ARM Group LLC
Engineers and Scientists

March 5, 2020

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

Re: Monitoring Network Letter Report:
Eastern Groundwater Delineation
Area A: Parcel A11
Tradepoint Atlantic
Sparrows Point, MD 21219

Dear Ms. Brown:

ARM Group LLC (ARM), on behalf of EnviroAnalytics Group, LLC (EAG), completed a Phase II Investigation of Parcel A11 in March 2017. Parcel A11 is part of Area A of the Tradepoint Atlantic (TPA) property located in Sparrows Point, Maryland. Following completion of the investigation, ARM prepared a Phase II Investigation Report (Revision 0) dated March 27, 2018, which was subsequently submitted to the Maryland Department of the Environment (MDE) and the United States Environmental Protection Agency (USEPA).

Project Background

During the initial Phase II Investigation, several soil samples were identified with elevated concentrations of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), particularly naphthalene. To supplement the original Phase II Investigation, a Work Plan (Revision 1 dated June 7, 2018) for the delineation of naphthalene and associated chemical constituents including benzene and benzo[a]pyrene was submitted to the MDE and USEPA to facilitate additional soil and groundwater delineation sampling activities in Parcel A11. The scope of the supplemental investigation proposed within the Work Plan was later expanded from the original scope, and the findings were periodically reported to the MDE and USEPA.

A Response and Development Work Plan (RADWP) for Sub-Parcel A11-1 (Revision 4 dated May 28, 2019) was completed to facilitate development within the eastern portion of Parcel A11. The RADWP discussed the relevant results from the Phase II Investigation and supplemental investigation that were obtained in the vicinity of the proposed development sub-parcel. As

described in the RADWP, there were widespread locations within, or adjacent to, the proposed development area with soil Project Action Limit (PAL) exceedances of benzene, benzo[a]pyrene, and naphthalene. Additionally, there were numerous PAL exceedances of total petroleum hydrocarbons (TPH)/Oil & Grease and/or indications of non-aqueous phase liquid (NAPL) in the soil cores. Soil samples exhibiting significant PAL exceedances of the identified organics were often co-located with observations of NAPL in the soil cores. NAPL was not observed to accumulate in any screening piezometers (gauged at standard 0-hr, 48-hr, and 30-day intervals) or groundwater monitoring points (gauged prior to sampling) relevant to the development sub-parcel.

Although there is no potential for direct exposures to groundwater for a Composite Worker since groundwater is not used on the TPA property (and is not proposed to be utilized), groundwater conditions were identified as a concern due to the potential to cause an unacceptable vapor intrusion condition. The RADWP addressed potential concerns associated with elevated levels of VOCs and SVOCs below the development area and proposed warehouse; however, the selected remedies were confined to the proposed development area.

Elevated concentrations of VOCs and SVOCs were documented in groundwater at various locations to the east of the development sub-parcel, which appeared to indicate the potential for dissolved-phase contaminant migration in the groundwater. Therefore, additional groundwater monitoring wells were installed to the east of the development sub-parcel to define and monitor the downgradient plume. This document summarizes the monitoring well installation activities and delineation results.

Field Methods

A total of 11 groundwater monitoring wells were installed to better characterize and define the VOC and SVOC impacts in the shallow groundwater aquifer within the eastern portion of Parcel A11 and beyond the eastern parcel boundary. Groundwater monitoring wells were constructed in accordance with the procedures referenced in the Quality Assurance Project Plan (QAPP) Worksheet 21 – Field Standard Operating Procedures (SOPs), SOP No. 014 – Monitoring Well Construction in Unconsolidated Formations. In addition, one historical groundwater monitoring well installed during the CH2M Hill Groundwater Investigation (SW02-PZM000) has been incorporated into the groundwater monitoring network. The groundwater sampling points are shown in **Figure 1**.

Between October 29, 2018 and January 23, 2019, ARM provided oversight during the installation of eight 2-inch diameter permanent groundwater monitoring wells (SW-087-MWS, SW-088-MWS, SW-089-MWS, SW-090-MWS, SW-091-MWS, SW-092-MWS, SW-093-MWS, and SW-094-MWS). Between October 24 and October 25, 2019, ARM provided oversight for the installation of three supplemental 1-inch diameter permanent groundwater monitoring wells (SW-095-MWS, SW-096-MWS, and SW-097-MWS). Soil cores at each location were screened and

logged by ARM personnel. The combined soil boring observation and well construction logs for the 11 permanent wells installed during this investigation are provided as **Attachment 1**. Following installation, all monitoring wells were developed in accordance with the procedures given in the QAPP Worksheet 21 – Field SOPs, SOP No. 018 – Well Development. The well development logs are provided as **Attachment 2**.

Through multiple groundwater sample collection events between November 19, 2018 and November 1, 2019, groundwater samples were collected from the 12 permanent groundwater monitoring wells. Immediately prior to sampling, each groundwater collection point was checked for the presence of NAPL using an oil-water interface probe. NAPL was not detected in any of the wells. Groundwater samples were collected in accordance with the QAPP Worksheet 21 – Field SOPs, SOP No. 007 – Low-Flow Groundwater Sampling. The sampling and purge logs are provided as **Attachment 3**. Laboratory samples were submitted to Pace Analytical Services, Inc. (PACE) and analyzed for VOCs, polynuclear aromatic hydrocarbons (PAHs), Oil & Grease, and TPH diesel range organics (DRO) and gasoline range organics (GRO). Sample containers, preservatives, and holding times for these analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times.

The groundwater sample collection points were surveyed by a Maryland-licensed surveyor to obtain horizontal coordinates and top of casing (TOC) elevation data. A synoptic round of groundwater measurements was collected on October 29, 2019 to obtain depth to water (DTW) measurements from each monitoring well in the vicinity. Select piezometers installed in the nearby Parcel A8 provided supplemental groundwater elevation data based on gauging measurements collected between September 13 and September 16, 2019. The data were used to construct a localized groundwater potentiometric surface map, as shown on **Figure 2**. Surveyed TOC and ground surface elevations for all applicable locations can be found in **Table 1**, along with the construction details (depths, screen intervals, etc.) and DTW measurements from these dates. The SW02-PZM000 screen interval is notably higher in elevation than the screen intervals of the other sample locations.

Delineation Results

Table 2 provides the groundwater analytical results for organics detected among the 12 monitoring wells that were sampled for this investigation along the eastern boundary of Parcel A11. The analytical laboratory reports for the 12 groundwater samples are included as electronic attachments. **Figure 3** displays the organic compounds that were detected at concentrations which exceeded the PALs established in the QAPP.

Benzene and naphthalene were determined to be the most significant contaminants in groundwater in the investigation area. **Figure 4** displays the benzene and naphthalene results from each of the 12 locations sampled during this investigation, as well as the analytical results for both constituents

obtained from numerous surrounding groundwater points that were previously sampled under the Parcel A7, Parcel A8, or Parcel A11 Phase II Investigations. Because the groundwater data from the surrounding locations was obtained during separate investigations over the past several years, the sample collection date for each identified location is provided on the figure.

Figure 5 and **Figure 6** show concentration isocontour maps for benzene and naphthalene, respectively, incorporating the analytical data obtained from the shallow groundwater aquifer during the various historical investigations completed in the vicinity. For both constituents, the elevated groundwater concentrations appear to exist in localized hotspots along the eastern boundary of Parcel A11. The elevated benzene impacts appear to be more widespread in groundwater than the elevated naphthalene impacts; however, both appear to be delineated horizontally in all directions, with concentrations decreasing radially from the hotspots.

Conclusions

The concentrations of benzene and naphthalene in groundwater have been adequately defined along the eastern boundary of Parcel A11. Based on the localized groundwater potentiometric surface map for the shallow aquifer, groundwater appears to flow in the northern and eastern directions from the suspected source area in Parcel A11. Groundwater samples collected from the piezometers and monitoring wells in the adjacent Parcel A7 and Parcel A8 contained negligible or low concentrations of both benzene and naphthalene, suggesting limited migration to these areas.

Because the benzene and naphthalene hotspots are predominantly located in unoccupied areas and within the I-695 exit/entry cloverleaf ramps, there does not appear to be any current vapor intrusion risk. Future development in the area occupied by the I-695 ramps is unlikely. However, if future development is proposed, it will be necessary to incorporate the delineation findings into a vapor intrusion assessment within a RADWP or related document for this area of the property. The need for any additional delineation or response actions will be contingent on future development planning (i.e., if an enclosed structure is proposed for construction in the area).

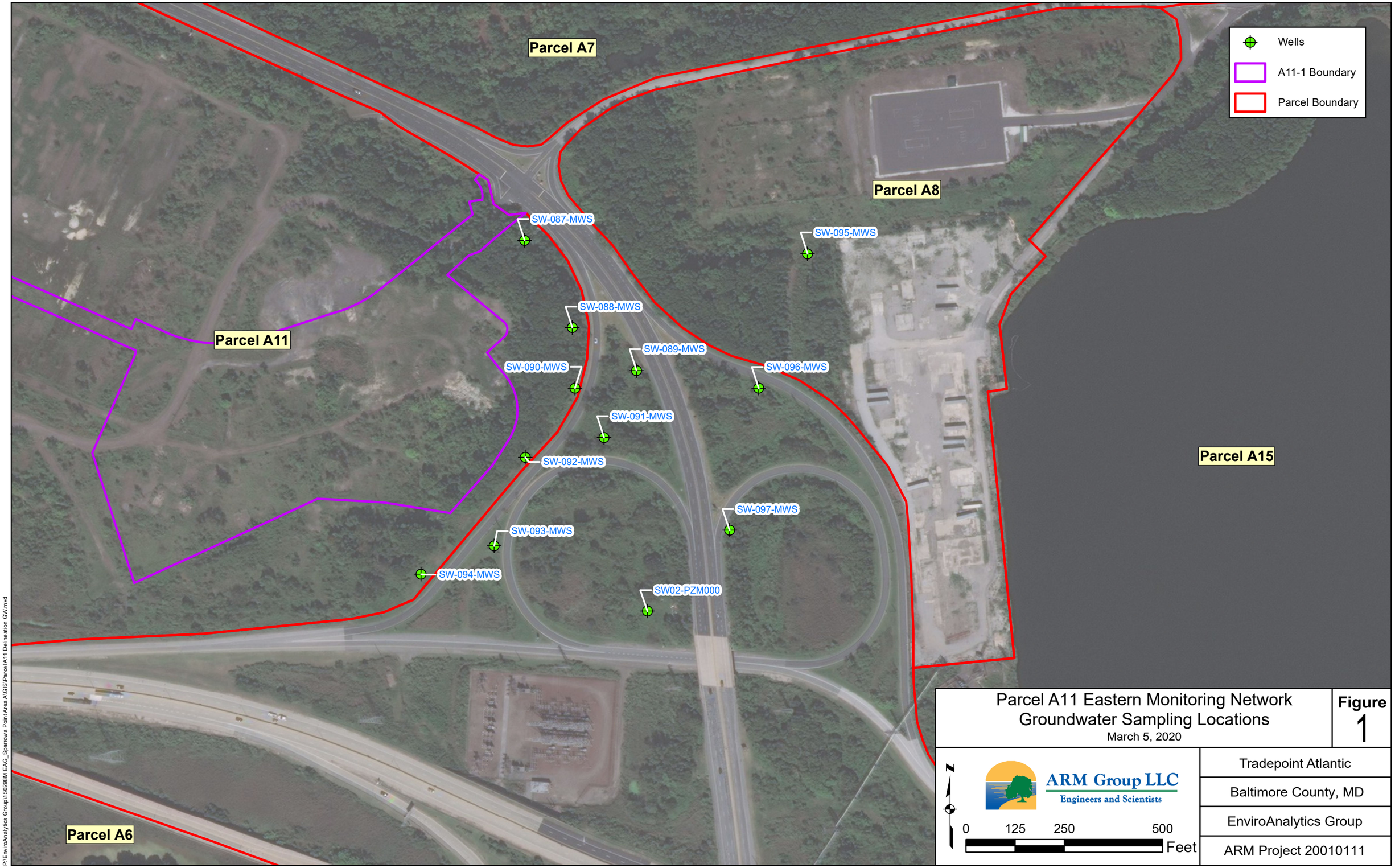
If you have any questions, or if we can provide any additional information at this time, please do not hesitate to contact ARM Group LLC at 410-290-7775.

