ARM Group LLC
Engineers and Scientists

January 22, 2020

Ms. Barbara Brown
Project Coordinator
Maryland Department of the Environment
1800 Washington Boulevard
Baltimore, MD 21230

Re: Supplemental Investigation Report:
CVOC Impacted Groundwater
Area A: Parcel A8 (A8-007-PZ)
Tradepoint Atlantic
Sparrows Point, MD 21219

Dear Ms. Brown:

ARM Group LLC (ARM), on behalf of EnviroAnalytics Group (EAG), completed a Phase II Investigation of Parcel A8 (the Site) in April 2016. Parcel A8 is part of Area A of the Tradepoint Atlantic property located in Sparrows Point, Maryland. During the Phase II Investigation, seven temporary groundwater sample collection points were installed at locations shown on **Figure 1**. Several of the groundwater collection points, including A8-007-PZ, were installed within the footprint of the former Air Products Facility, which is located in the southern half of the Site. A representation of the local groundwater potentiometric surface, which was constructed using a synoptic round of groundwater measurements obtained on April 8, 2016 during the Phase II Investigation, is also provided on **Figure 1**.

During the preparation of the Phase II Investigation Report, the groundwater data obtained from the seven temporary groundwater sample collection points were screened to determine whether individual sample results, or cumulative results summed by sample location, exceeded the applicable United States Environmental Protection Agency (USEPA) Vapor Intrusion Screening Levels (VISLs). The VISLs are used to evaluate the potential for risk associated with the vapor intrusion to indoor air pathway, and were determined using the USEPA's VISL Calculator, which was set for a Target Cancer Risk (TCR) of 1E-5 and Target Hazard Quotient (THQ) of 1.

An initial review of the analytical results identified elevated concentrations of chlorinated volatile organic compounds (CVOCs), specifically 1,1-dichloroethane and trichloroethene, in the groundwater sample from A8-007-PZ. This location had reported 1,1-dichloroethane and trichloroethene concentrations of 409 ug/L and 28.3 ug/L, respectively, which resulted in an elevated cumulative vapor intrusion cancer risk (2E-5) in the vicinity of A8-007-PZ. In addition,

1,1-dichloroethene (detected at 874 ug/L) was identified slightly above its individual non-cancer VISL (820 ug/L); however, this concentration did not cause the cumulative vapor intrusion non-cancer Hazard Index (HI) to exceed 1. Based on these elevated CVOC detections, it was determined that additional characterization was needed to evaluate the nature and extent of these aqueous contaminants in the vicinity of A8-007-PZ.

A Work Plan for the Characterization of CVOCs in Groundwater at A8-007-PZ dated June 12, 2019 was submitted to the Maryland Department of the Environment (MDE) and the USEPA. Following review of the proposed sampling approach (including an associated Comment Response Letter dated July 15, 2019), the Work Plan was formally approved by the agencies on July 17, 2019. Characterization activities were initiated in the vicinity of A8-007-PZ on September 11, 2019. This Supplemental Investigation Report provides a summary of the field methods and findings of the characterization activities.

Field Methods

A total of seven temporary groundwater sample collection points were installed on September 11, 2019 and September 12, 2019 to determine the nature and extent of groundwater containing elevated concentrations of CVOCs in the vicinity of A8-007-PZ. As specified in the approved Work Plan, a groundwater collection point was reinstalled at location A8-007-PZ (which had previously been abandoned) with an identical screen interval as the original sample location (from 5 to 20 feet below ground surface (bgs)). In addition to the reinstallation of A8-007-PZ, six new temporary groundwater sample collection points were installed within the footprint of the former Air Products Facility at the locations show on **Figure 2** to further define the lateral extent of the elevated CVOCs.

Following the identification of all utilities in the study area, each groundwater collection point was installed in accordance with the procedures referenced in the Quality Assurance Project Plan (QAPP) Worksheet 21 – Field Standard Operating Procedures (SOPs), SOP No. 028 – Direct Push Installation and Construction of Temporary Groundwater Sample Collection Points. Soil cores recovered from each location were screened and logged by ARM personnel. The combined soil boring logs and piezometer construction logs from the CVOC investigation have been included in **Attachment 1**. Each boring was completed to a final depth between 20 and 30 feet bgs, and the groundwater collection points were installed and screened in accordance with the requirements given in the referenced SOP and the approved Work Plan. Immediately after installation, 48 hours after installation, and immediately prior to sampling, each groundwater collection point was checked for the presence of non-aqueous phase liquid (NAPL) using an oil-water interface probe. NAPL was not detected at any of the locations.

On September 27, 2019, groundwater samples were collected from the seven locations in accordance with the procedures referenced in the QAPP Worksheet 21 – Field SOPs, SOP No. 006 – Groundwater Sampling. The sampling and purge logs are provided as **Attachment 2**. Laboratory samples were submitted to Pace Analytical Services, Inc. (PACE) and analyzed for the Target Compound List (TCL) of VOCs via USEPA Method 8260. Sample containers, preservatives, and holding times for the VOCs analysis are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times.

Investigation-Derived Waste (IDW)

In accordance with the approved Work Plan and the requirements of the QAPP, potentially impacted IDW generated during this investigation was containerized in 55-gallon (DOT-UN1A2) drums. Following the completion of field activities in 2019, a composite sample was prepared using aliquots from each of the Parcel A8 CVOC IDW soil drums for waste characterization. A list of all results from the soil IDW characterization procedure can be found in **Attachment 3**. 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 chosen as a subset of the aqueous drums being staged on-site at the date of collection. Following the analysis of the sample, the aqueous IDW was characterized as non-hazardous. A list of all results from the aqueous waste characterization procedure can be found in **Attachment 4**.

Characterization Results

Table 1 provides the analytical results for VOCs detected in groundwater in the vicinity of A8-007-PZ. This table includes the original analytical results for VOCs obtained during the Phase II Investigation at locations A8-002-PZ, A8-004-PZ, A8-007-PZ, and A8-009-PZ. The laboratory report for the supplemental characterization samples, as well as the laboratory reports and associated data validation reports (DVRs) for the original Phase II Investigation samples obtained from those locations, are included as electronic attachments.

Figure 3 displays the VOC concentrations in the groundwater samples which exceeded the Project Action Limits (PALs) established in the property-wide QAPP. The red highlighting in the figure indicates which of the groundwater sample locations had a potentially elevated cumulative vapor intrusion risk based on a comparison to the USEPA VISLs.

A summary of the cumulative vapor intrusion evaluation is provided on **Table 2**. Two of the characterization locations (A8-007E-PZ and A8-00F-PZ) had elevated CVOC concentrations that contributed to a potentially elevated cumulative vapor intrusion non-cancer hazard (HI=2). The compounds causing the elevated cumulative vapor intrusion risk were trichloroethene (37.2 ug/L) and 1,1-dichloroethene (1,440 ug/L) at locations A8-007E-PZ and A8-007F-PZ, respectively. In addition, trichloroethene was identified slightly above its individual non-cancer

VISL (22 ug/L) at locations A8-007B-PZ (27 ug/L), A8-007C-PZ (27.4 ug/L), and A8-007F-PZ (25.7 ug/L); however, these concentrations were only slightly above the VISL and did not cause the cumulative vapor intrusion non-cancer HI to exceed 1. It should also be noted that the reinstalled location A8-007-PZ did not exceed the cumulative vapor intrusion cancer or non-cancer criteria when resampled during this investigation.

