	none	
		TCL-SVOCs	2- 1 L Amber	none	
		Oil & Grease	2- 1 L Amber	HCl	
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (total)	1 - 250 mL Plastic	none	
		Total Cyanide	1 - 250 mL Plastic	NaOH	
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					
Duplicate					

Sampled By: LMG

Comments:

Casing Volume: **1" I.D.** = 0.041 gal/ft - **2" I.D.** = 0.163 gal/ft - **4" I.D.** = 0.653 gal/ft - **6" I.D.** = 1.47 gal/ft

_____ ft x _____ gal/ft = _____ (gal)

Low Flow Sampling
Permanent Wells

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: B19 P2	Project Number:
Well Number: B19-048-P2	Date: 5/26/2020
Well Diameter (in): 1	One Well Volume (gal):
Depth to Product (ft): NAN	QED Controller Settings:
Depth to Water (ft): 5.46	Flow Rate (mL/min) 400
Product Thickness (ft): —	Length of time Purged (min)
Depth to Bottom (ft): 16.86	Condition of Pad/Cover: /

PURGING RECORD

Time	Volume Purged (gallons)	DTW (feet)	Temp (°C)	pH (s.u.) ± 0.1	Specific Conductance (ms/cm) ± 3%	Dissolved Oxygen (mg/L) ± 0.3	ORP (mV) ± 10	Turbidity (NTU) ± 10% or < 5	Comments
1340	2	5.50	18.4	12.58	5.397	4.36	-162.8	53.1	
1345	2.5	.54	18.3	12.59	4.888	3.27	-213.1	26.8	
1350	3	.58	17.8	12.61	4.813	3.15	-216.2	10.4	
1355	3.5		18.2	12.59	4.624	2.99	-214.7	6.58	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
B19-048-P2	1400	TCL-VOCs	3 - 40 mL VOA	HCl	
		TPH-GRO	3 - 40 mL VOA	HCl	
		TPH-DRO	2 - 1 L Amber	none	
		TCL-SVOCs	2- 1 L Amber	none	
		Oil & Grease	2- 1 L Amber	HCl	
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (total)	1 - 250 mL Plastic	none	
		Total Cyanide	1 - 250 mL Plastic	NaOH	
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					
Duplicate					

Sampled By: LMG

Comments:

Casing Volume: **1" I.D.** = 0.041 gal/ft - **2" I.D.** = 0.163 gal/ft - **4" I.D.** = 0.653 gal/ft - **6" I.D.** = 1.47 gal/ft

_____ft x _____gal/ft = _____(gal)

APPENDIX E

Parcel B19 AST Investigation - IDW Drum Log

Drum Identification Number	Designation	Activity/Phase	Contents	Open Date
1403-Soil-5/20/20-B19	Non-Haz	Parcel B19 AST Investigation	Soil	5/20/2020
1391-Decon Water-4/14/20-B24/A14/A18/A17/B20/B22/B19	Non-Haz	Parcel B19 AST Investigation	Water	4/14/2020
1408-Purge Water-5/18/2020-GLF/PORI/B19	Non-Haz	Parcel B19 AST Investigation	Water	5/18/2020

APPENDIX F

QA/QC Tracking Log

Trip Blank:	Date:	Sample IDs:	
X	5/20/2020	1) B19-044-SB-1	Pace Analytical (All parameters except PAH)
		2) B19-044-SB-4	
		3) B19-043-SB-1	
		4) B19-046-SB-1	
		5) B19-046-SB-5	
		6) B19-045-SB-1	
		7) B19-047-SB-1	Duplicate: B19-046-SB-1
		8) B19-047-SB-5	Date: 5/20/2020
		9) B19-048-SB-1	MS/MSD: B19-046-SB-5
		10) B19-048-SB-5	Date: 5/20/2020
		11)	Field Blank Field Blank
		12)	Date: 5/20/2020
		13)	Eq. Blank: EQ Blank
		14)	Date: 5/20/2020
		15)	
		16)	
		17)	
		18)	
		19)	
		20)	

Trip Blank:	Date:	Sample IDs:	
X	5/26/2020	1) B19-044-PZ	
		2) B19-047-PZ	
		3) B19-048-PZ	
X	5/28/2020	4) B19-046-PZ	
		5)	
		6)	
		7)	Duplicate: B19-044-PZ
		8)	Date: 5/26/2020
		9)	MS/MSD: B19-046-PZ
		10)	Date: 5/28/2020
		11)	Field Blank 1515
		12)	Date: 5/28/2020
		13)	Eq. Blank:
		14)	Date:
		15)	
		16)	
		17)	
		18)	
		19)	
		20)	

	5/20/2020	1) B19-044-SB-1	Alpha Labs (PAH Analysis Only)
		2) B19-044-SB-4	
		3) B19-043-SB-1	
		4) B19-046-SB-1	
		5) B19-046-SB-5	
		6) B19-045-SB-1	
		7) B19-047-SB-1	Duplicate: B19-047-SB-5
		8) B19-047-SB-5	Date: 5/20/2020
		9) B19-048-SB-1	MS/MSD: B19-045-SB-1
		10) B19-048-SB-5	Date: 5/20/2020
		11)	Field Blank Field Blank
		12)	Date: 5/20/2020
		13)	Eq. Blank: EQ Blank
		14)	Date: 5/20/2020
		15)	
		16)	
		17)	
		18)	
		19)	
		20)	

		1)	
		2)	
		3)	
		4)	
		5)	
		6)	
		7)	Duplicate:
		8)	Date:
		9)	MS/MSD:
		10)	Date:
		11)	Field Blank:
		12)	Date:
		13)	Eq. Blank:
		14)	Date:
		15)	
		16)	
		17)	
		18)	
		19)	
		20)	

Soil samples with a sustained PID reading of 10 ppm or greater were collected for VOCs.
VOC samples were placed in a cooler with a trip blank.