Respectfully Submitted,
ARM Group LLC

Taylor R. Smith, P.E.
Project Engineer

Eric S. Magdar, P.G.
Vice President

FIGURES



Parcel A11 Eastern Monitoring Network Groundwater Sampling Locations

March 5, 2020

Figure 1

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EnviroAnalytics Group
ARM Project 20010111

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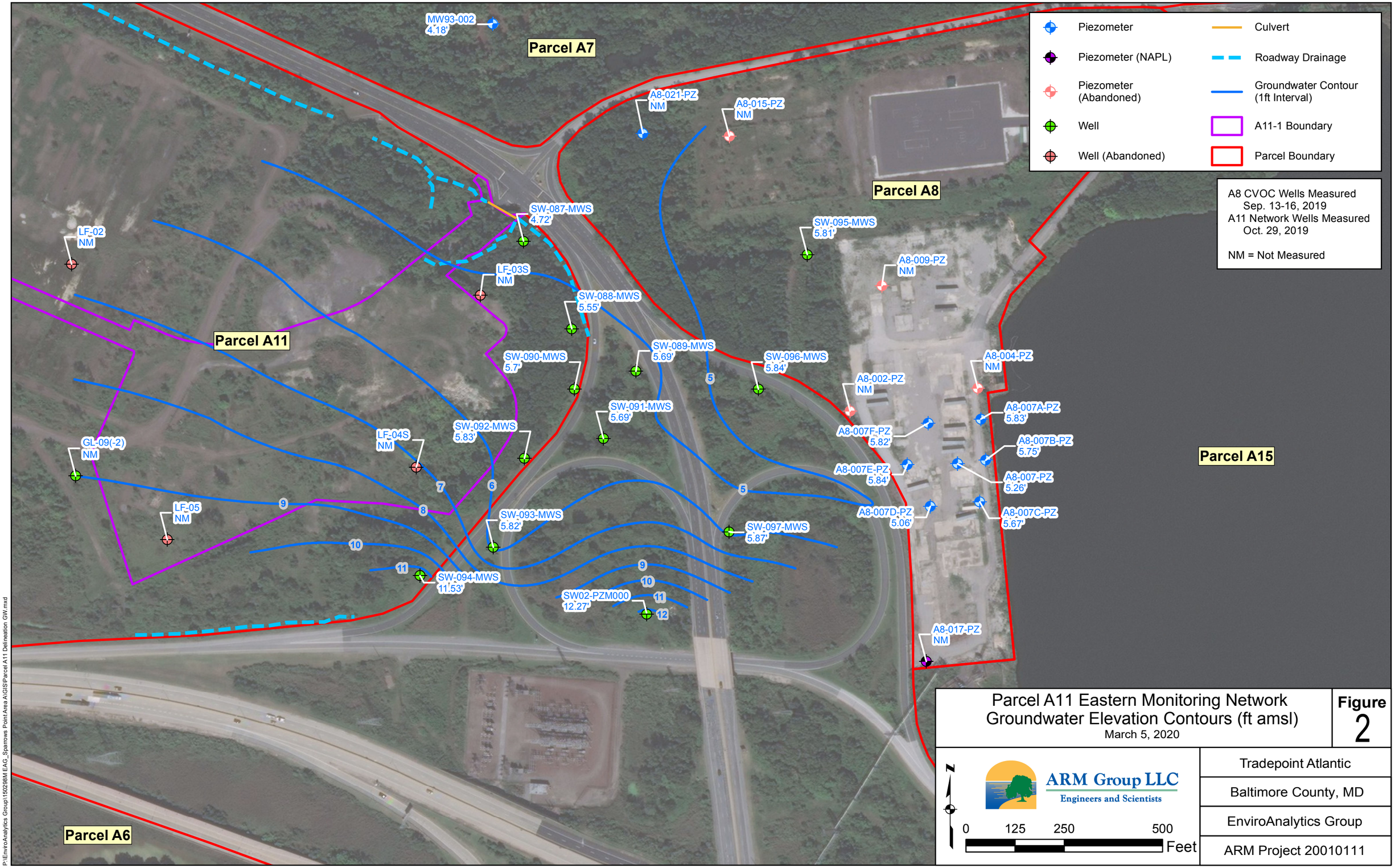

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Parcel A11 Eastern Monitoring Network Groundwater Elevation Contours (ft amsl)

March 5, 2020

Figure 2

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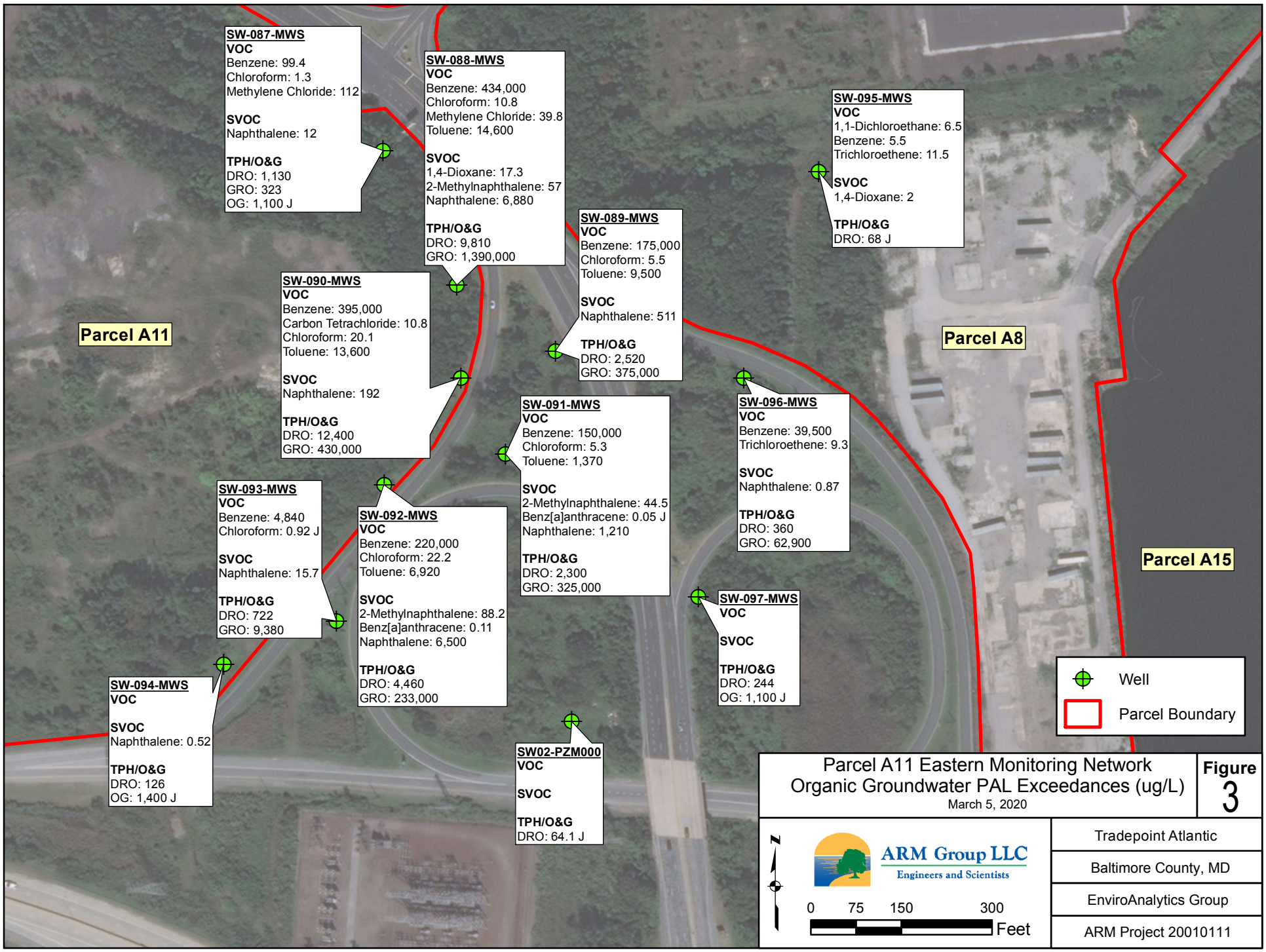
SW-087-MWS
VOC
Benzene: 99.4
Chloroform: 1.3
Methylene Chloride: 112
SVOC
Naphthalene: 12
TPH/O&G
DRO: 1,130
GRO: 323
OG: 1,100 J
SW-088-MWS
VOC
Benzene: 434,000
Chloroform: 10.8
Methylene Chloride: 39.8
Toluene: 14,600
SVOC
1,4-Dioxane: 17.3
2-Methylnaphthalene: 57
Naphthalene: 6,880
TPH/O&G
DRO: 9,810
GRO: 1,390,000
SW-095-MWS
VOC
1,1-Dichloroethane: 6.5
Benzene: 5.5
Trichloroethene: 11.5
SVOC
1,4-Dioxane: 2
TPH/O&G
DRO: 68 J
SW-089-MWS
VOC
Benzene: 175,000
Chloroform: 5.5
Toluene: 9,500
SVOC
Naphthalene: 511
TPH/O&G
DRO: 2,520
GRO: 375,000
SW-090-MWS
VOC
Benzene: 395,000
Carbon Tetrachloride: 10.8
Chloroform: 20.1
Toluene: 13,600
SVOC
Naphthalene: 192
TPH/O&G
DRO: 12,400
GRO: 430,000
Parcel A11
Parcel A8
Parcel A15
SW-091-MWS
VOC
Benzene: 150,000
Chloroform: 5.3
Toluene: 1,370
SVOC
2-Methylnaphthalene: 44.5
Benz[a]anthracene: 0.05 J
Naphthalene: 1,210
TPH/O&G
DRO: 2,300
GRO: 325,000
SW-096-MWS
VOC
Benzene: 39,500
Trichloroethene: 9.3
SVOC
Naphthalene: 0.87
TPH/O&G
DRO: 360
GRO: 62,900
SW-093-MWS
VOC
Benzene: 4,840
Chloroform: 0.92 J
SVOC
Naphthalene: 15.7
TPH/O&G
DRO: 722
GRO: 9,380
SW-092-MWS
VOC
Benzene: 220,000
Chloroform: 22.2
Toluene: 6,920
SVOC
2-Methylnaphthalene: 88.2
Benz[a]anthracene: 0.11
Naphthalene: 6,500
TPH/O&G
DRO: 4,460
GRO: 233,000
SW-097-MWS
VOC
SVOC
TPH/O&G
DRO: 244
OG: 1,100 J
SW-094-MWS
VOC
SVOC
Naphthalene: 0.52
TPH/O&G
DRO: 126
OG: 1,400 J
SW02-PZM000
VOC
SVOC
TPH/O&G
DRO: 64.1 J
Well
Parcel Boundary
Parcel A11 Eastern Monitoring Network
Organic Groundwater PAL Exceedances (ug/L)
March 5, 2020
Figure
3
N
ARM Group LLC
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0 75 150 300
Feet
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Baltimore County, MD
EnviroAnalytics Group
ARM Project 20010111
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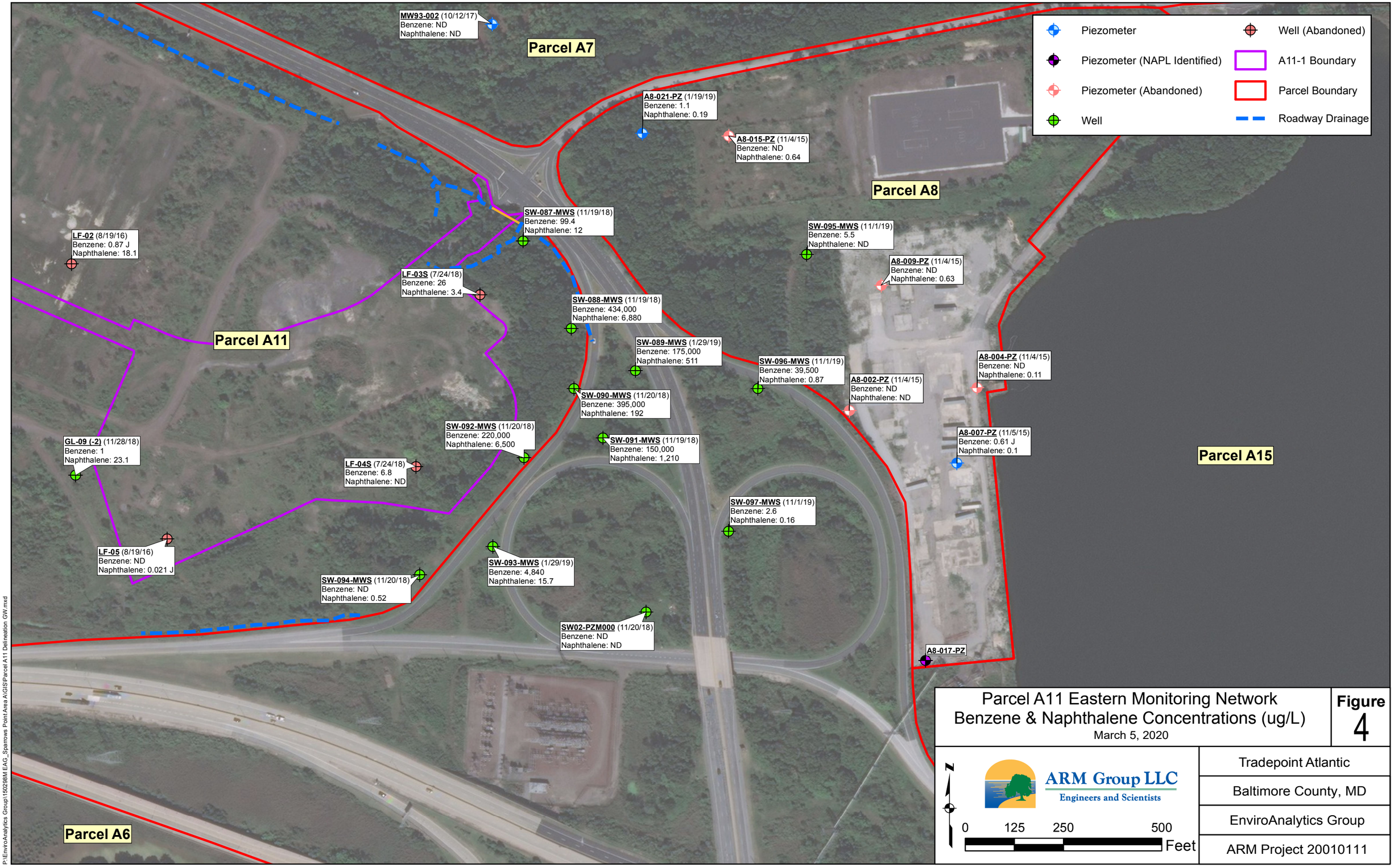

Parcel A11 Eastern Monitoring Network
Benzene & Naphthalene Concentrations (ug/L)