Characterization activities indicate that two supplemental groundwater samples (A8-007E-PZ and A8-007F-PZ) exceeded the acceptable cumulative vapor intrusion non-cancer HI. Upon review of the results, elevated concentrations of CVOCs contributing to potential vapor intrusion risks appear to extend to the north and west of A8-007-PZ. However, available data from the original Phase II Investigation obtained from locations A8-002-PZ, A8-004-PZ, and A8-009-PZ has indicated comparatively low CVOC concentrations (when present) and lack of VISL exceedances at these historical locations. The extent of the groundwater concentrations resulting in potentially elevated vapor intrusion risk has been adequately delineated out to these historical points.

In the future, it will be necessary to incorporate all characterization findings into a vapor intrusion assessment within a Response and Development Work Plan (RADWP) or related document for this area of the property. The need for any additional delineation or response action in the future will be contingent on future development planning (i.e., if an enclosed structure is proposed for construction in the area).

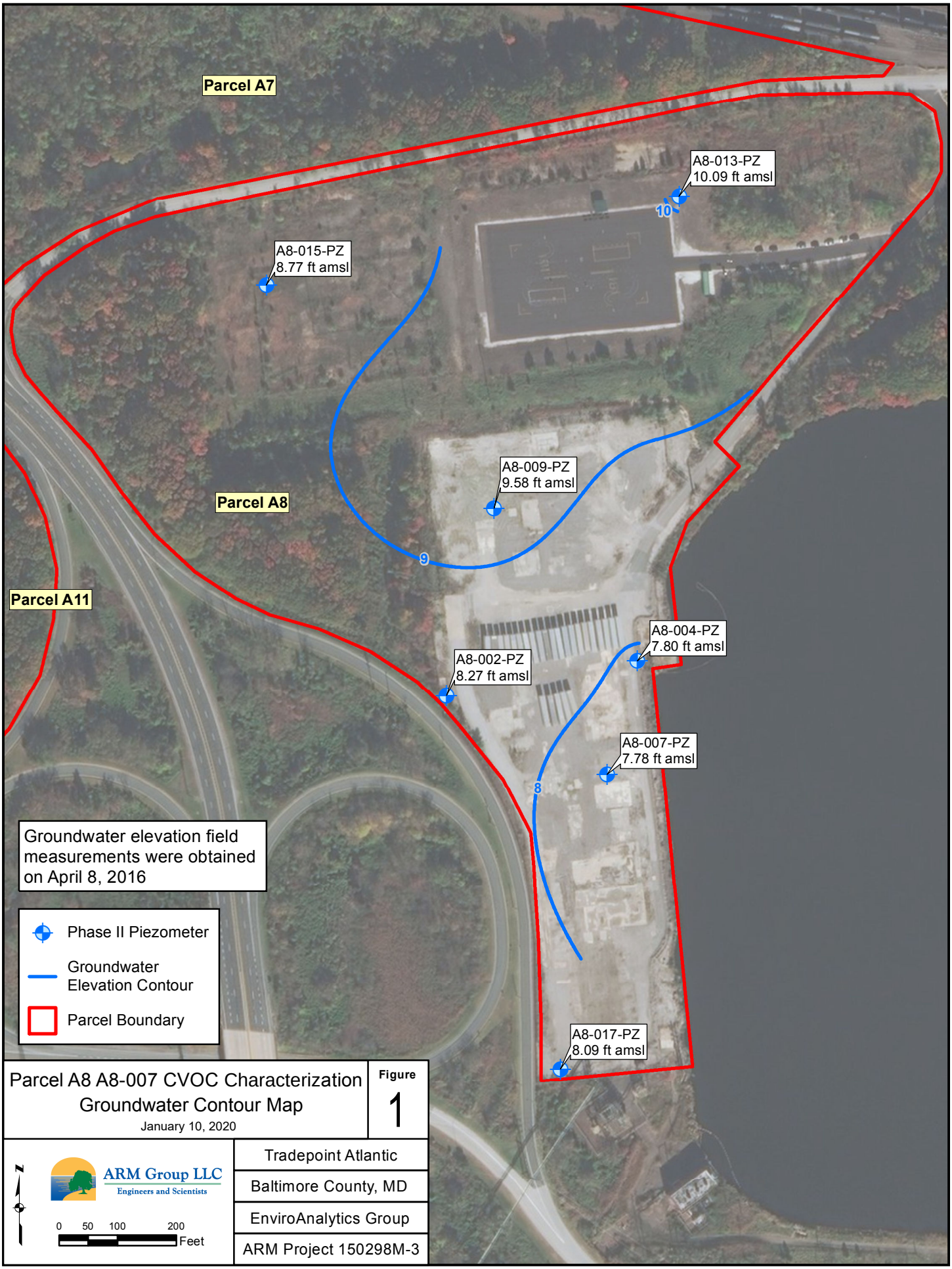
If you have questions regarding any information covered in this document, please feel free to contact ARM Group LLC at (410) 290-7775.