APPENDIX G

Well/Piezometer Abandonment Form

Well/Piezometer ID: B19-044-PZ

General Project Information:

Client: EAG

Site Location: Sparrows Point, MD

Parcel ID: B19

Abandonment Date: 6/1/20

Abandonment Contractor: GSI

Abandonment Method (circle appropriate):

1. PVC → (Pulled) / Split / Perforated / Left-In-Place
2. Abandoned → Grout / (Bentonite Chips)

Field Equipment: Geoprobe 7822DT

ARM Representative(s): L. Perrin

Well Diameter: ___1"_____

Depth to Bottom (TOC)	Final Gauging Prior to Abandonment:
Reported (historical/log): 13.11'	Depth to Water (TOC): 4.00'
Measured: 13.11'	Depth to NAPL (TOC): No DNAPL/LNAPL

Please note if this abandonment is for a known NAPL delineation/monitoring area or individual NAPL screening piezometer and identify the name of the delineation area (e.g., B6-066 NAPL Area or B5-144 Screening Piezometer): B19 AST Characterization

Please Note: If NAPL is identified in a piezometer, the Project Manager should be notified and the piezometer may not be abandoned unless the presence of NAPL is already known and a decision has been made to abandon the NAPL monitoring network.

Additional Comments (if any):

ARM Group LLC
Engineers and Scientists
9175 Guilford Road - Suite 310
Columbia, Maryland 21046
(410) 290-7775 FAX: (410) 290-7775

Well/Piezometer Abandonment Form

Well/Piezometer ID: B19-046-PZ

General Project Information:

Client: EAG

Site Location: Sparrows Point, MD

Parcel ID: B19

Abandonment Date: 6/1/20

Abandonment Contractor: GSI

Abandonment Method (circle appropriate):

1. PVC → (Pulled) / Split / Perforated / Left-In-Place
2. Abandoned → Grout / (Bentonite Chips)

Field Equipment: Geoprobe 7822DT

ARM Representative(s): L. Perrin

Well Diameter: ___1"_____

Depth to Bottom (TOC)	Final Gauging Prior to Abandonment:
Reported (historical/log): 17.62'	Depth to Water (TOC): 4.10'
Measured: 17.10'	Depth to NAPL (TOC): No DNAPL/LNAPL

Please note if this abandonment is for a known NAPL delineation/monitoring area or individual NAPL screening piezometer and identify the name of the delineation area (e.g., B6-066 NAPL Area or B5-144 Screening Piezometer): B19 AST Characterization

Please Note: If NAPL is identified in a piezometer, the Project Manager should be notified and the piezometer may not be abandoned unless the presence of NAPL is already known and a decision has been made to abandon the NAPL monitoring network.

Additional Comments (if any):

ARM Group LLC
Engineers and Scientists
9175 Guilford Road - Suite 310
Columbia, Maryland 21046
(410) 290-7775 FAX: (410) 290-7775

Well/Piezometer Abandonment Form

Well/Piezometer ID: B19-047-PZ

General Project Information:

Client: EAG

Site Location: Sparrows Point, MD

Parcel ID: B19

Abandonment Date: 6/1/20

Abandonment Contractor: GSI

Abandonment Method (circle appropriate):

1. PVC → (Pulled) / Split / Perforated / Left-In-Place
2. Abandoned → Grout / (Bentonite Chips)

Field Equipment: Geoprobe 7822DT

ARM Representative(s): L. Perrin

Well Diameter: 1"

Depth to Bottom (TOC)	Final Gauging Prior to Abandonment:
Reported (historical/log): 15.72'	Depth to Water (TOC): 4.31'
Measured: 15.73'	Depth to NAPL (TOC): No DNAPL/LNAPL

Please note if this abandonment is for a known NAPL delineation/monitoring area or individual NAPL screening piezometer and identify the name of the delineation area (e.g., B6-066 NAPL Area or B5-144 Screening Piezometer): B19 AST Characterization

Please Note: If NAPL is identified in a piezometer, the Project Manager should be notified and the piezometer may not be abandoned unless the presence of NAPL is already known and a decision has been made to abandon the NAPL monitoring network.

Additional Comments (if any):

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Columbia, Maryland 21046
(410) 290-7775 FAX: (410) 290-7775

Well/Piezometer Abandonment Form

Well/Piezometer ID: B19-048-PZ

General Project Information:

Client: EAG

Site Location: Sparrows Point, MD

Parcel ID: B19

Abandonment Date: 6/1/20

Abandonment Contractor: GSI

Abandonment Method (circle appropriate):

1. PVC → (Pulled) / Split / Perforated / Left-In-Place
2. Abandoned → Grout / (Bentonite Chips)

Field Equipment: Geoprobe 7822DT

ARM Representative(s): L. Perrin

Well Diameter: 1"

Depth to Bottom (TOC)	Final Gauging Prior to Abandonment:
Reported (historical/log): 17.61'	Depth to Water (TOC): 5.86'
Measured: 17.57'	Depth to NAPL (TOC): No DNAPL/LNAPL

Please note if this abandonment is for a known NAPL delineation/monitoring area or individual NAPL screening piezometer and identify the name of the delineation area (e.g., B6-066 NAPL Area or B5-144 Screening Piezometer): B19 AST Characterization

Please Note: If NAPL is identified in a piezometer, the Project Manager should be notified and the piezometer may not be abandoned unless the presence of NAPL is already known and a decision has been made to abandon the NAPL monitoring network.

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