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Figure 4

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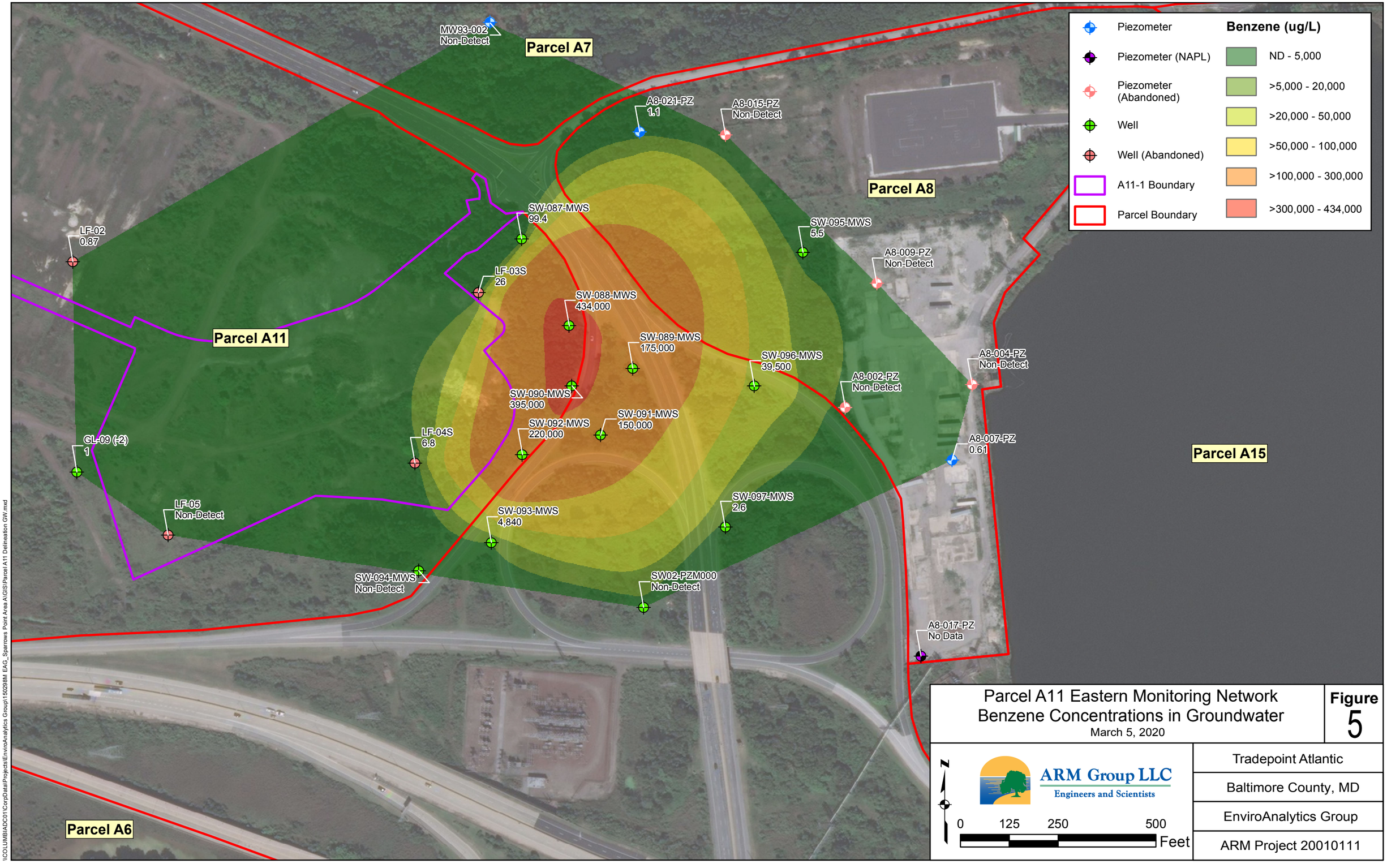

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Parcel A11 Eastern Monitoring Network
Benzene Concentrations in Groundwater

March 5, 2020

Figure 5

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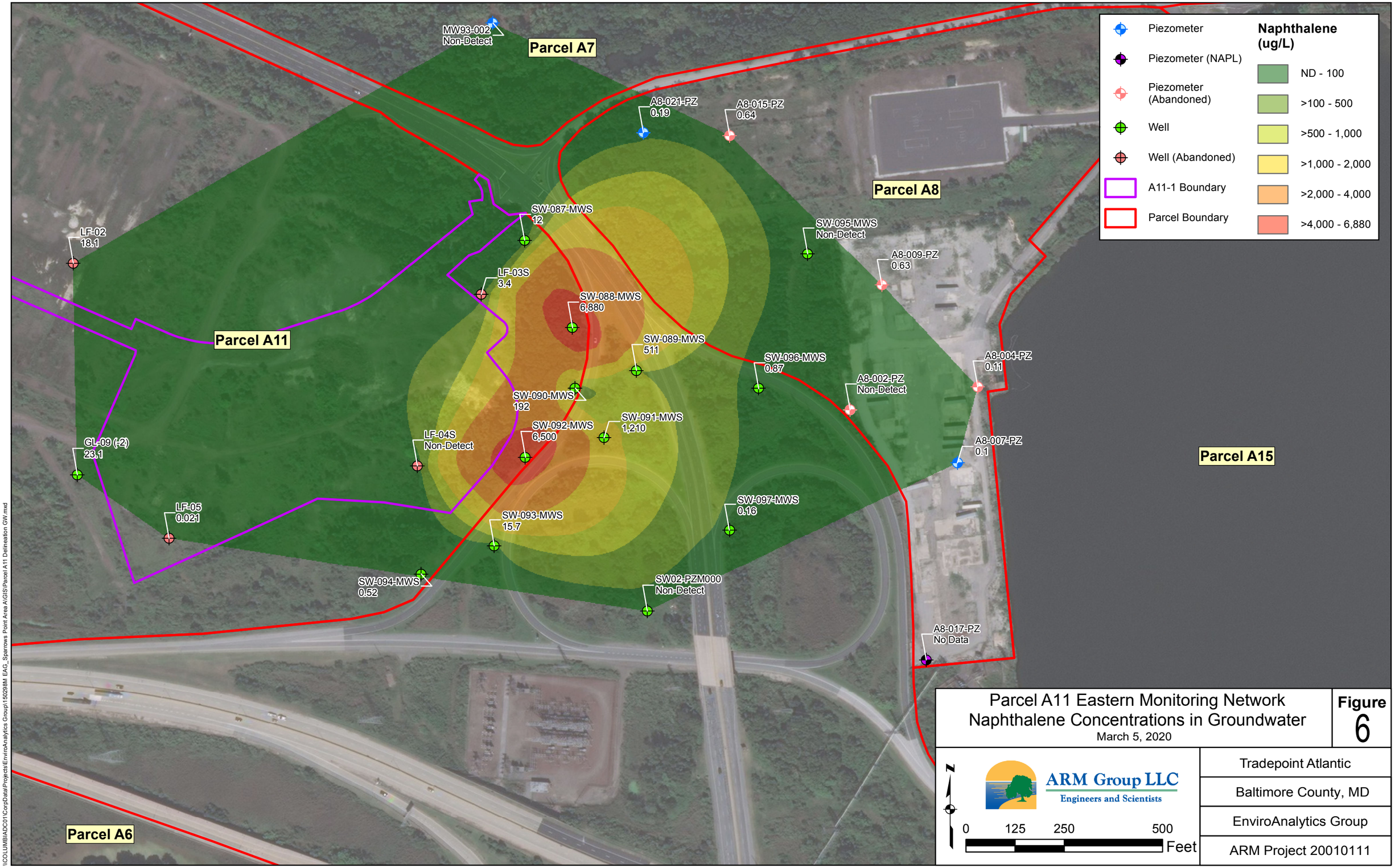
ARM Project 20010111



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Parcel A11 Eastern Monitoring Network
Naphthalene Concentrations in Groundwater

March 5, 2020

Figure 6

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ARM Project 20010111

TABLES

Table 1 - Parcel A11 Groundwater Delineation
Construction Details and Elevation Measurements

Location ID	TOC Elevation (ft. AMSL)	Measured DTW (ft. TOC)	Groundwater Elevation (ft. amsl)	Ground Elevation (ft. amsl)	Screen Interval (ft. bgs)	Screen Bottom Elevation (ft. amsl)
Sample Locations (12 wells)						
SW02-PZM000	17.70	5.43	12.27	14.27	4 to 14	0.3
SW-087-MWS	14.22	9.50	4.72	11.85	3.1 to 21.1	-9.3
SW-088-MWS	15.88	10.33	5.55	13.31	2.6 to 23.6	-10.3
SW-089-MWS	17.25	11.56	5.69	14.62	2 to 28	-13.4
SW-090-MWS	14.78	9.08	5.70	12.34	3.5 to 24.5	-12.2
SW-091-MWS	16.41	10.72	5.69	14.19	3.9 to 24.9	-10.7
SW-092-MWS	16.44	10.61	5.83	14.49	3.3 to 24.3	-9.8
SW-093-MWS	17.95	12.13	5.82	15.50	4 to 28	-12.5
SW-094-MWS	18.32	6.79	11.53	15.70	3.5 to 24.5	-8.8
SW-095-MWS	15.06	9.25	5.81	12.73	15 to 25	-12.3
SW-096-MWS	16.32	10.48	5.84	13.99	18 to 28	-14.0
SW-097-MWS	35.61	29.74	5.87	33.39	30 to 40	-6.6
Supplemental Gauging Locations						
MW93-002	18.77	14.59	4.18	16.28	17.5 to 27.5	-11.2
A8-007-PZ	15.86	10.60	5.26	12.60	5 to 20	-7.4
A8-007A-PZ	15.76	9.93	5.83	13.36	13 to 23	-9.6
A8-007B-PZ	16.01	10.26	5.75	13.37	20 to 30	-16.6
A8-007C-PZ	16.47	10.80	5.67	13.91	20 to 30	-16.1
A8-007D-PZ	15.97	10.91	5.06	13.63	20 to 30	-16.4
A8-007E-PZ	16.06	10.22	5.84	13.34	15 to 25	-11.7
A8-007F-PZ	16.18	10.36	5.82	13.24	16 to 26	-12.8

DTW = Depth to water
TOC = Top of casing
bgs = below ground surface
amsl = above mean sea level

Table 2 - Parcel A11 Eastern Monitoring Network
Summary of Organics Detected in Groundwater

Parameter	Units	PAL	SW02-PZM000 11/20/2018	SW-087-MWS 11/19/2018	SW-088-MWS 11/19/2018	SW-089-MWS 1/29/2019	SW-090-MWS 11/20/2018	SW-091-MWS 11/19/2018	SW-092-MWS 11/20/2018	SW-093-MWS 1/29/2019	SW-094-MWS 11/20/2018	SW-095-MWS 11/1/2019	SW-096-MWS 11/1/2019	SW-097-MWS 11/1/2019
Volatile Organic Compounds														
1,1-Dichloroethane	µg/L	2.7	1 U	1 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	**6.5**	5 U	1 U
1,1-Dichloroethene	µg/L	7	1 U	1 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	**4.7**	5 U	1 U
1,2,3-Trichlorobenzene	µg/L	7	2 U	2 U	10 U	10 U	10 U	**3.5 J**	10 U	2 U	2 U	2 U	10 U	2 U
2-Butanone (MEK)	µg/L	5,600	10 U	10 U	**20.3 J**	50 U	**16.5 J**	50 U	50 U	10 U	10 U	10 U	50 U	10 U
4-Methyl-2-pentanone (MIBK)	µg/L	1,200	10 U	10 U	**6.1 J**	50 U	**11.6 J**	50 U	**2.7 J**	10 U	10 U	10 U	50 U	10 U
Acetone	µg/L	14,000	**3.6 J**	**9.4 J**	**117**	**61**	**114**	**26.1 J**	**67.7**	**11.1**	**3.8 J**	10 U	50 U	**22.4**
Benzene	µg/L	5	1 U	**99.4**	**434,000**	**175,000**	**395,000**	**150,000**	**220,000**	**4,840**	1 U	**5.5**	**39,500**	**2.6**
Carbon disulfide	µg/L	810	1 U	1 U	**58.4**	**15.1**	**38**	**6.1**	**6.9**	1 U	1 U	1 U	5 U	**1.7**
Carbon tetrachloride	µg/L	5	1 U	1 U	5 U	5 U	**10.8**	5 U	5 U	1 U	1 U	1 U	5 U	1 U
Chlorobenzene	µg/L	100	1 U	1 U	**0.78 J**	5 U	**0.98 J**	**0.82 J**	5 U	1 U	1 U	1 U	5 U	1 U
Chloroform	µg/L	0.22	1 U	**1.3**	**10.8**	**5.5**	**20.1**	**5.3**	**22.2**	**0.92 J**	1 U	1 U	5 U	1 U
Cyclohexane	µg/L	13,000	10 U	10 U	**11.5 J**	**3.7 J**	**9 J**	**6.5 J**	**4 J**	10 U	10 U	10 U	50 U	10 U
Ethylbenzene	µg/L	700	1 U	1 U	**91.3**	**29.6**	**90.6**	**40.8**	**38.9**	**1.1**	1 U	1 U	5 U	1 U
Isopropylbenzene	µg/L	450	1 U	1 U	**7.6**	**2.3 J**	**7.7**	**4.6 J**	**2.2 J**	**0.35 J**	1 U	1 U	5 U	1 U
Methyl tert-butyl ether (MTBE)	µg/L	14	1 U	1 U	5 U	5 U	5 U	5 U	5 U	**0.55 J**	1 U	1 U	5 U	1 U
Methylene Chloride	µg/L	5	1 U	**112**	**39.8**	5 U	5 U	5 U	5 U	1 U	1 U	**2.2**	5 U	1 U
Styrene	µg/L	100	1 U	1 U	5 U	5 U	**2.3 J**	5 U	5 U	1 U	1 U	1 U	5 U	1 U
Toluene	µg/L	1,000	1 U	**2.4**	**14,600**	**9,500**	**13,600**	**1,370**	**6,920**	**20.9**	1 U	1 U	**6.9**	1 U
Trichloroethene	µg/L	5	1 U	1 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U	**11.5**	**9.3**	1 U
Xylenes	µg/L	10,000	3 U	**3.9**	**2,600**	**932**	**2,680**	**747**	**948**	**8.3**	3 U	3 U	**46.6**	3 U
Semi-Volatile Organic Compounds^														
1,4-Dioxane	µg/L	0.46	0.099 U	0.099 U	**17.3**	**0.19**	**0.35**	0.099 U	97.6 U	**0.11**	0.098 U	**2**	**0.21**	0.099 U
2-Methylnaphthalene	µg/L	36	0.099 U	**0.29**	**57**	**11.7**	**6.2**	**44.5**	**88.2**	**1.2**	0.098 U	0.098 U	**0.061 J**	**0.033 J**
Acenaphthene	µg/L	530	0.099 U	**0.27**	**1.6**	**1**	**0.52 J**	**0.84**	**1.7**	**0.047 J**	0.098 U	0.098 U	0.1 U	**0.042 J**
Acenaphthylene	µg/L	530	0.099 U	**0.038 J**	**0.2**	0.098 U	0.97 U	**0.095 J**	**0.34**	**0.042 J**	0.098 U	0.098 U	0.1 U	0.099 U
Anthracene	µg/L	1,800	0.099 U	**0.2**	**0.54**	0.098 U	**0.29 J**	**0.46**	**0.76**	**0.034 J**	0.098 U	0.098 U	0.1 U	0.099 U
Benz[a]anthracene	µg/L	0.03	0.099 U	0.099 U	0.1 U	0.098 U	0.97 U	**0.05 J**	**0.11**	0.099 U	0.098 U	0.098 U	0.1 U	0.099 U
Benzo[a]pyrene	µg/L	0.2	0.099 U	0.099 U	0.1 U	0.098 U	0.97 U	**0.025 J**	**0.066 J**	0.099 U	0.098 U	0.098 U	0.1 U	**0.016 J**
Benzo[b]fluoranthene	µg/L	0.25	0.099 U	0.099 U	0.1 U	0.098 U	0.97 U	0.099 U	**0.065 J**	0.099 U	0.098 U	0.098 U	0.1 U	0.099 U
Chrysene	µg/L	25	0.099 U	0.099 U	0.1 U	0.098 U	0.97 U	**0.052 J**	**0.11**	0.099 U	0.098 U	0.098 U	0.1 U	0.099 U
Fluoranthene	µg/L	800	0.099 U	**0.15**	**0.71**	**0.038 J**	0.97 U	**0.41**	**0.59**	0.099 U	0.098 U	0.098 U	0.1 U	**0.07 J**
Fluorene	µg/L	290	0.099 U	**1**	**9**	**0.11**	**1.8**	**3.3**	**8.3**	**0.32**	0.098 U	0.098 U	0.1 U	**0.071 J**
Naphthalene	µg/L	0.17	0.2 B	**12**	**6,880**	**511**	**192**	**1,210**	**6,500**	**15.7**	**0.52**	0.098 U	**0.87**	**0.16**
Phenanthrene	µg/L		0.099 U	**0.59**	**8.3**	**0.076 J**	**2.2**	**5.2**	**6.3**	**0.22**	0.098 U	0.098 U	**0.044 J**	**0.083 J**
Pyrene	µg/L	120	0.099 U	**0.15**	**0.4**	0.098 U	0.97 U	**0.55**	**0.97**	0.099 U	0.098 U	0.098 U	0.1 U	**0.053 J**
TPH/Oil & Grease														
Diesel Range Organics	µg/L	47	**64.1 J**	**1,130**	**9,810**	**2,520**	**12,400**	**2,300**	**4,460**	**722**	**126**	**68 J**	**360**	**244**
Gasoline Range Organics	µg/L	47	200 U	**323**	**1,390,000**	**375,000**	**430,000**	**325,000**	**233,000**	**9,380**	200 U	200 U	**62,900**	200 U
Oil & Grease	µg/L	47	4,750 U	**1,100 J**	4,750 U	4,750 U	4,750 U	4,750 U	4,750 U	4,750 U	**1,400 J**	4,750 U	4,750 U	**1,100 J**