Respectfully submitted,
ARM Group LLC

Taylor R. Smith, P.E.
Project Engineer

Eric S. Magdar, P.G.
Vice President

FIGURES


Parcel A7
A8-013-PZ
10.09 ft amsl
10
A8-015-PZ
8.77 ft amsl
A8-009-PZ
9.58 ft amsl
Parcel A8
9
Parcel A11
A8-004-PZ
7.80 ft amsl
A8-002-PZ
8.27 ft amsl
A8-007-PZ
7.78 ft amsl
8
Groundwater elevation field measurements were obtained on April 8, 2016
Phase II Piezometer
Groundwater Elevation Contour
Parcel Boundary
A8-017-PZ
8.09 ft amsl
Parcel A8 A8-007 CVOC Characterization
Groundwater Contour Map
January 10, 2020
Figure
1
ARM Group LLC
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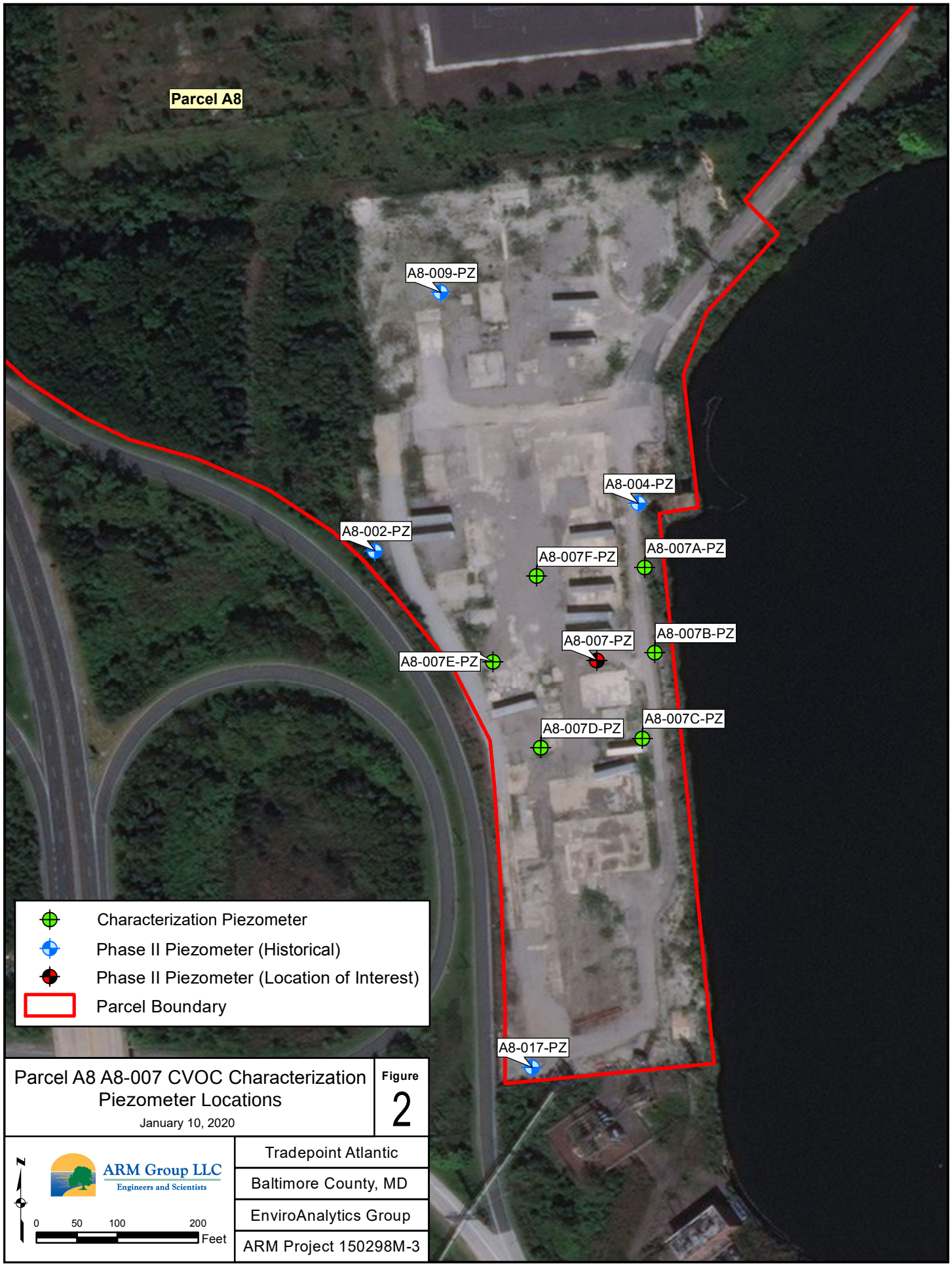
0 50 100 200
Feet
Tradepoint Atlantic
Baltimore County, MD
EnviroAnalytics Group
ARM Project 150298M-3



Parcel A8 A8-007 CVOC Characterization Piezometer Locations

January 10, 2020

Figure 2

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Baltimore County, MD

EnviroAnalytics Group

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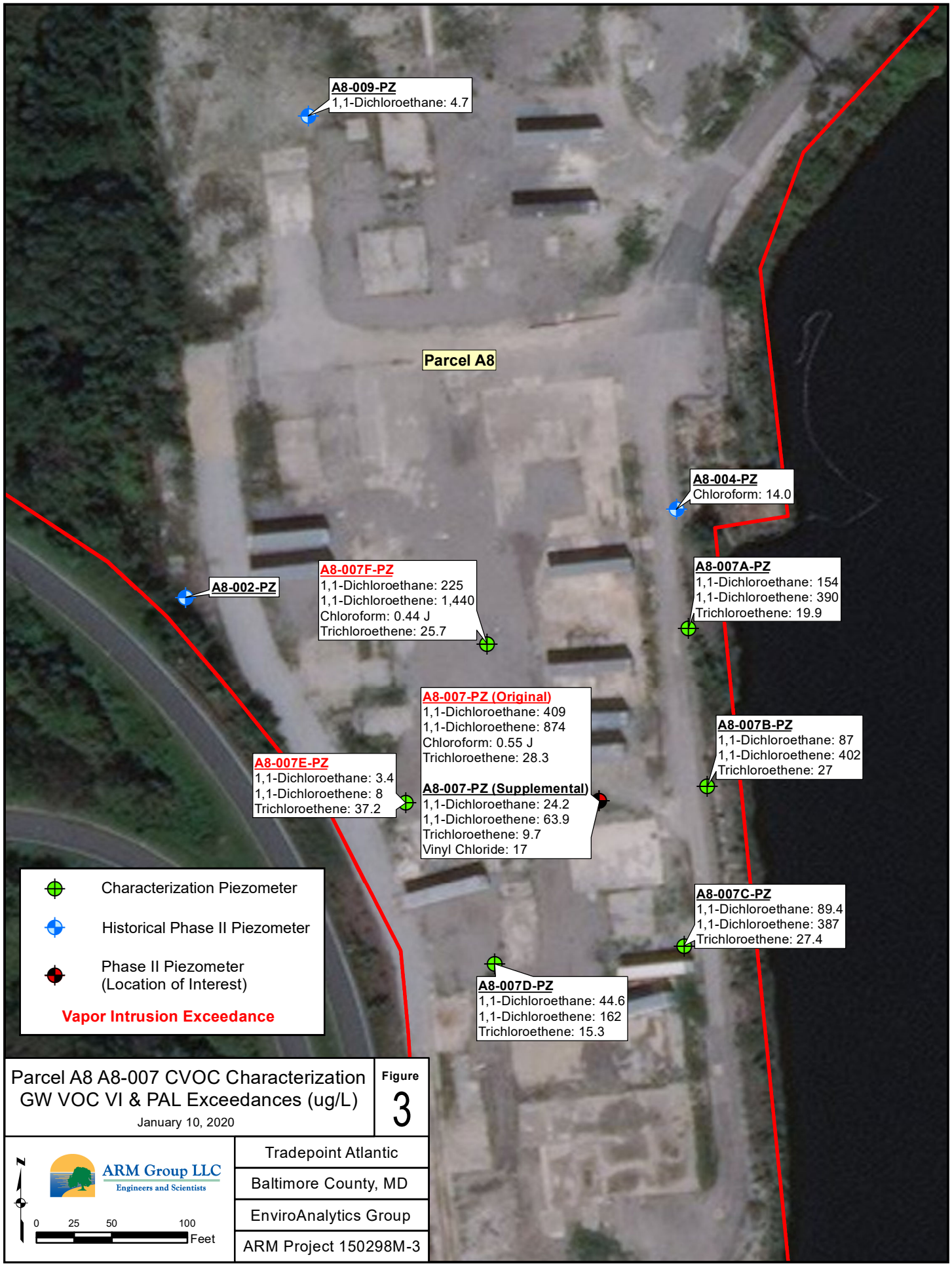

Parcel A8 A8-007 CVOC Characterization GW VOC VI & PAL Exceedances (ug/L)

January 10, 2020

Figure 3

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0 25 50 100 Feet

Tradepoint Atlantic

Baltimore County, MD

EnviroAnalytics Group

ARM Project 150298M-3

TABLES

Table 1 - Parcel A8
A8-007-PZ CVOC Characterization
Summary of VOCs Detected in Groundwater

Parameter	Units	PAL	A8-002-PZ 11/4/2015	A8-004-PZ 11/4/2015	A8-007-PZ 11/5/2015	A8-007-PZ 9/27/2019	A8-007A-PZ 9/27/2019	A8-007B-PZ 9/27/2019	A8-007C-PZ 9/27/2019	A8-007D-PZ 9/27/2019	A8-007E-PZ 9/27/2019	A8-007F-PZ 9/27/2019	A8-009-PZ 11/4/2015
Volatile Organic Compounds													
1,1,1-Trichloroethane	ug/L	200	1 U	1 U	**41.4**	1 U	**3.6**	1 U	1 U	1 U	1 U	**104**	1 U
1,1-Dichloroethane	ug/L	2.7	**1.3**	**2**	**409**	**24.2**	**154**	**87**	**89.4**	**44.6**	**3.4**	**225**	**4.7**
1,1-Dichloroethene	ug/L	7	**0.94 J**	1 U	**874**	**63.9**	**390**	**402**	**387**	**162**	**8**	**1,440**	**1.2**
1,2-Dichloroethane	ug/L	5	1 U	1 U	**2.4**	1 U	1 U	**0.88 J**	**0.91 J**	1 U	1 U	**2.5**	1 U
1,2-Dichloroethene (Total)	ug/L	70	2 U	2 U	**4.1**	**52.3**	**6.4**	**6.3**	**5.7**	**2.7**	**7.4**	**3.9**	2 U
Acetone	ug/L	14,000	10 R	10 R	10 R	10 U	10 U	**5.6 J**	10 U	10 U	10 U	10 U	10 R
Benzene	ug/L	5	1 U	1 U	**0.61 J**	1 U	1 U	1 U	1 U	1 U	1 U	**0.74 J**	1 U
Carbon disulfide	ug/L	810	1 U	1 U	**1.2**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chloroform	ug/L	0.22	1 U	**14**	**0.55 J**	1 U	1 U	1 U	1 U	1 U	1 U	**0.44 J**	1 U
cis-1,2-Dichloroethene	ug/L	70	1 U	1 U	**3.4**	**50.3**	**5.2**	**4.9**	**3.6**	**1.9**	**7.4**	**2.6**	**0.32 J**
Tetrachloroethene	ug/L	5	1 U	**3.3**	**0.99 J**	1 U	**0.74 J**	1 U	1 U	1 U	1 U	**1.1**	1 U
Toluene	ug/L	1,000	1 U	**0.38 J**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**0.22 J**
trans-1,2-Dichloroethene	ug/L	100	1 U	1 U	**0.69 J**	**2**	**1.1**	**1.4**	**2.2**	**0.78 J**	1 U	**1.3**	1 U
Trichloroethene	ug/L	5	**0.76 J**	**1.3**	**28.3**	**9.7**	**19.9**	**27**	**27.4**	**15.3**	**37.2**	**25.7**	**2.9**
Trichlorofluoromethane	ug/L	1,100	1 U	**2.2**	**0.71 J**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Vinyl chloride	ug/L	2	1 U	1 U	**1.7**	**17**	**1.7**	**1.7**	**1.2**	**0.59 J**	**0.86 J**	**1.2**	1 U
Xylenes (Total)	ug/L	10,000	3 U	**1.6 J**	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	**1.6 J**

Detections in bold
Values in red indicate an exceedance of the Project Action Limit (PAL)
U: This analyte was not detected in the sample. The numeric value represents that sample quantitation/detection limit.
J: The positive result reported for this analyte is a quantitative estimate.
R: The analytical result was rejected during validation.

Table 2 - Parcel A8
A8-007-PZ CVOC Characterization
Cumulative Vapor Intrusion Criteria Comparison

				A8-002-PZ 11/4/2015		A8-004-PZ 11/4/2015		A8-007-PZ 11/5/2015		A8-007-PZ 9/27/2019		A8-007A-PZ 9/27/2019		A8-007B-PZ 9/27/2019	
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	Conc. (ug/L)	Risk/ Hazard	Conc. (ug/L)	Risk/ Hazard
Cancer Risk															
1,1-Dichloroethane	VOC		330	1.3	3.9E-08	2	6.1E-08	409	1.2E-05	24.2	7.3E-07	154	4.7E-06	87	2.6E-06
1,2-Dichloroethane	VOC		98	1 U	0	1 U	0	2.4	2.4E-07	1 U	0	1 U	0	0.88 J	9.0E-08
Benzene	VOC		69	1 U	0	1 U	0	0.61 J	8.8E-08	1 U	0	1 U	0	1 U	0
Chloroform	VOC		36	1 U	0	14	3.9E-06	0.55 J	1.5E-07	1 U	0	1 U	0	1 U	0
Trichloroethene	VOC		74	0.76 J	1.0E-07	1.3	1.8E-07	28.3	3.8E-06	9.7	1.3E-06	19.9	2.7E-06	27	3.6E-06
Vinyl chloride	VOC		25	1 U	0	1 U	0	1.7	6.8E-07	17	6.8E-06	1.7	6.8E-07	1.7	6.8E-07
Cumulative Vapor Intrusion Cancer Risk					1E-07		4E-06		2E-05		9E-06		8E-06		7E-06
Non-Cancer Hazard															
1,1-Dichloroethene	VOC	Hepatic	820	0.94 J	0.001	1 U	0	874	1	63.9	0.08	390	0.5	402	0.5
Cumulative Vapor Intrusion Non-Cancer Hazard					0		0		1		0		0		0
Trichloroethene	VOC	Cardiovascular; Developmental; Immune	22	0.76 J	0.03	1.3	0.06	28.3	1	9.7	0.4	19.9	0.9	27	1
Cumulative Vapor Intrusion Non-Cancer Hazard					0		0		1		0		1		1
Xylenes (Total)	VOC	Nervous	1,600	3 U	0	1.6 J	0.001	3 U	0	3 U	0	3 U	0	3 U	0
Cumulative Vapor Intrusion Non-Cancer Hazard					0		0		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.

Table 2 - Parcel A8
A8-007-PZ CVOC Characterization
Cumulative Vapor Intrusion Criteria Comparison

				A8-007C-PZ 9/27/2019		A8-007D-PZ 9/27/2019		A8-007E-PZ 9/27/2019		A8-007F-PZ 9/27/2019		A8-009-PZ 11/4/2015	
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	Conc. (ug/L)	Risk/ Hazard
Cancer Risk													
1,1-Dichloroethane	VOC		330	89.4	2.7E-06	44.6	1.4E-06	3.4	1.0E-07	225	6.8E-06	4.7	1.4E-07
1,2-Dichloroethane	VOC		98	0.91 J	9.3E-08	1 U	0	1 U	0	2.5	2.6E-07	1 U	0
Benzene	VOC		69	1 U	0	1 U	0	1 U	0	0.74 J	1.1E-07	1 U	0
Chloroform	VOC		36	1 U	0	1 U	0	1 U	0	0.44 J	1.2E-07	1 U	0
Trichloroethene	VOC		74	27.4	3.7E-06	15.3	2.1E-06	37.2	5.0E-06	25.7	3.5E-06	2.9	3.9E-07
Vinyl chloride	VOC		25	1.2	4.8E-07	0.59 J	2.4E-07	0.86 J	3.4E-07	1.2	4.8E-07	1 U	0
Cumulative Vapor Intrusion Cancer Risk					7E-06		4E-06		5E-06		1E-05		5E-07
Non-Cancer Hazard													
1,1-Dichloroethene	VOC	Hepatic	820	387	0.5	162	0.2	8	0.01	1,440	2	1.2	0.001
Cumulative Vapor Intrusion Non-Cancer Hazard					0		0		0		2		0
Trichloroethene	VOC	Cardiovascular; Developmental; Immune	22	27.4	1	15.3	0.7	37.2	2	25.7	1	2.9	0.1
Cumulative Vapor Intrusion Non-Cancer Hazard					1		1		2		1		0
Xylenes (Total)	VOC	Nervous	1,600	3 U	0	3 U	0	3 U	0	3 U	0	1.6 J	0.001
Cumulative Vapor Intrusion Non-Cancer Hazard					0		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.