Detections in bold
Values in red indicate an exceedance of the Project Action Limit (PAL)
^PAH compounds were analyzed via SIM

U: This analyte was not detected in the sample. The numeric value represents the sample quantitation/detection limit.
B: The analyte was not detected substantially above the level of the associated method blank or field blank.
J: The positive result reported for this analyte is a quantitative estimate.

ATTACHMENT 1

ARM Group LLC
Engineers and Scientists

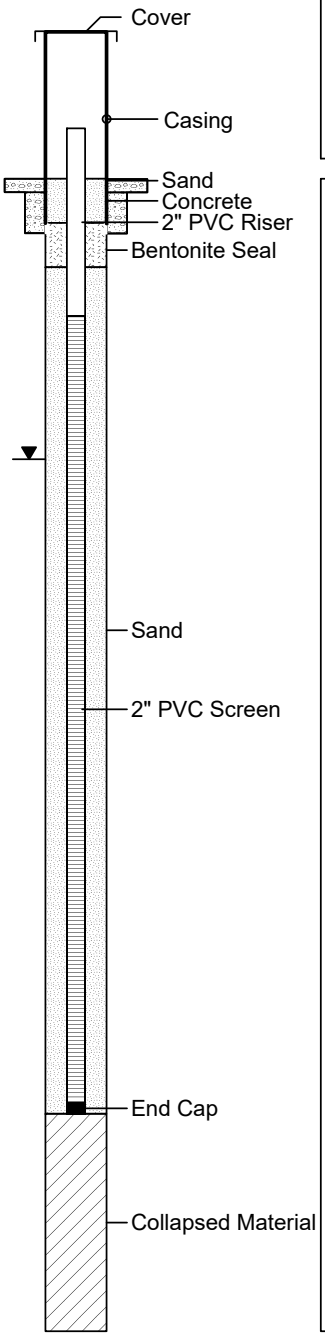
Well ID: SW-087-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: S. Kabis
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Gary Brugger
Drilling Equipment	: Diedrich-D120

Northing (ft)	: 574013.65
Easting (ft)	: 1460935.27
Date/Time Started	: 11/01/18 / 1310
Date/Time Completed	: 11/01/18 / 1645
Surf. Elev. (ft AMSL)	: 11.85
TOC Elev. (ft AMSL)	: 14.22
Total Well Depth (ft)	: 21.1' bgs
Depth to Water (ft)	: 0 Hr: 6.81' TOC
Depth to Water (ft)	: 5 Day: 6.33' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	SS# %Recovery	PID (ppm)	Blow Count	DESCRIPTION	USCS
0	1-50	1.2	2 2 3 2	(0-4') SANDY SILT grading to SILT, hard, very light brown, dry, non-plastic, non-cohesive	SM
2		1.3			
	2-100	0.6	4 4 6 7		
4		0.0			
	3-100	0.1	4 7 6 9	(4-6.5') SANDY SILT, hard, very light brown, dry, non-plastic, non-cohesive	ML
6		0.1			
	4-75	0.1	5 7 8 8	(6.5-11.5') SILTY CLAY, hard, very light brown, dry, high plasticity, cohesive	CL
8	5-100	0.3	WOH 4 6 4		
		0.1			
10	6-100	0.1	6 6 8 6		
		0.1			
12	7-100	-	2 2 2 2	(11.5-12') CLAY, hard, very light brown, dry, high plasticity, cohesive	CL
		-		(12-17') SANDY CLAY, soft, very light brown, wet, medium plasticity, cohesive	CL
14	8-100	-	WOH WOH 2 4		
		-			
16	9-100	-	WOH WOH 1 5		
		-		(17-18') SAND, loose, very light brown, wet, non-plastic, non-cohesive	SW
18	10-100	-	2 4 4 2	(18-19') SANDY CLAY, soft, very light brown, wet, medium plasticity, cohesive	CL
		-		(19-26') SAND, loose, very light brown, wet, non-plastic, cohesive	SW
20	11-100	-	2 2 6 3		
		-			
22	12-100	-	3 4 3 3		
		-			
24	13-50	-	2 4 3 4		
26				End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 2.90'

Bentonite Seal: 1/4" pellets
Top: 1.0' bgs
Bottom: 2.0' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 3.10' bgs
Bottom: 21.10' bgs
Total Screen: 18'

Filter Pack: FilPro W.G. #2 Sand
Top: 2.0' bgs
Bottom: 21.10' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/14/2018
Purged Amount: 48 gallons
Well Volumes Removed: 17.43

ARM Group LLC
Engineers and Scientists

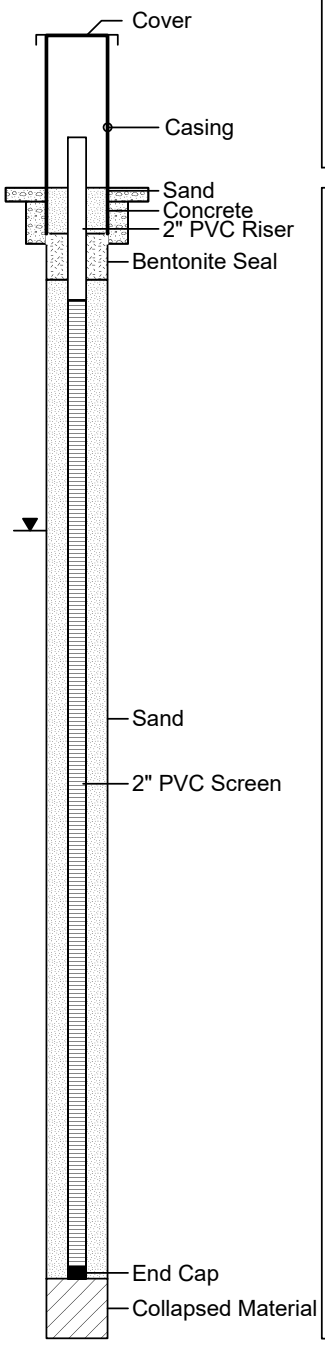
Well ID: SW-088-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Perrin/S. Kabis
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Gary Brugger
Drilling Equipment	: Diedrich-D120

Northing (ft)	: 573800.73
Easting (ft)	: 1461060.38
Date/Time Started	: 10/31/18 / 1440
Date/Time Completed	: 11/01/18 / 1140
Surf. Elev. (ft AMSL)	: 13.31
TOC Elev. (ft AMSL)	: 15.88
Total Well Depth (ft)	: 23.7' bgs
Depth to Water (ft)	: 0 Hr: 8.04' TOC
Depth to Water (ft)	: 48 Hr: 7.45' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	SS# %Recovery	PID (ppm)	Blow Count	DESCRIPTION	USCS
0	1-90	0.0 0.0	3 5 9 12	(0-0.6') SILTY SAND with trace roots, loose, dark brown, dry, non-plastic, non-cohesive	SM
2	2-50	- 0.0	3 9 9 10	(0.6-3.5') CLAYEY SAND, very fine to fine, dense, very pale brown with some reddish yellow mottling, dry, non-plastic, non-cohesive	SC
4	3-75	0.0 0.0	5 4 4 3	(3.5-4.2') CLAY with SAND, very fine to fine, very firm, pale brown with light brownish gray, dry, low plasticity, cohesive	CL
6	4-85	0.0 0.0	4 3 3 5	(4.2-5.6') SANDY CLAY, very firm, grayish brown, moist, low plasticity, cohesive	CL
8	5-90	0.0 0.0	WOH 2 4 4	(5.6-6.1') SAND with CLAY, fine to medium, medium dense, grayish brown, moist, non-plastic, cohesive	SW-SC
10	6-100	0.0 0.0	4 4 5 6	(6.1-12') CLAY, hard to very firm, light grayish brown with some reddish yellow mottling, very moist, low plasticity, cohesive, trace SAND	CL
12	7-100	3.7 3.7	WOH WOH WOH WOH	(12-14') CLAY, soft, light grayish brown, very moist, low plasticity, cohesive	CL
14	8-0	- -	WOH WOH WOH WOH	(14-17.5') No recovery due to soft soils	
16	9-0	-	WOH WOH		
18	10-75	- -	2 3 3 4	(17.5-24') SAND, medium dense, very light brown, wet, non-plastic, non-cohesive	SW
20	11-100	- -	3 3 4 5		
22	12-75	- -	WOH 2 3 3		
24	13-100	- -	2 2 3 2	(24-25') CLAY, hard, gray, dry, high plasticity, cohesive	CL
26				End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 2.98'

Bentonite Seal: 1/4" pellets
Top: 1.0' bgs
Bottom: 2.0' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 2.63' bgs
Bottom: 23.63' bgs
Total Screen: 18'

Filter Pack: FilPro W.G. #2 Sand
Top: 2.0' bgs
Bottom: 23.63' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/15/2018
Purged Amount: 55 gallons
Well Volumes Removed: 18.47

ARM Group LLC
Engineers and Scientists

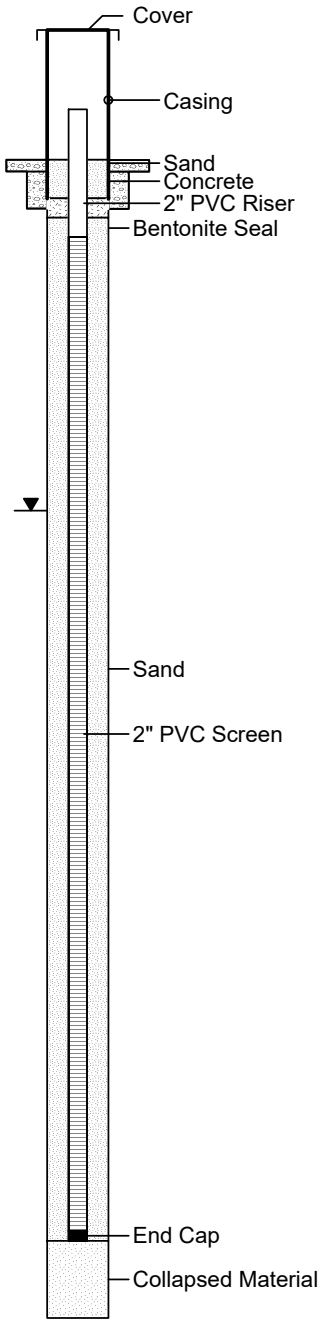
Well ID: SW-089-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Tim Moyer
Drilling Equipment	: Geoprobe 77DT

Northing (ft)	: 573725.12
Easting (ft)	: 1461219.38
Date/Time Started	: 01/22/19 / 1240
Date/Time Completed	: 01/22/19 / 1740
Surf. Elev. (ft AMSL)	: 14.62
TOC Elev. (ft AMSL)	: 17.25
Total Well Depth (ft)	: 28' bgs
Depth to Water (ft)	: 0 Hr: 9.09' TOC
Depth to Water (ft)	: 48 Hr: 7.89' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS
0				
2	40	-	(0-4') SANDY SILT grading to SILT, hard, very light brown, dry, non-plastic, non-cohesive	SM
4		0.0		
		0.0	(4-6.5') SANDY SILT, hard, very light brown, dry, non-plastic, non-cohesive	ML
6		-		
8	60	0.1	(6.5-11.5') SILTY CLAY, hard, very light brown, dry, high plasticity, cohesive	CL
		0.0		
10		0.0		
		1.9		
12	90	15.3	(11.5-12') CLAY, hard, very light brown, dry, high plasticity, cohesive	CL
		0.0		
14		0.1	(12-17') SANDY CLAY, soft, very light brown, wet, medium plasticity, cohesive	CL
		0.0		
16		-		
		22.8		
18	80	2.5	(17-18') SAND, loose, very light brown, wet, non-plastic, non-cohesive	SW
		0.4	(18-19') SANDY CLAY, soft, very light brown, wet, medium plasticity, cohesive	CL
20		0.1		
		3.9	(19-26') SAND, loose, very light brown, wet, non-plastic, cohesive	SW
22	90	21.6		
		52.6		
24		117.9		
		-		
26	20	-		
		1142		
28		-		
	30	-		
30			End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 2.75'