ATTACHMENT 1

ARM Group LLC
Engineers and Scientists

Boring ID: A8-007-SB/PZ

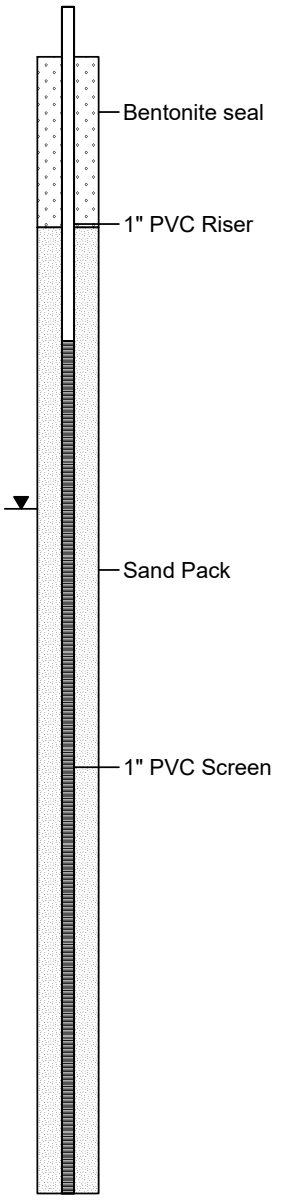
(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/11/2019
Piezometer Installation Date	: 9/11/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 573458.80
Easting (US ft)	: 1462039.43
0-Hr DTW	: 10.54' TOC
48-Hr DTW	: 10.60' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	96	-	No samples collected	(0-4.1') SILT with some fine SAND, loose, brown then black at 2.5' bgs, dry, no plasticity, no cohesion	ML	
		0.0				
		0.0				
		0.0				
		0.0		(4.1-5') CLAYEY SAND, fine, medium to dense, gray brown, dry, low plasticity, cohesion	SC	
5	100	0.0		(5-15') CLAY, dense then soft at 12.6' bgs, light gray and brown, dry, medium plasticity, cohesive	CH	
		0.0				
		0.0				
		0.0				
		0.0				
10	100	0.0				
		0.0				
		0.0				
		0.0				
15	100	0.0		(15-19.1') SILT and SAND, fine, soft then very soft at 18.8' bgs, light gray and light brown, wet, no plasticity, no cohesion	SM	Wet at 15' bgs
		0.0				
		0.0				
		0.0				
		0.0		(19.1-20') SAND, very fine, very dense, reddish yellow, wet, no plasticity, no cohesion	SP	
20				End of Boring		



Boring terminated at 20' bgs due to Work Plan
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 2.65'
Riser: 0 - 5' bgs
Screen: 5 - 20' bgs [Slot Size: 0.010"]
Sand Pack: 3 - 20' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 3' bgs [Grain Size: Granular]

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Boring ID: A8-007A-SB/PZ

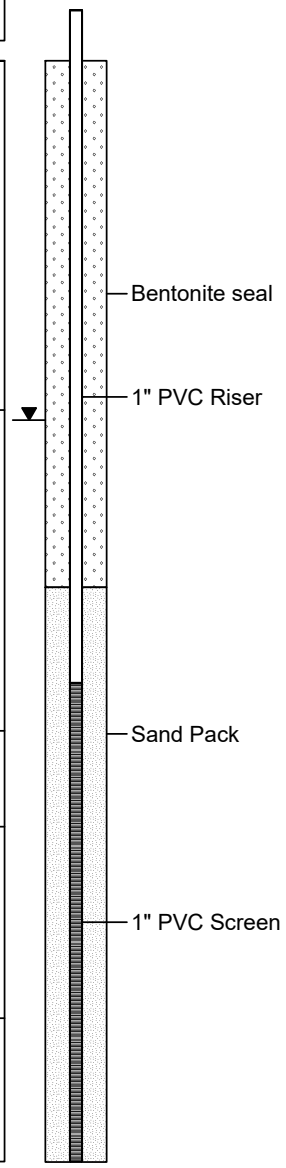
(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/12/2019
Piezometer Installation Date	: 9/12/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 1462098.46
Easting (US ft)	: 573573.16
0-Hr DTW	: 10.21' TOC
48-Hr DTW	: 9.93' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	80	-	No samples collected	(0-7.3') SILT with some fine SAND, loose, dark brown and black, dry, no plasticity, no cohesion	ML	
		0.0				
		1.6				
		8.1				
5		2.0				
		0.8				
		0.3				
	90	0.0		(7.3-14') CLAY, hard then medium at 12' bgs, light gray and very pale brown, dry, medium plasticity, cohesive	CL	
		0.0				
		0.0				
10		0.0				
		0.0				
	100	0.0				
		0.0				
		0.0				
		0.0		(14-16') CLAY, soft, gray, moist, medium plasticity, cohesive	CH	
15		0.0				
		0.0		(16-20') SAND, very fine, very dense, gray (16-16.7' bgs), then reddish yellow (16.7-20' bgs), wet, no plasticity, no cohesion	SP	Wet at 16' bgs
	100	0.0				
		0.0				
		0.0				
20		-		(20-23') NO RECOVERY DUE TO HEAVING SANDS		
	0	-				
		-				
				End of Boring		
25						



Boring terminated at 23' bgs due to groundwater and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 2.42'
Riser: 0 - 13' bgs
Screen: 13 - 23' bgs [Slot Size: 0.010"]
Sand Pack: 11 - 23' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 11' bgs [Grain Size: 3/8" chips]

ARM Group LLC
Engineers and Scientists

Boring ID: A8-007B-SB/PZ

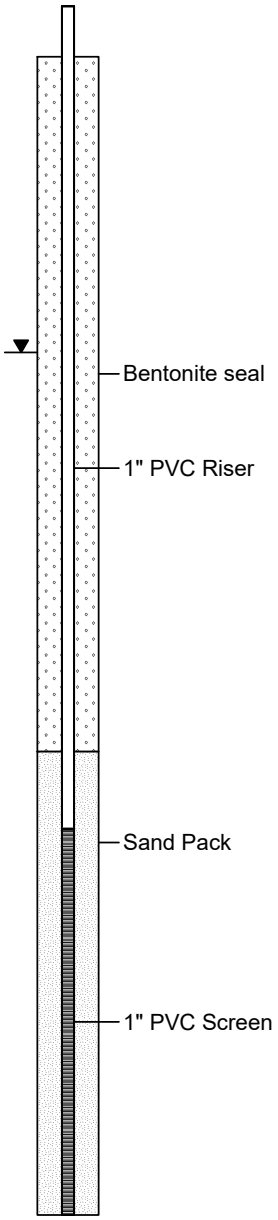
(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/11/2019
Piezometer Installation Date	: 9/11/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 1462110.96
Easting (US ft)	: 573468.51
0-Hr DTW	: 10.38' TOC
48-Hr DTW	: 10.26' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	60	- - 0.0 0.0 32.9	No samples collected	(0-6.7') SILT with some fine SAND, loose, gray and dark brown, dry, no plasticity, no cohesion	ML	
5	100	0.0 0.0 0.0 0.0 0.0		(6.7-11.8') CLAY, medium, reddish yellow brown and light gray, dry, low plasticity, cohesive	CL	
10	100	0.0 0.0 0.0 0.0 0.0		(11.8-13.3') SILT and SAND, fine, soft, gray brown, moist, low plasticity, cohesive	SM	
15	100	0.0 0.0 0.0 0.0 0.0		(13.3-22') CLAY, medium, yellowish red and light gray, dry, low plasticity, cohesive	CL	
20	100	- - - - -		(22-25') SAND, very fine, dense, light reddish brown and gray, wet, no plasticity, no cohesion	SP	Wet at 22' bgs
25	0	- - - - -		(25-30') NO RECOVERY DUE TO HEAVING SANDS		
30				End of Boring		



Boring terminated at 30' bgs due to groundwater and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 2.60'
Riser: 0 - 20' bgs
Screen: 20 - 30' bgs [Slot Size: 0.010"]
Sand Pack: 18 - 30' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 18' bgs [Grain Size: 3/8" chips]

ARM Group LLC
Engineers and Scientists

Boring ID: A8-007C-SB/PZ

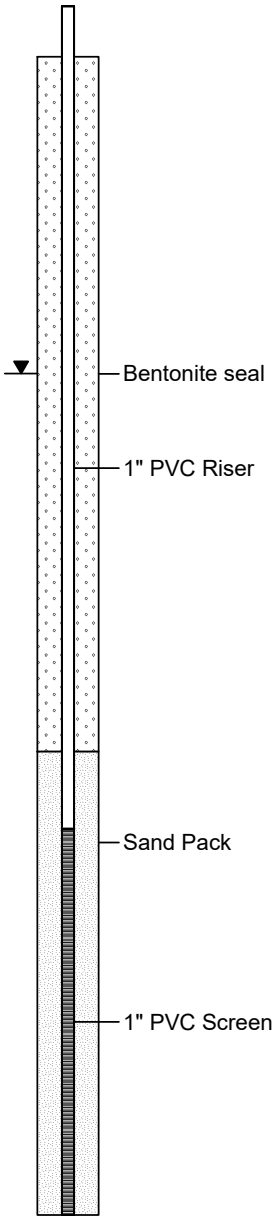
(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/11/2019
Piezometer Installation Date	: 9/11/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 1462095.62
Easting (US ft)	: 573362.69
0-Hr DTW	: 10.69' TOC
48-Hr DTW	: 10.80' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	60	-	No samples collected	(0-7') SILT with some fine SAND, loose, dark gray and brown, dry, no plasticity, no cohesion	ML	
		-				
		2.0				
		0.1				
		6.0				
5		-				
	80	5.7		(7-20') CLAY, soft and dark gray (7-10' bgs), then dense and light gray (10-17.3' bgs), then soft and light gray grading to dark gray (17.3-20' bgs), dry, high plasticity, cohesive	CH	
		0.0				
		0.0				
		0.0				
10		0.0				
		0.0				
	100	0.0				
		0.0				
		0.0				
15		0.0				
		0.0				
	100	0.0				
		0.0				
		0.0				
20		0.0		(20-22') CLAY with some SAND, soft, moist, low plasticity, cohesive	CL	
		0.0				
	100	0.0		(22-25') SAND, very fine, very dense, dark gray (22-22.8' bgs), then reddish yellow (22.8-23' bgs), then light gray (23-24' bgs), then dark gray, wet, no plasticity, no cohesion	SP	Wet at 22' bgs
		0.0				
		0.0				
25		-		(25-30') NO RECOVERY DUE TO HEAVING SANDS		
	0	-				
		-				
		-				
30				End of Boring		



Boring terminated at 30' bgs due to groundwater and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 2.59'
Riser: 0 - 20' bgs
Screen: 20 - 30' bgs [Slot Size: 0.010"]
Sand Pack: 18 - 30' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 18' bgs [Grain Size: 3/8" chips and granular]

ARM Group LLC
Engineers and Scientists

Boring ID: A8-007D-SB/PZ

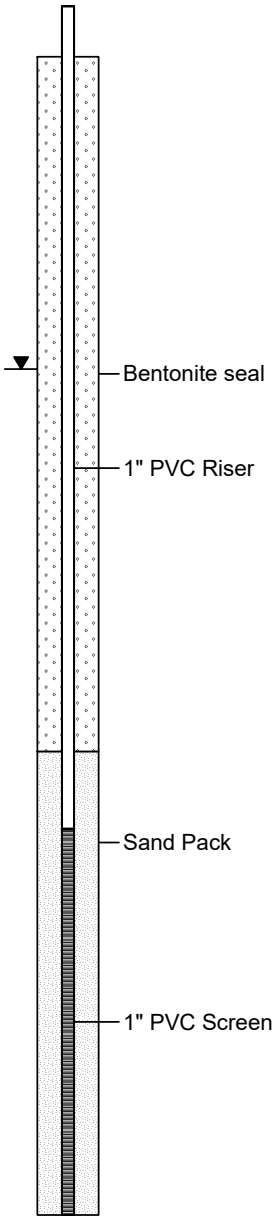
(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/11/2019
Piezometer Installation Date	: 9/11/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 1461970.26
Easting (US ft)	: 573350.74
0-Hr DTW	: 10.95' TOC
48-Hr DTW	: 10.91' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	60	- - 0.0 0.0 0.0	No samples collected	(0-7') SILT with SAND, loose, light gray and brown, dry, no plasticity, no cohesion	ML	
5		0.0 0.0 0.0				
	82	0.0 0.0 0.0 0.0 0.0 0.0 0.0		(7-22') CLAY, dense, light gray grading to light gray and reddish yellow, then dark gray and soft (14-22' bgs), dry, medium plasticity, cohesive	CH	
10		0.0 0.0 0.0 0.0 0.0 0.0 0.0				
	100	0.0 0.0 0.0 0.0 0.0 0.0 0.0				
15		0.0 0.0 0.0 0.0 0.0 0.0 0.0				
	100	0.0 0.0 0.0 0.0 0.0 0.0 0.0				
20		0.0 0.0 0.0 0.0 0.0 0.0 0.0				
	100	0.0 0.0 0.0 0.0		(22-25') SAND, very fine, very dense, dark gray, wet, no plasticity, no cohesion	SP	Wet at 22' bgs
25		- - - -		(25-30') NO RECOVERY DUE TO HEAVING SANDS		
	0	- - - -				
30				End of Boring		



Boring terminated at 30' bgs due to groundwater and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 2.82'
Riser: 0 - 20' bgs
Screen: 20 - 30' bgs [Slot Size: 0.010"]
Sand Pack: 18 - 30' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 18' bgs [Grain Size: 3/8" chips]