Bentonite Seal: 1/4" pellets
Top: 1.0' bgs
Bottom: 1.5' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 2' bgs
Bottom: 28' bgs
Total Screen: 26'

Filter Pack: FilPro W.G. #2 Sand
Top: 1.5' bgs
Bottom: 28' bgs

Collapsed Material 28-30' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/24/2019
Purged Amount: 46 gallons
Well Volumes Removed: 12.35

ARM Group LLC
Engineers and Scientists

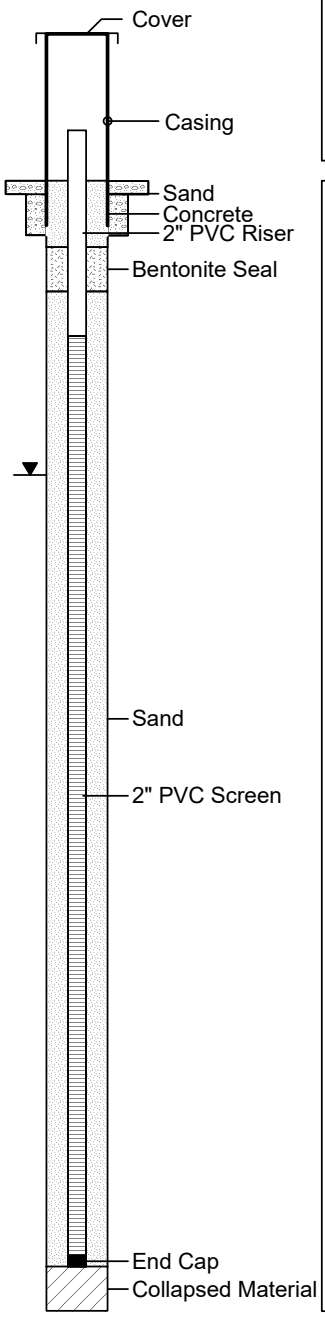
Well ID: SW-090-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Gary Brugger
Drilling Equipment	: Diedrich-D120

Northing (ft)	: 573636.04
Easting (ft)	: 1461066.08
Date/Time Started	: 10/29/18 / 945
Date/Time Completed	: 10/29/18 / 1545
Surf. Elev. (ft AMSL)	: 12.34
TOC Elev. (ft AMSL)	: 14.78
Total Well Depth (ft)	: 24.5' bgs
Depth to Water (ft)	: 0 Hr: 6.68' TOC
Depth to Water (ft)	: 48 Hr: 6.64' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	SS# %Recovery	PID (ppm)	Blow Count	DESCRIPTION	USCS
0	1-40	0.0	2	(0-1') SILTY SAND with trace ORGANICS, loose to medium dense, dark brown, dry, non-plastic, non-cohesive	SM
		0.0	2		
		0.0	4		
2	2-80	0.0	3	(1-4.1') SAND with CLAY, very fine to medium, dense, very pale brown with very light gray, dry, non-plastic, non-cohesive	SW-SC
		0.0	6		
		0.0	6		
4	3-90	0.0	3	(4.1-13.1') CLAY, dense then firm to soft, light brownish gray with reddish yellow mottling, dry to moist, low plasticity, cohesive	CL
		0.0	5		
		5.6	6		
6	4-85	0.0	7		
		0.0	9		
		0.0	9		
8	5-100	0.5	7		
		0.0	4		
		0.0	6		
10	6-100	0.0	5		
		0.0	5		
		-	6		
12	7-50	7.3	WOH		
		14.0	WOH	(13.1-15.2') CLAY with SAND, soft, light brownish gray, very moist, low plasticity, cohesive	CL
		277.8	1		
14	8-90	138.7	1		
		41.2	5	(15.2-25.2') SAND with CLAY to 15.9' bgs then SAND, fine to coarse, medium dense, very pale brown and reddish brown, wet, non-plastic, non-cohesive	SW
		218.5	6		
16	9-100	497.1	7		
		111.7	9		
		505.8	WOH		
18	10-100	385.7	WOH		
		143.3	WOH		
		41.7	WOH		
20	11-75		4		
			4		
			4		
22	12-100		6		
			6		
			5		
24	13-100		5		
			7		
			3		
26			3		
			9	(25.2-25.5') CLAY, soft, brownish gray, very moist, low plasticity, cohesive	CL
				End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 2.59'

Bentonite Seal: 1/4" pellets
Top: 1.5' bgs
Bottom: 2.5' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 3.5' bgs
Bottom: 24.5' bgs
Total Screen: 21'

Filter Pack: FilPro W.G. #2 Sand
Top: 2.5' bgs
Bottom: 24.5' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/12/2018
Purged Amount: 55 gallons
Well Volumes Removed: 16.21

ARM Group LLC
Engineers and Scientists

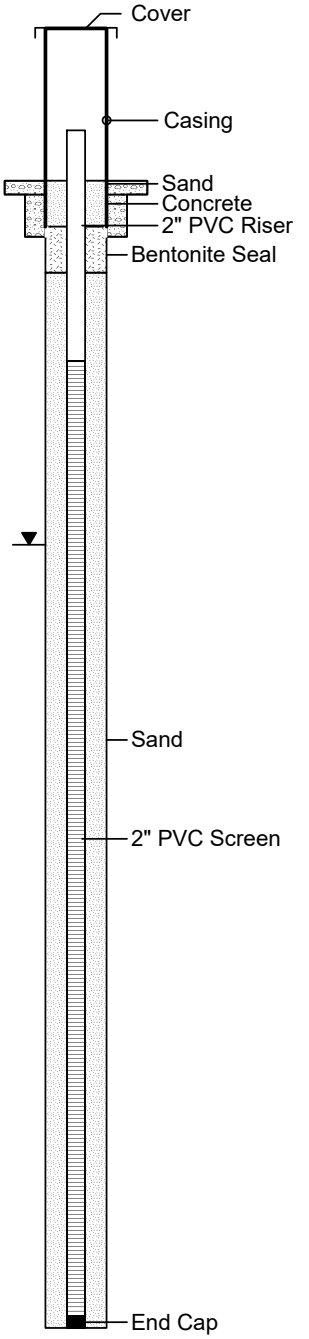
Well ID: SW-091-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: M. Kedenburg
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Tim Moyer
Drilling Equipment	: Geoprobe 77DT

Northing (ft)	: 573516.56
Easting (ft)	: 1461139.98
Date/Time Started	: 11/07/18 / 1230
Date/Time Completed	: 11/08/18 / 1330
Surf. Elev. (ft AMSL)	: 14.19
TOC Elev. (ft AMSL)	: 16.41
Total Well Depth (ft)	: 24.92' bgs
Depth to Water (ft)	: 0 Hr: 7.91' TOC
Depth to Water (ft)	: 6 Day: 7.82' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	SS# %Recovery	PID (ppm)	Blow Count	DESCRIPTION	USCS
0	1-75	0.1 0.0	WOH WOH 1 2	(0-1') SAND with SILT, medium to fine, dense, dark brown, moist, non-plastic, non-cohesive	SW-SM
2	2-50	- 0.0	5 8 10 10	(1-6') CLAY with SAND, firm, pale brown to yellowish red, moist, low plasticity, cohesive	CL
4	3-100	0.3 0.1	WOH WOH WOH 3		
6	4-100	0.0 0.0	5 10 12 12	(6-10.8') CLAY with trace SAND, very firm, light gray to reddish yellow, slightly moist to moist at 8' bgs, low plasticity, cohesive, trace GRAVEL at depth	CL
8	5-100	0.0 0.1	WOH WOH 3 3		
10	6-100	- -	WOH WOH WOH 3	(10.8-13.8') CLAY with trace GRAVEL, soft, light gray, wet, low plasticity, cohesive	CL
12	7-100	- -	WOH WOH 1 2		
14	8-100	8.8 12.6	1 1 4 10	(13.8-22') SAND with trace GRAVEL, medium to fine, medium dense, light gray then pale brown at 14.5' bgs, non-plastic, non-cohesive	SW
16	9-100	98.2 135.7	8 12 12 8		
18	10-100	85.6 115.2	10 10 12 12		
20	11-100	35.1 177.6	1 6 6 1		
22	11-100	17.3 1.5	WOH WOH WOH 1	(22-24') CLAY with trace SAND, firm, gray, moist, low plasticity, cohesive	CL
24				End of boring	
26					



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 3.00'

Bentonite Seal: 1/4" pellets
Top: 1' bgs
Bottom: 2' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 3.92' bgs
Bottom: 24.92' bgs
Total Screen: 21'

Filter Pack: FilPro W.G. #2 Sand
Top: 2' bgs
Bottom: 24.92' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/14/2018
Purged Amount: 50 gallons
Well Volumes Removed: 16.24

ARM Group LLC
Engineers and Scientists

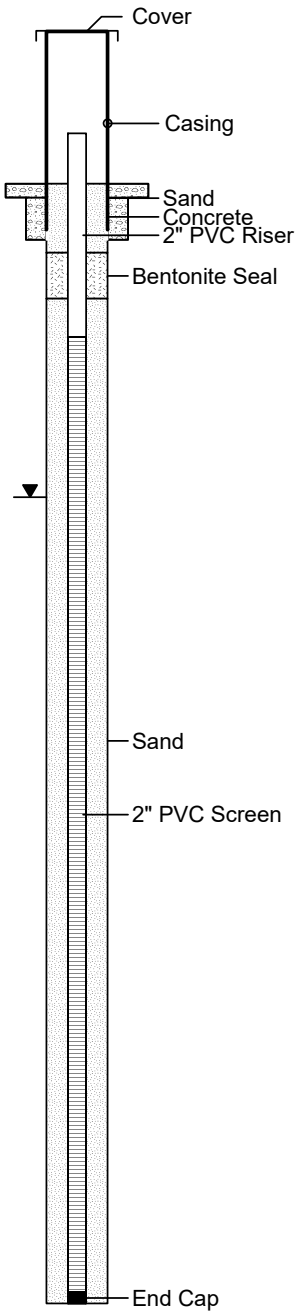
Well ID: SW-092-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Gary Brugger
Drilling Equipment	: Geoprobe 77DT

Northing (ft)	: 573475.62
Easting (ft)	: 1460942.67
Date/Time Started	: 10/30/18 / 1025
Date/Time Completed	: 10/30/18 / 1630
Surf. Elev. (ft AMSL)	: 14.49
TOC Elev. (ft AMSL)	: 16.44
Total Well Depth (ft)	: 24.33' bgs
Depth to Water (ft)	: 0 Hr: 3.67' TOC
Depth to Water (ft)	: 48 Hr: 6.81' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	SS# %Recovery	PID (ppm)	Blow Count	DESCRIPTION	USCS
0	1-95	0.0 0.0	5 7 7 9	(0-0.9') SILTY SAND, very fine to medium, medium dense, dark brown, dry to moist, non-plastic, non-cohesive	SM
2	2-100	0.0 0.0	12 14 16 22	(0.9-4.5') SAND with CLAY, dense, very pale brown, dry, non-plastic, non-cohesive	SW
4	3-100	0.0 0.0	5 6 9 3	(4.5-5.2') CLAYEY SAND, dense, dark brown, dry, non-plastic, non-cohesive	SC
					SW
6	4-90	0.0 0.0	9 6 12 13	(5.2-6') SAND, very fine to medium, medium dense, pale brown, dry, non-plastic, non-cohesive	CL
8	5-100	2.1 26.5	3 3 6 6	(6-6.6') SANDY CLAY, hard, light brownish gray with pale brown mottling dry, low plasticity, cohesive	
10	6-100	47.7 53.7	6 6 5 7	(6.6-12') CLAY with trace SAND, hard then firm at 8' bgs, light brownish gray with reddish yellow mottling, dry then moist at 8' bgs, low plasticity, cohesive	CL
12	7-100	44.7 280.3	2 2 2 2	(12-15.5') CLAY with trace SAND, soft, light brownish gray with pale brown mottling, very moist, low plasticity, cohesive	CL
14	8-100	84.1 580.2	WOH 2 3 4		
16	9-50	- 618.3	1 1 1 1	(15.5-15.8') SANDY CLAY, soft, light brownish gray, very moist, low plasticity, cohesive	CL
18	10-100	288.0 627.1	WOH WOH 3 4	(15.8-23.9') SAND, fine to coarse, medium dense, very pale brown to pale brown, wet, non-plastic, non-cohesive, light odor	SW
20	11-100	193.3 697.7	2 2 2 2		
22	12-100	1498 1609	3 3 2 3		
24				(23.9-24') CLAY, soft, gray, moist, low plasticity, cohesive	CL
26				End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
1.73x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 2.12'

Bentonite Seal: 1/4" pellets
Top: 1.5' bgs
Bottom: 2.5' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 3.33' bgs
Bottom: 24.33' bgs
Total Screen: 21'

Filter Pack: FilPro W.G. #2 Sand
Top: 2.5' bgs
Bottom: 24.33' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/12/2018
Purged Amount: 11 gallons
Well Volumes Removed: 4.17