ARM Group LLC
Engineers and Scientists

Boring ID: A8-007E-SB/PZ

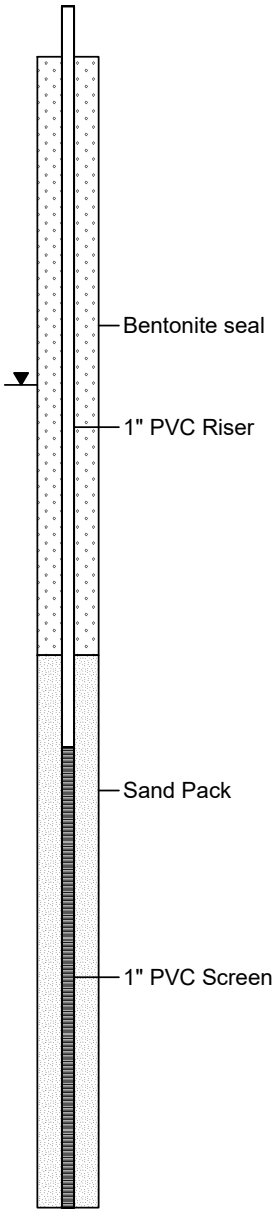
(page 1 of 1)

Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/11/2019
Piezometer Installation Date	: 9/11/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 1461911.27
Easting (US ft)	: 573457.44
0-Hr DTW	: 10.96' TOC
48-Hr DTW	: 10.22' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS	REMARKS
0	70	-	No samples collected	(0-4.6') SILT and SAND grading to SAND with SILT, loose, brown and black, dry then most from 4-4.6' bgs, no plasticity, no cohesion	ML	
		-				
		3.5				
		0.0				
		0.2				
5		0.0		(4.6-5.5') CLAY, hard, dark brown, dry, low plasticity, cohesive	CL	
		0.0		(5.5-7.7') SAND, SILT, and CLAY, light gray, wet, low plasticity, cohesive	SC	
	76	0.0				
		0.0		(7.7-15') CLAY, hard, light gray and reddish yellow, dry, medium plasticity, cohesive	CH	
		0.0				
10		0.0				
		0.0				
		0.0				
	100	0.0				
		0.0				
		0.0				
15		0.0		(15-18.5') CLAY, soft, light gray and pale brown, then dark gray (17-18.5' bgs), moist, medium plasticity, cohesive	CH	
		0.0				
	100	0.0				Wet at 18.5' bgs
		0.0				
		0.0		(18.5-20') SAND, very fine, very dense, very pale brown, wet, no plasticity, no cohesion	SP	
20		0.0		(20-25') NO RECOVERY DUE TO HEAVING SANDS		
		0.0				
	0	0.0				
		0.0				
		0.0				
25				End of Boring		



Boring terminated at 25' bgs due to groundwater and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 3.09'
Riser: 0 - 15' bgs
Screen: 15 - 25' bgs [Slot Size: 0.010"]
Sand Pack: 13 - 25' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 13' bgs [Grain Size: 3/8" chips]

ARM Group LLC
Engineers and Scientists

Boring ID: A8-007F-SB/PZ

(page 1 of 1)

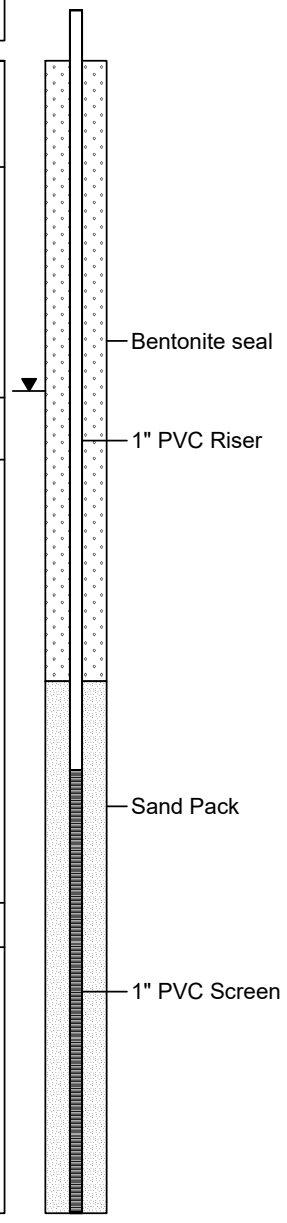
Client	: EnviroAnalytics Group
ARM Project No.	: 150298M-3-3
Project Description	: Sparrows Point - Parcel A8
Site Location	: Sparrows Point, MD
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Don Marchese
Drilling Equipment	: Geoprobe 7822DT

Soil Boring Installation Date	: 9/12/2019
Piezometer Installation Date	: 9/12/2019
Casing/Riser/Screen Type	: PVC
Borehole Diameter	: 2.25"
Riser/Screen Diameter	: 1"
Northing (US ft)	: 1461965.09
Easting (US ft)	: 573562.87
0-Hr DTW	: 10.57' TOC
48-Hr DTW	: 10.36' TOC

No LNAPL or DNAPL detected at 0 or 48 hours

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample No/Interval	DESCRIPTION	USCS
0		-			
		7.3		(0-2.4') SILT with some fine SAND, loose, black, dry, no plasticity, no cohesion	ML
	70	2.7	No samples collected		
		0.0		(2.4-7.6') CLAY, medium hard, light brown, dry, low plasticity, cohesive	
		0.0			
5		0.0			CL
		0.0			
	54	0.0			
		0.0		(7.6-9') SILT and CLAY, soft, light gray, moist, low plasticity, cohesive	CL
		0.0		(9-19') CLAY, soft to medium, light gray (9-12.5' bgs), then light brown (12.5-15' bgs), then light gray (15-17.6' bgs), then dark gray (17.6-19' bgs), moist, low plasticity, cohesive	
10		0.0			
		0.0			
	58	0.0			
		0.0			CL
		0.0			
15		0.0			
		0.0			
	60	0.0			
		0.0			
		0.0		(19-20') SAND, very fine, very dense, reddish yellow, wet, no plasticity, no cohesion	SP
20		-		(20-26') NO RECOVERY DUE TO HEAVING SANDS	
		-			
	0	-			
		-			
		-			
25					
	0	-			

End of Boring



REMARKS

Wet at 19' bgs

Boring terminated at 26' bgs due to groundwater and piezometer installation
TOC: Top of PVC casing
DTW: Depth to water
bgs: Below ground surface
AMSL: Above mean sea level

Riser Stickup: 2.91'
Riser: 0 - 16' bgs
Screen: 16 - 26' bgs [Slot Size: 0.010"]
Sand Pack: 14 - 26' bgs [Grain Size: WG #2]
Bentonite Seal: 0 - 14' bgs [Grain Size: 3/8" chips]

ATTACHMENT 2

Low Flow Sampling
Permanent Wells

AKM Group Inc.
Earth Resource Engineers and Consultants

Project Name: AG CVOC GW	Project Number: 150298M
Well Number: AG-007-PZ	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 10.89	Flow Rate (mL/min) 300
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 22.35	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
1142		12.76	19.78	6.39	1.403	4.01	14.6		
1147		13.39	19.04	6.32	1.171	0.53	13.2		
1152		13.95	18.88	6.12	1.276	0.38	27.9		
1157		13.87	18.82	5.98	1.101	0.40	35.4		
1202		13.84	18.77	5.87	1.080	0.40	41.9		
1207		13.82	18.71	5.77	1.059	0.37	47.3		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AG-007-PZ	1212	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: TCV

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

AKM Group Inc.
Earth Resource Engineers and Consultants

Project Name: AS CVOC GW	Project Number: 1592.48M
Well Number: AS-007A-PZ	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 10.26	Flow Rate (mL/min)
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 25.01	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
1221		10.36	19.03	6.28	1.063	3.94	11.5		
1226		10.38	18.56	6.36	1.078	0.56	-12.8		
1231		10.39	18.46	6.31	1.066	0.25	-8.7		
1236		10.41	18.43	6.23	1.058	0.25	-1.0		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AS-007A-PZ	1241	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: TCV

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: AG CMOC GW	Project Number: 150298M
Well Number: AG-007B-PZ	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 10.54	Flow Rate (mL/min) 200
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 29.95	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
1250		10.80	18.77	6.49	1.027	3.09	11.3		
1255		10.80	18.32	6.24	1.079	0.69	19.6		
1300		10.80	18.11	6.06	1.090	0.33	25.9		
1305		10.81	17.95	6.00	1.091	0.29	27.8		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AG-007B-PZ	1310	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: TCV

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

Project Name: AG CMC GW	Project Number: 150298M
Well Number: AG-007C-P2	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 10.99	Flow Rate (mL/min) 300
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 31.91	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
1103		11.12	14.70	5.99	1.389	5.51	64.2		
1108		11.13	14.16	6.05	1.366	1.02	19.6		
1113		11.14	17.93	6.04	1.321	0.66	10.6		
1118		11.14	17.63	6.03	1.306	0.57	8.4		
1123			17.59	6.01	1.305	0.51	6.9		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AG-007C-P2	1128	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: TCV

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

AXIM Group Inc.
Earth Resource Engineers and Consultants

Project Name: AS+ CVOC GW	Project Number: 150298M
Well Number: AS-007D-PZ	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 11.17	Flow Rate (mL/min) 300
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 27.75	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
1321		11.27	19.14	6.01	1.415	4.63	35.5		
1326		11.27	14.20	5.94	1.315	0.69	13.4		
1331		11.27	14.04	5.90	1.291	0.36	12.0		
1336		11.28	14.01	5.88	1.286	0.33	10.9		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AS-007D-PZ	1341	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: TCV

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: AG- CVOC GW	Project Number: 150298M
Well Number: AG-007E-PZ	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 10.51	Flow Rate (mL/min) 300
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 25.98	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
1352		10.85	19.07	6.20	1.874	3.81	44.5		
1357		10.85	18.62	6.43	1.843	0.73	8.7		
1402		10.85	18.37	6.41	1.811	0.36	2.0		
1407		10.86	18.24	6.34	1.793	0.25	4.5		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AG-007E-PZ	1412	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: TCV

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: AS CVOC GW	Project Number: 150295M
Well Number: AS-007F-PZ	Date: 9-27-19
Well Diameter (in):	One Well Volume (gal):
Depth to Product (ft):	QED Controller Settings:
Depth to Water (ft): 10.73	Flow Rate (mL/min)
Product Thickness (ft):	Length of time Purged (min)
Depth to Bottom (ft): 28.31	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
1422		10.93	19.00	6.67	0.893	3.75	-20.6		
1427		10.94	18.26	6.60	0.932	0.89	-59.0		
1432		10.94	18.15	6.50	0.965	0.39	-56.7		
1437		10.95	18.04	6.35	0.983	0.26	-48.6		
1442		10.95	18.00	6.24	0.992	0.22	-40.5		
1447		10.96	17.98	6.16	0.996	0.21	-34.7		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
AS-007F-PZ	1452	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: TCV

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)

ATTACHMENT 3

Attachment 3 - Parcel A8
A8-007-PZ CVOC Characterization
Characterization Results for Solid IDW

Sample ID	Parameter	Result (mg/L)	Laboratory Flag	TCLP Limit (mg/L)	TCLP Exceedance	Laboratory LOQ (mg/L)
A8 WASTE (10/25/2019)	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	5
	2-Methylphenol	2	U	200	no	2
	3&4-Methylphenol(m&p Cresol)	2	U	200	no	2
	Arsenic	0.025	U	5	no	0.05
	Barium	0.27		100	no	1
	Benzene	0.05	U	0.5	no	0.05
	Cadmium	0.015	U	1	no	0.05
	Carbon tetrachloride	0.05	U	0.5	no	0.05
	Chlorobenzene	0.05	U	100	no	1
	Chloroform	0.05	U	6	no	0.5
	Chromium	0.025	U	5	no	0.05
	Hexachlorobenzene	0.1	U	0.13	no	0.1
	Hexachloroethane	0.2	U	3	no	0.5
	Lead	0.12	U	5	no	0.1
	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	0.1
	Silver	0.03	U	5	no	0.05
	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.
TCLP: Toxicity Characteristic Leaching Procedure
LOQ: Limit of Quantitation

ATTACHMENT 4

Attachment 4 - Parcel A8
A8-007-PZ CVOC Characterization
Characterization Results for Liquid IDW

Sample ID	Parameter	Result (mg/L)	Laboratory Flag	TCLP Limit (mg/L)	TCLP Exceedance	Laboratory LOQ (mg/L)
WASTE WATER 1247-1281 (10/25/19)	1,1-Dichloroethene	0.01	U	0.7	no	0.01
	1,2-Dichloroethane	0.01	U	0.5	no	0.01
	1,4-Dichlorobenzene	0.01	U	7.5	no	0.01
	2,4,5-Trichlorophenol	0.0024	U	400	no	0.0024
	2,4,6-Trichlorophenol	0.00097	U	2	no	0.00097
	2,4-Dinitrotoluene	0.00097	U	0.13	no	0.00097
	2-Butanone (MEK)	0.1	U	200	no	0.1
	2-Methylphenol	0.0028		200	no	0.00097
	3&4-Methylphenol(m&p Cresol)	0.0019	U	200	no	0.0019
	Arsenic	0.0154		5	no	0.005
	Barium	0.242		100	no	0.01
	Benzene	0.394		0.5	no	0.01
	Cadmium	0.0062		1	no	0.003
	Carbon tetrachloride	0.01	U	0.5	no	0.01
	Chlorobenzene	0.01	U	100	no	0.01
	Chloroform	0.01	U	6	no	0.01
	Chromium	0.156		5	no	0.005
	Hexachlorobenzene	0.00097	U	0.13	no	0.00097
	Hexachloroethane	0.00097	U	3	no	0.00097
	Lead	0.129		5	no	0.005
	Mercury	0.00051		0.2	no	0.0002
	Nitrobenzene	0.00097	U	2	no	0.00097
	Pentachlorophenol	0.0024	U	100	no	0.0024
	Selenium	0.008	U	1	no	0.008
	Silver	0.006	U	5	no	0.006
	Tetrachloroethene	0.01	U	0.7	no	0.01
	Trichloroethene	0.01	U	0.5	no	0.01
	Vinyl chloride	0.01	U	0.2	no	0.01

U: The analyte was not detected in the sample. The numeric value represents the sample LOQ.
TCLP: Toxicity Characteristic Leaching Procedure
LOQ: Limit of Quantitation