ARM Group LLC
Engineers and Scientists

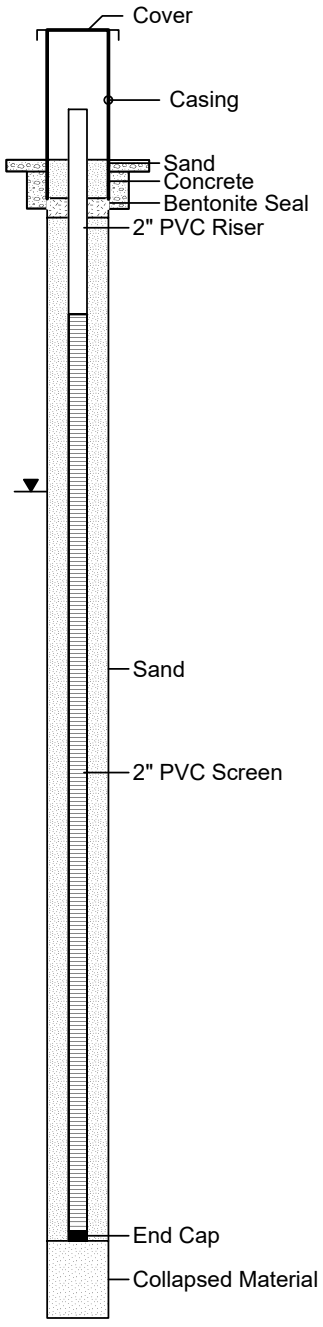
Well ID: SW-093-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Tim Moyer
Drilling Equipment	: Geoprobe 77DT

Northing (ft)	: 573238.26
Easting (ft)	: 1460869.54
Date/Time Started	: 01/23/19 / 1100
Date/Time Completed	: 01/23/19 / 1600
Surf. Elev. (ft AMSL)	: 15.50
TOC Elev. (ft AMSL)	: 17.95
Total Well Depth (ft)	: 28' bgs
Depth to Water (ft)	: 0 Hr: 8.60' TOC
Depth to Water (ft)	: 5 Day: 8.25' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS
0		-	(0-2') CLAY, very firm to hard, reddish yellow to brown, dry to moist, low plasticity, cohesive, trace ORGANICS at surface	CL
2	50	0.8	(2-3') SLAG GRAVEL, fine to coarse, medium dense, dark brown, dry, non-plastic, non-cohesive	GW
4		0.8		
		0.0	(3-7') CLAY, very firm to hard, reddish yellow to brown, dry to moist, low plasticity, cohesive	CL
6		5.4		
		0.0		
8	86	0.0	(7-8.5') SANDY CLAY, firm to soft, yellowish brown, very moist, low plasticity, cohesive	CL
		0.0		
		0.0	(8.5-15') CLAY, very firm to hard, reddish yellow to brown, dry to moist, low plasticity, cohesive	CL
10		0.7		
		0.5		
12	100	0.9		
		0.0		
14		0.0		
		0.0	(15-22') CLAY with SAND, soft, light grayish brown with trace reddish yellow, very moist, low plasticity, cohesive	CL
16		0.0		
	100	0.0		
18		0.0		
		0.0		
20		-		
		-		
22	30	-	(22-30') SAND, fine to medium, medium dense, very pale brown, wet, non-plastic, non-cohesive	SW
		-		
24		1.7		
		-		
26		-		
	60	-		
28		-		
		-		
30			End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 2.70'

Bentonite Seal: 3/8" chips
Top: 0' bgs
Bottom: 1.5' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 4' bgs
Bottom: 28' bgs
Total Screen: 25'

Filter Pack: FilPro W.G. #2 Sand
Top: 1.5' bgs
Bottom: 28' bgs

Collapsed Material 28-30' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/24/2019
Purged Amount: 58 gallons
Well Volumes Removed: 18.73

ARM Group LLC
Engineers and Scientists

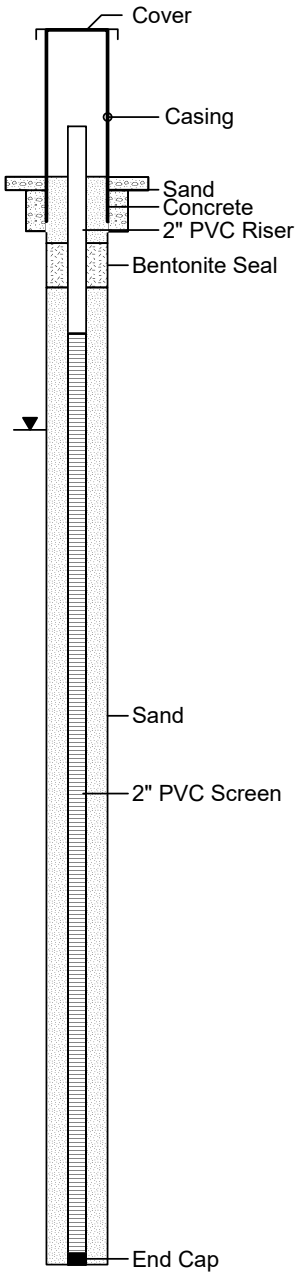
Well ID: SW-094-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Perrin
Checked by	: M. Replogle, E.I.T.
Drilling Company	: Allied Well Drilling
Driller	: Gary Brugger
Drilling Equipment	: Geoprobe 77DT

Northing (ft)	: 573153.87
Easting (ft)	: 1460669.28
Date/Time Started	: 11/05/18 / 1300
Date/Time Completed	: 11/05/18 / 1630
Surf. Elev. (ft AMSL)	: 15.70
TOC Elev. (ft AMSL)	: 18.32
Total Well Depth (ft)	: 24.67' bgs
Depth to Water (ft)	: 0 Hr: 3.59' TOC
Depth to Water (ft)	: 48 Hr: 5.71' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	SS# %Recovery	PID (ppm)	Blow Count	DESCRIPTION	USCS
0	1-100	0.0	25 50/2	(0-1.2') SILT with SAND grading to SANDY SILT, soft, brown, very moist, low plasticity, cohesive, trace GRAVEL	ML
2		-		(1.2-9.9') Air Hammer, no recovery	
4	2-0	-	-		NA
6		-			
8	3-5	-	2 3 4 6		
10	4-100	0.0	4 4 3 6	(9.9-10') CLAYEY GRAVEL, loose, black, very moist, non-plastic, non-cohesive	GC
12	5-90	0.0	WOH 2 2 2	(10-17') CLAY with trace SAND, very firm to hard then soft at 14' bgs, pale brown with some reddish yellow mottling grading to pale brown, moist to very moist, low plasticity, cohesive	CL
14	6-100	0.0	2 2 2 2		
16	7-100	0.0	7 8 9 8		
18	8-100	0.0	4 3 3 4	(17-17.5') CLAYEY SAND, dense, light brownish gray, wet, non-plastic, non-cohesive	SC SW CL
20	9-75	0.0	WOH 1 2 2	(17.5-18') SAND, fine to coarse, medium dense, very pale brown, wet, non-plastic, non-cohesive (18-19.2') CLAY with SAND, soft, light brownish gray, very moist, low plasticity, cohesive	SC SW
22	10-50	-	2 2 2 2	(19.2-19.7') CLAYEY SAND, medium dense, light brownish gray, wet, non-plastic, non-cohesive	
24		0.0		(19.7-24') SAND, fine to coarse, medium dense, very pale brown grading to reddish yellow, wet, non-plastic, non-cohesive	
26				End of boring	



COMPLETION DETAILS

4.25" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
2x2' concrete pad
2" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 2 in
Riser Stickup (ags): 3.11'

Bentonite Seal: 1/4" pellets
Top: 1.5' bgs
Bottom: 2.5' bgs

Screen: Sch 40 PVC
Screen Diameter: 2 in
Slot Size: 0.020"
Top: 3.54' bgs
Bottom: 24.54' bgs
Total Screen: 21'

Filter Pack: FilPro W.G. #2 Sand
Top: 2.5' bgs
Bottom: 24.54' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 11/12/2018
Purged Amount: 50 gallons
Well Volumes Removed: 16.4

ARM Group LLC
Engineers and Scientists

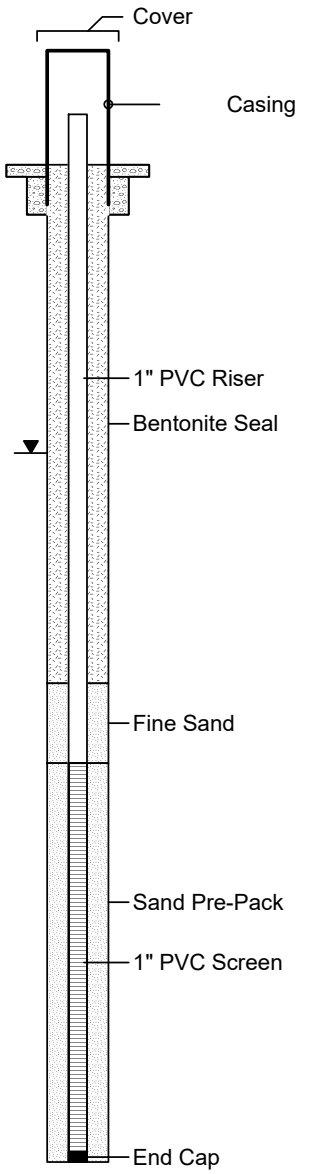
Well ID: SW-095-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Kevin Pumphrey
Drilling Equipment	: Geoprobe 7822DT

Northing (ft)	: 573991.82
Easting (ft)	: 1461657.85
Date/Time Started	: 10/24/19 / 1420
Date/Time Completed	: 10/24/19 / 1530
Surf. Elev. (ft AMSL)	: 12.73
TOC Elev. (ft AMSL)	: 15.06
Total Well Depth (ft)	: 25' bgs
Depth to Water (ft)	: 0 Hr: 9.73' TOC
Depth to Water (ft)	: 48 Hr: 9.25' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS
0		-	(0-0.5') SILT with SAND, loose, dark brown, dry, non-plastic, non-cohesive	OL
2	92	0.0 0.0 0.0	(0.5-4.2') SILTY CLAY, hard, brown and gray with little red, dry, low plasticity, cohesive	CL
4		0.0	(4.2-5.3') SILTY CLAY, very soft, strong brown, moist, low plasticity, cohesive	CL
6	94	- 0.0	(5.3-6.7') SANDY CLAY with coarse pale brown SAND at depth, soft, dark gray, moist, low plasticity, cohesive	SC
8		0.0 0.0 0.0	(6.7-14.6') CLAY with MUDSTONE at 10' bgs, medium to hard, light gray, brown, and yellowish red, dry, medium plasticity, cohesive	CH
10		0.0		
12	100	0.0 0.0		
14		0.0		
16	100	- -	(14.6-18') SANDY CLAY, soft, gray, moist, low plasticity, cohesive	SC
18		-	(18-20') SAND, fine to coarse, medium, brown, reddish yellow, and light gray, wet, non-plastic, non-cohesive	SW
20	0	-	(20-25') No recovery due to heaving sands	
22		- -		
24		-		
26			End of boring	
28				
30				



COMPLETION DETAILS

4" Protective Steel
Casing with Locking Lid
Weep hole approximately 6"
above concrete pad
18" diameter concrete pad
1" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 1 in
Riser Stickup (ags): 32"

Bentonite Seal: 3/8" chips
Top: 0' bgs
Bottom: 13' bgs

Sreen: Sch 40 PVC
Screen Diameter: 1 in
Slot Size: 0.010"
Top: 15' bgs
Bottom: 25' bgs
Total Screen: 10'

Pre-Pack:
Sand
Top: 15' bgs
Bottom: 25' bgs

Filter Pack: FilPro W.G. #2
Sand
Top: 13' bgs
Bottom: 15' bgs

2.5" Long flush-threaded
PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 10/30/2019
Purged Amount: 3.5 gallons
Well Volumes Removed: 4.7

ARM Group LLC
Engineers and Scientists

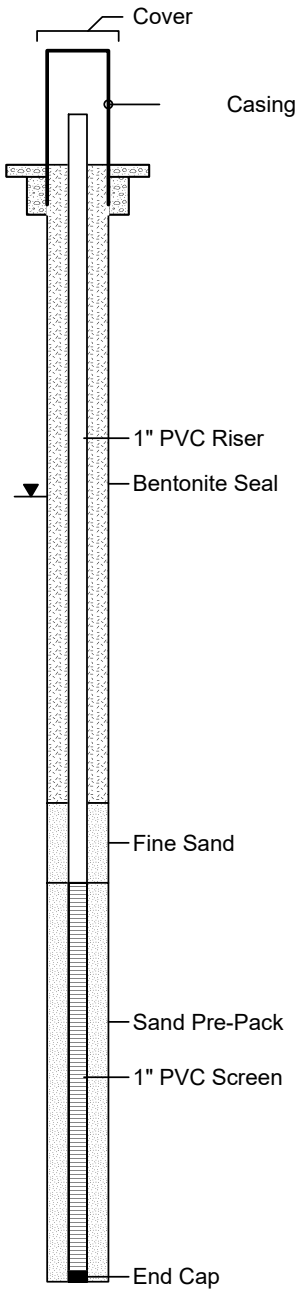
Well ID: SW-096-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Kevin Pumphrey
Drilling Equipment	: Geoprobe 7822DT

Northing (ft)	: 573644.88
Easting (ft)	: 1461507.39
Date/Time Started	: 10/25/19 / 830
Date/Time Completed	: 10/25/19 / 1100
Surf. Elev. (ft AMSL)	: 13.99
TOC Elev. (ft AMSL)	: 16.32
Total Well Depth (ft)	: 28' bgs
Depth to Water (ft)	: 0 Hr: 10.82' TOC
Depth to Water (ft)	: 48 Hr: 10.48' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS
0		0.0	(0-2') SILT with SAND and GRAVEL, medium to hard, brown, dry, non-plastic, non-cohesive	ML
2	100	0.0	(2-5') SILTY CLAY, medium to hard, light gray with reddish yellow mottling, dry, low plasticity, cohesive	CL
4		0.0		
6	100	0.0	(5-10.7') CLAY, hard then medium at 10' bgs, gray and dark gray then light gray with reddish yellow mottling at 6.5' bgs, dry, medium plasticity, cohesive	CL
8		0.0		
10		0.0		
12	100	0.0	(10.7-11') SAND and CLAY, medium, light gray, moist, non-plastic, non-cohesive	SW
14		0.0	(11-21') SANDY CLAY with MUDSTONE, medium to soft, light gray with reddish yellow mottling, then light gray at 15' bgs, tthen dark gray at 15.9' bgs, moist, low plasticity, cohesive	SC
16		0.0		
18	100	0.0		
20		0.0		
22	100	-	(21-25') SAND, fine to medium, medium, dark gray, wet, non-plastic, non-cohesive	SW
24		-		
26	0	-	(25-28') No recovery due to heaving sands	
28		-	End of boring	
30				



COMPLETION DETAILS

4" Protective Steel
Casing with Locking Lid
Weep hole approximately 6"
above concrete pad
18" diameter concrete pad
1" expandable-type cap

Riser: Sch 40 PVC
Riser Diameter: 1 in
Riser Stickup (ags): 32"

Bentonite Seal: 3/8" chips
Top: 0' bgs
Bottom: 16' bgs

Sreen: Sch 40 PVC
Screen Diameter: 1 in
Slot Size: 0.010"
Top: 18' bgs
Bottom: 28' bgs
Total Screen: 10'

Pre-Pack:
Sand
Top: 18' bgs
Bottom: 28' bgs

Filter Pack: FilPro W.G. #2
Sand
Top: 16' bgs
Bottom: 18' bgs

2.5" Long flush-threaded
PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 10/30/2019
Purged Amount: 4.0 gallons
Well Volumes Removed: 4.9

ARM Group LLC
Engineers and Scientists

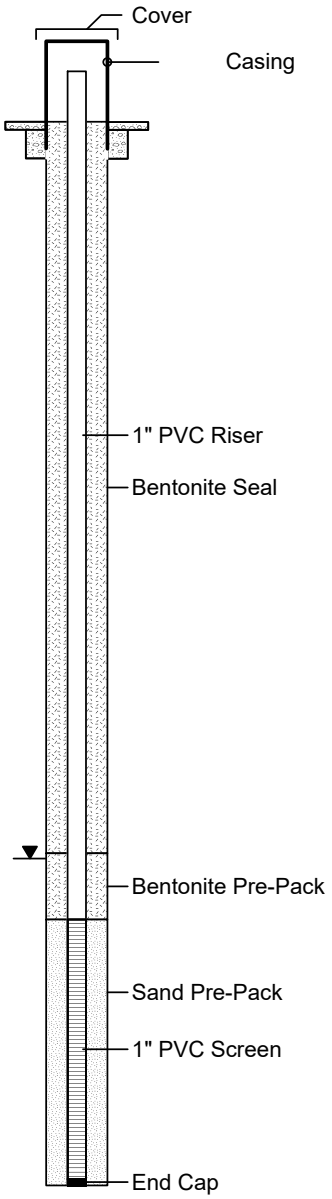
Well ID: SW-097-MWS

(page 1 of 1)

Project Name	: A11-1 Well Installation
Project Number	: 180556M-2-2
Client	: EnviroAnalytics Group
Site	: Sparrow's Point
Borehole Location	: Parcel A11-1
ARM Representative	: L. Glumac
Checked by	: M. Replogle, E.I.T.
Drilling Company	: GSI
Driller	: Kevin Pumphrey
Drilling Equipment	: Geoprobe 7822DT

Northing (ft)	: 573284.03
Easting (ft)	: 1461460.78
Date/Time Started	: 10/24/19 / 1015
Date/Time Completed	: 10/24/19 / 1350
Surf. Elev. (ft AMSL)	: 33.39
TOC Elev. (ft AMSL)	: 35.61
Total Well Depth (ft)	: 40' bgs
Depth to Water (ft)	: 0 Hr: 30.20' TOC
Depth to Water (ft)	: 48 Hr: 29.74' TOC
Bit/Auger Size (in.)	: 7.75" OD (4.25" ID) HSA

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS
0		-	(0-0.25') CLAY with SILT, medium, dark brown, dry, low plasticity, cohesive	CL
2	54	-		
4		0.0	(0.25-19.7') SLAG GRAVEL and SAND, medium, then dense at 7' bgs, then very dense at 12' bgs, dark brown, dry, non-plastic, non-cohesive	GW
6		7.3		
8	60	1.5		
10		-		
12	60	-		
14		0.7		
16	100	1.1		
18		1.5		
20		-		
22	100	-	(19.7-22') SILTY CLAY, hard, brown and light gray, dry, low plasticity, cohesive	CL
24		1.3	(22-24') SANDY CLAY, medium to dense, brown and light gray, dry, low plasticity, cohesive	SC
26	100	0.7	(24-25') CLAYEY SAND, medium to dense, brown and light gray, dry, non-plastic, non-cohesive	SC
28		2.9	(25-32') CLAY with little MUDSTONE, hard then medium at 30' bgs, dark gray, light gray, and light brown with yellowish red mottling. dry, high plasticity, cohesive	CH
30		0.0		
32	100	0.0	(32-32.9') SILTY CLAY with little MUDSTONE, medium to soft, light gray with trace pale brown, moist, low plasticity, cohesive	CL
34		0.0		SC
36	100	0.0	(32.9-35') SANDY CLAY with SILT, light gray and light brown, wet, low plasticity, cohesive	SC
38		-		SW
40		-	(35-36') CLAYEY SAND, fine, light gray, wet, non-plastic, non-cohesive	
42		-	(36-40') SAND, coarse to fine, medium, light brown to very pale brown and cream, wet, non-plastic, non-cohesive	
44		-	End of boring	



COMPLETION DETAILS

4" Protective Steel Casing with Locking Lid
Weep hole approximately 6" above concrete pad
18" diameter concrete pad
1" expandable-type cap
Riser: Sch 40 PVC
Riser Diameter: 1 in
Riser Stickup (ags): 32"

Bentonite Seal: 3/8" chips
Top: 0' bgs
Bottom: 27.5' bgs

Bentonite Pre-Pack
Top: 27.5' bgs
Bottom: 30' bgs

Sreen: Sch 40 PVC
Screen Diameter: 1 in
Slot Size: 0.010"
Top: 30' bgs
Bottom: 40' bgs
Total Screen: 10'

Pre-Pack:
Sand
Top: 30' bgs
Bottom: 40' bgs

2.5" Long flush-threaded PVC end cap

TOC - Top of PVC Casing
AMSL - Above Mean Sea Level
ags - above ground surface
bgs - below ground surface
WOH - weight of hammer

Monitoring Well Development
Date: 10/30/2019
Purged Amount: 10 gallons
Well Volumes Removed: 19.6

ATTACHMENT 2

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW02-PZM000 **Well Permit No.:** _____ Page 1 of 2

ARM Project No.: ~~180~~ 180556m-22	Date/Time Started: 11/15/18 / 1040	Developed by: L. Perrin
Client: **EnviroAnalytics Group**	Date/Time Completed: 11/15/18 / 1140	Company: ARM Group
Well Location: Area A, Parcel A11	Weather/Site Conditions: Snow 30s	Checked by: _____

A. Well Construction Details

Well Cover Type: *Stick-up* or *Flush-Mount*	PVC Screen Interval: 4 to 14
Well riser/screen material: PVC	Sandpack Interval: 2 to 14
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 14' bgs

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 17.55 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 3.85 ft. (C)
Petroleum/Product Present? Y or N Thickness (ft.): NA	Height of Water Column: (B - C) 13.7 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): ? ft.	Wetted Bore Volume: (A x D) 2.23 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 2" surge Block and pump

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	4-9	10	2	0.890	Light gray → clear
2	9-14	15	4	1.79	V. light brown → cloudy
					purged dry/or couldn't pump any more
Cumulative Totals: (Minimum of 3 Well Volumes)			6	2.69	

Final Depth to Water (from TOC): 16.9

Thickness of Any Sediment Remaining in Well: Ø

Final depth 17.56

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1124 - Purge water - 11/15/18 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perry	Lisa Perry	11/15/18

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-087-MWS **Well Permit No.:** _____

ARM Project No.: ~~180~~ 180556m-2-2	Date/Time Started: 11/~~13~~14/19 / ~~0900~~ 1130	Developed by: L. Perrin
Client: EA6 **EnviroAnalytics Group**	Date/Time Completed: 11/~~13~~14/19 / 1245	Company: ARMgroup
Well Location: Area A, Parcel A11	Weather/Site Conditions: Drizzle 50s	Checked by: _____

A. Well Construction Details

Well Cover Type: (Stick-up) or *Flush-Mount*	PVC Screen Interval: 3.1 to 21.1
Well riser/screen material: (PVC)	Sandpack Interval: 2 to 21.1
Difference between Ground Surface and TOC: (+) / -)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 24.00

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 22.90 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 5.80 ft. (C)
Petroleum/Product Present? *Y* or (N) Thickness (ft.): NA	Height of Water Column: (B - C) 17.1 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 1.1 ft.	Wetted Bore Volume: (A x D) 2.79 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: Surge block + pump

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	3-8	10	5	1.80	Light brown - mod turb
2	8-13	15	5	1.80	Light brown - mod turb
3	13-18'	20	15	5.38	Light brown → V. pale brown
4	18-21	20	23	8.25	V. pale brown → clear
	Cumulative Totals: (Minimum of 3 Well Volumes)		48	17.23	

Final Depth to Water (from TOC): 12.24

Thickness of Any Sediment Remaining in Well: Ø

24.75 Final depth

All depths reported are from reference notch in top of TOC.

Well ID: SW-087-MW-S
Date: 11/13/18

ID Numbers of IDW Drums Generated:

1. (12) - Purge water - 11/13/18 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

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F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin		11/14/18

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-088-MW5 **Well Permit No.:** _____ Page 1 of 2

ARM Project No.: 150 180556 m-22	Date/Time Started: 11/15/13 0820	Developed by: L. Perrin
Client: **EnviroAnalytics Group**	Date/Time Completed: 11/15/13 1015	Company: ARM Group
Well Location: Area A, Parcel A11	Weather/Site Conditions: snow/sleet 30s	Checked by: _____

A. Well Construction Details

Well Cover Type: (*Stick-up*) or *Flush-Mount*	PVC Screen Interval: 2.63 to 23.63
Well riser/screen material: (*PVC*)	Sandpack Interval: 2 to 23.63
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 26.18

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 25.73 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 7.45 ft. (C)
Petroleum/Product Present? Y or (N) Thickness (ft.): NA	Height of Water Column: (B - C) 18.28 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.45 ft.	Wetted Bore Volume: (A x D) 2.98 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 2" surge block + pump

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	3-8	10	~~10~~ 10	3.36	Light brown - mod turb
2	8-13	10	~~10~~ 10	3.36	" "
3	13-18	15	~~10~~ 10	~~3.36~~ 3.36	" "
4	18-22	20	~~20~~ 20	6.71	Light brown → cloudy
5	22-24	20	~~5~~ 5	1.68	Cloudy → clear
	Cumulative Totals: (Minimum of 3 Well Volumes)		55	18.47	

Final Depth to Water (from TOC): 8.24

Thickness of Any Sediment Remaining in Well: Ø

All depths reported are from reference notch in top of TOC.

26.61 Final depth

ID Numbers of IDW Drums Generated:

1. 1123- Purge water- 11/15/18 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

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F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin		11/15/18

All depths reported are from reference notch in top of TOC.
All measurements made in 10^{ths} of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-089-MW5 **Well Permit No.:** _____ Page 1 of 2

ARM Project No.: ~~150297~~ 160536m-2	Date/Time Started: 1/24/19 / 1310	Developed by: L. Perrin
Client: EAG **EnviroAnalytics Group**	Date/Time Completed: 1/24/19 / 1400	Company: ARM Group Inc.
Well Location: Area A, Parcel A11-1	Weather/Site Conditions: Rainy, windy 40s	Checked by: _____

A. Well Construction Details

Well Cover Type: (*Stick-up*) or *Flush-Mount*	PVC Screen Interval: 2 to 23
Well riser/screen material: *PVC*	Sandpack Interval: 1.5 to 28
Difference between Ground Surface and TOC: (+) -)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 31.20

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 30.71 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 7.89 ft. (C)
Petroleum/Product Present? *Y* or (*N*.) Thickness (ft.): _____	Height of Water Column: (B - C) 22.82 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.49 ft.	Wetted Bore Volume: (A x D) 3.72 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: _____

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	8-13	20	3	0.8	grayish brown/turbid/strong odor
2	13-18	15	8	2.15	" "
3	18-23	15	10	2.70	grayish brown to light brown
4	23-28	10	15	4.0	grayish brown → cloudy
5	28-	10	10	2.70	light brown → clear
	Cumulative Totals: (Minimum of 3 Well Volumes)		46	12.35	

Final Depth to Water (from TOC): 8.31

Thickness of Any Sediment Remaining in Well: Ø

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1155 - Purge water - 1/24/19 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

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F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin		1-24-19

All depths reported are from reference notch in top of TOC.
All measurements made in 10^{ths} of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-090-MWS **Well Permit No.:** _____

ARM Project No.: ~~180~~ 180556m-2-2	Date/Time Started: 11/12/18 / 900	Developed by: L. Perrin
Client: **EnviroAnalytics Group**	Date/Time Completed: 11/12/18 / 1150	Company:
Well Location: Area A, Parcel 11	Weather/Site Conditions:	ARMGroup
	Cloudy 50s	Checked by:

A. Well Construction Details

Well Cover Type: *Stick-up* or *Flush-Mount*	PVC Screen Interval: 3.5 to 24.5
Well riser/screen material: *PVC*	Sandpack Interval: 2.5 to 24.5
Difference between Ground Surface and TOC: (+) / -	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 27.09

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 26.98 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 6.21 ft. (C)
Petroleum/Product Present? *Y* or *N* Thickness (ft.): NA	Height of Water Column: (B - C) 20.77 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.11 ft.	Wetted Bore Volume: (A x D) 3.39 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: Surge block + pump

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	3-8	10	2	0.59	~~met~~ Light brown / slight odor
2	8-13	10	3	0.88	Light brown / turb / Light odor
3	13-18	10	5	1.47	Same
4	18-24.5	20	20	5.90	Light brown to pale brown
5	18-24.5	15	25	7.37	cloudy → clear
	Cumulative Totals: (Minimum of 3 Well Volumes)		55	16.21	

Final Depth to Water (from TOC): 6.73

Thickness of Any Sediment Remaining in Well: 0.02

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1118 - Purge water - 11/12/18 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

turbid water until near very end

F. Signatures

Field Representative(s): Lisa Perna (Print Name) Lisa Perna (Signature) 11/12/18 (Date)

_____ (Print Name) _____ (Signature) _____ (Date)

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-091-MW5 **Well Permit No.:** _____ Page 1 of 2

ARM Project No.: ~~180536~~ 180536m-2.2	Date/Time Started: 11/14/18 / 1350	Developed by: L. Perrin
Client: **EnviroAnalytics Group**	Date/Time Completed: 11/14/18 / 1530	Company: ARM Group
Well Location: Area A, Parcel A11	Weather/Site Conditions: cloudy 40s	Checked by: _____

A. Well Construction Details

Well Cover Type: *Stick-up* / or *Flush-Mount*	PVC Screen Interval: 3.92 to ~~29.92~~ 24.92
Well riser/screen material: *PVC*	Sandpack Interval: 2 to ~~29.92~~ 24.92
Difference between Ground Surface and TOC: (+/ -)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 24.92

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 26.7 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 7.82 ft. (C)
Petroleum/Product Present? *Y or N?* Thickness (ft.): NA	Height of Water Column: (B - C) 18.88 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 1.22 ft.	Wetted Bore Volume: (A x D) ~~0.07~~ 3.08 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 2" Surge pump + block

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	4-9	10	10	~~3.25~~ 3.25	Light brown mod turb mod odor
2	9-14	10	10	~~3.25~~ 3.25	Light brown → pale brown
3	14-19	20	10	~~3.25~~ 3.25	Light brown → pale brown
4	19-25	15	15	4.87	pale brown → v. pale brown
5	19-25	15	5	1.62	v. pale brown → clear
	Cumulative Totals: (Minimum of 3 Well Volumes)		50	16.24	

Final Depth to Water (from TOC): 7.92

Thickness of Any Sediment Remaining in Well: ~~0~~ 0.40

27.52' Final TOC

All depths reported are from reference notch in top of TOC.

Well ID: SW-091-MWS
Date: 11/14/18

ID Numbers of IDW Drums Generated:

1. 1122 - Purge water - 11/14/18 - AM
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin		11/14/18

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-092-MW05 **Well Permit No.:** _____

ARM Project No.: ~~180~~ 180556m2-2	Date/Time Started: 11/12/18 / 1250	Developed by: L. Perrin
Client: **EnviroAnalytics Group**	Date/Time Completed: 11/12/18 / 1030	Company: ARM Group
Well Location: Area ~~A~~, Parcel All	Weather/Site Conditions: Cloudy 50s	Checked by:

A. Well Construction Details

Well Cover Type: (*Stick-up*) or *Flush-Mount*	PVC Screen Interval: 3.33 to 24.33
Well riser/screen material: (*PVC*)	Sandpack Interval: 2.5 to 24.33
Difference between Ground Surface and TOC: (+) / -)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) ~~24.33~~ 26.45

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): ~~23.80~~ ~~26.80~~ 23.80 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 7.63 ft. (C)
Petroleum/Product Present? Y or (N) Thickness (ft.): NA	Height of Water Column: (B - C) 16.17 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.53 ft.	Wetted Bore Volume: (A x D) 2.64 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 2" Surge Block + pump

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	3-8	15	5	~~3~~ 1.89	Heavy turb - soapy
2	8-13'	5	1	~~1~~ 0.39	" "
3	13-18'	5	1	~~1~~ 0.38	" "
4	18-23'	5	3	~~3~~ 1.14	" "
5	23-24.5'	5	1	~~1~~ 0.38	Light turb → cloudy soapy
	Cumulative Totals: (Minimum of 3 Well Volumes)		11	4.17	

Final Depth to Water (from TOC): 25.67

Thickness of Any Sediment Remaining in Well: Ø

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1119 - Purge water - 11/12/18 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin		11/13/18

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-093-MWS **Well Permit No.:** _____ Page 1 of 2

ARM Project No.: ~~150~~ 18055bm-2-2	Date/Time Started: 1/24/19 / 1106	Developed by: L. Perrin
Client: EAG **EnviroAnalytics Group**	Date/Time Completed: 1/24/19/1240	Company: ARM Group Inc
Well Location: Area A, Parcel A11-1	Weather/Site Conditions: rainy 40s	Checked by: _____

A. Well Construction Details

Well Cover Type: (*Stick-up*) or *Flush-Mount*	PVC Screen Interval: 2 to 28'
Well riser/screen material: *PVC*	Sandpack Interval: 1.5 to 30
Difference between Ground Surface and TOC: (+/-) 0	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) ~~30.70~~ 30.70 ?

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): ~~26.95~~ 26.95 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 7.93 ft. (C)
Petroleum/Product Present? *Y* or (*N*) Thickness (ft.): _____	Height of Water Column: (B - C) 19.02 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 3.75 ft.	Wetted Bore Volume: (A x D) 3.10 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 2" surge block

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	~~13-18~~ 13-18	10	4	1.30	brown/turbid/strong odor
2	13-18	15	15	4.84	" / "
3	18-23	15	15	4.84	" / "
4	23-28	15	10	3.23	light brown ⇒ cloudy
5	23-28	10	14	4.52	brown ⇒ cloudy
	Cumulative Totals: (Minimum of 3 Well Volumes)		58	18.73	

Final Depth to Water (from TOC): 8.31

Thickness of Any Sediment Remaining in Well: 3.53 ?

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1154-Purge water-1/24/19-All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

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F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin		1-24-19

All depths reported are from reference notch in top of TOC.
All measurements made in 10^{ths} of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-094-MW5 **Well Permit No.:** _____

ARM Project No.: 150 180556m-22	Date/Time Started: 11/12/18 / 1430	Developed by: L. Perrin
Client: EAG **EnviroAnalytics Group**	Date/Time Completed: 11/12/18 / 1600	Company: ARM Group
Well Location: Area A, Parcel A11	Weather/Site Conditions: Cloudy 50s	Checked by: _____

A. Well Construction Details

Well Cover Type: *Stick-up* or *Flush-Mount*	PVC Screen Interval: 3.54 to 24.54
Well riser/screen material: PVC	Sandpack Interval: 2.5 to 24.54
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 27.65

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in.	Well Total Depth (TOC): 24.40 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A)	Depth to Static Water Level (TOC): 5.69 ft. (C)
Petroleum/Product Present? *Y* or N. Thickness (ft.): NA	Height of Water Column: (B - C) 18.71 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 3.25 ft.	Wetted Bore Volume: (A x D) 3.05 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: Surge block + pump

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	3.5 - 8.5	10	5	1.64	mod turb. Light brown
2	8.5 - 13.5	10	8	2.62	mod to light turb. Light brown → V. pale brown
3	13.5 - 18.5	15	10	3.28	mod to light turb Light brown → V. pale brown
4	18.5 - 24.5	20	20	6.56	Heavy turb to light turb Light brown → V. pale brown
5	18.5 - 24.5	15	7	2.30	Light turb. to cloudy (slightly) V. pale brown → clear
	Cumulative Totals: (Minimum of 3 Well Volumes)		50	16.4	

Final Depth to Water (from TOC): 5.52

Thickness of Any Sediment Remaining in Well: 0.80

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1120 - Purgewater - 11/12/18 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

_____

_____

_____

_____

_____

_____

F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Lisa Perrin	Lisa LP	11/12/18
	Print Name	Signature	Date

All depths reported are from reference notch in top of TOC.
All measurements made in 10^{ths} of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: Sw-095-MWS **Well Permit No.:** _____

ARM Project No.: NSQ 180556M	Date/Time Started: 10-30-19 / 1515	Developed by: TCV
Client: **EnviroAnalytics Group**	Date/Time Completed: 10-30-19 / 1605	Company:
Well Location: Area A, Parcel 11	Weather/Site Conditions: Cloudy 60's	Checked by:

A. Well Construction Details

Well Cover Type: *Stick-up* or *Flush-Mount*	PVC Screen Interval: 17 to 27
Well riser/screen material: *PVC*	Sandpack Interval: 15 to 27
Difference between Ground Surface and TOC: (+/-) 2.67	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 27.54

B. Wetted Bore Volume Determination

Well (PVC) Diameter: ~~2.0~~ in. 1.0 in	Well Total Depth (TOC): 27.51 ft. (B)
Well (PVC) Volume: ~~0.163~~ gal./ft. (A) 0.041 gal/ft	Depth to Static Water Level (TOC): 9.25 ft. (C)
Petroleum/Product Present? *Y* or (N) Thickness (ft.): _____	Height of Water Column: (B - C) 18.26 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.03 ft.	Wetted Bore Volume: (A x D) 0.75 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 1" surge block

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	23.67 - 27	10	1.5	2	light brown
2	20.33 - 23.67	10	1.0	1.33	light brown
3	17 - 20.33	10	1.0	1.33	light brown
	Cumulative Totals: (Minimum of 3 Well Volumes)		3.5	4.67	

Final Depth to Water (from TOC): 9.45 DTB: 27.51

Thickness of Any Sediment Remaining in Well: 0.03

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1283-water-10/29/19-All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Tyler Van Ness		10-30-19

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-096-MW5 **Well Permit No.:** _____

ARM Project No.: 150160556M	Date/Time Started: 10-30-19 / 1415	Developed by: TCV
Client: **EnviroAnalytics Group**	Date/Time Completed: 10-30-19 / 1509	Company:
Well Location: Area A, Parcel 11	Weather/Site Conditions: Cloudy 60's	Checked by:

A. Well Construction Details

Well Cover Type: *Stick-up* or *Flush-Mount*	PVC Screen Interval: 20 to 30
Well riser/screen material: *PVC*	Sandpack Interval: 18 to 30
Difference between Ground Surface and TOC: (+ / -) 2.67	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 28' (no 0hr measurements)

B. Wetted Bore Volume Determination

Well (PVC) Diameter: 2.0 in. 1.0 in	Well Total Depth (TOC): 30.45 ft. (B)
Well (PVC) Volume: ~~0.163~~ gal./ft. (A) 0.041 gal/ft	Depth to Static Water Level (TOC): 10.48 ft. (C)
Petroleum/Product Present? Y or (N) Thickness (ft.): _____	Height of Water Column: (B - C) 19.97 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.0 ft.	Wetted Bore Volume: (A x D) 0.82 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 1" surge block

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	26.67 - 30	10	1.5	1.82	brownish grey
2	23.33 - 26.67	10	1.5	1.82	grey
3	20 - 23.33	10	1.0	1.22	grey
	Cumulative Totals: (Minimum of 3 Well Volumes)		4.0	4.86	

Final Depth to Water (from TOC): 10.70 DTB: 30.50

Thickness of Any Sediment Remaining in Well: 0.0

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1283-water - 10/29/19 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

_____

_____

_____

_____

_____

_____

F. Signatures

Print Name	Signature	Date
Tyler Van Ness	[signature]	10-30-19

All depths reported are from reference notch in top of TOC.
All measurements made in 10ths of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ARM Group Inc.

Earth Resource Engineers and Consultants

Sparrows Point

Monitoring Well Development Form – Surge and Pump Method

Well ID: SW-097-MW5 **Well Permit No.:** _____

ARM Project No.: ~~150~~ 160556	Date/Time Started: 10-30-19 / 1030	Developed by: TCV
Client: **EnviroAnalytics Group**	Date/Time Completed: 10-30-19 / 1405	Company:
Well Location: Area A, Parcel 11	Weather/Site Conditions: Cloudy 60's	Checked by:

A. Well Construction Details

Well Cover Type: (*Stick-up*) or *Flush-Mount*	PVC Screen Interval: 32 to 42
Well riser/screen material: *PVC*	Sandpack Interval: 30 to 42
Difference between Ground Surface and TOC: (+/-) 2.67'	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) 42.31

B. Wetted Bore Volume Determination

Well (PVC) Diameter: ~~2~~ 0 in. 1 in	Well Total Depth (TOC): 42.23 ft. (B)
Well (PVC) Volume: 0.163 gal./ft. (A) 0.041 gal/ft	Depth to Static Water Level (TOC): 29.74 ft. (C)
Petroleum/Product Present? *Y* or (N) Thickness (ft.): _____	Height of Water Column: (B - C) 12.49 ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): 0.08 ft.	Wetted Bore Volume: (A x D) 0.51 gal. (E)

C. Surge and Pump Event Summary Data

Description of Surge Equipment: 1" Surge block

Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	38.67 - 42	10	4	8	dark brown
2	35.33 - 38.67	10	3	6	brown
3	32 - 35.33	10	3	6	brown
	Cumulative Totals: (Minimum of 3 Well Volumes)		10	20	

Final Depth to Water (from TOC): 30.25 OTB: 42.27

Thickness of Any Sediment Remaining in Well: 0.04

All depths reported are from reference notch in top of TOC.

ID Numbers of IDW Drums Generated:

1. 1283- water- 10/29/19 - All
2. _____
3. _____

D. Checklists

Equipment Check List:

- ☐ Original Well Construction Diagram
- ☐ Well Development Form
- ☐ Clean Weighted Tape for Determining Total Well Depth and Depth to Any Sediment or Possible Blockages Within the Well
- ☐ Water Level Meter and/or Oil-Water Interface Probe
- ☐ Surge Block and 2-inch ID PVC Casing Extensions
- ☐ Appropriate Pump
- ☐ Disposable Pump Tubing
- ☐ Clean Paper Towels
- ☐ Alconox Detergent
- ☐ Clean Brushes for Decontamination Work
- ☐ Distilled Water for Rinsing Equipment
- ☐ 2 New, Clean Spray Bottles for Spray Distilled Water
- ☐ 2 to 3 Clean Five-gallon Buckets
- ☐ 55-gallon Drum(s) for Development Water; Drum Non-hazardous Waste Labeling Supplies
- ☐ Personal Protective Equipment Per Health and Safety Plan

Quality Control Procedures Include:

- ☐ Decon All Equipment that Goes Down-hole per Appropriate Standard Operating Procedure (SOP)
- ☐ Staging Down-hole Equipment, Tubing, etc. on Clean Plastic Sheeting
- ☐ _____

E. Notes/Comments

DTW to deep for peristaltic pump. Used an inertia pump

F. Signatures

	Print Name	Signature	Date
Field Representative(s):	Tyler Van Ness		10-30-19

All depths reported are from reference notch in top of TOC.
All measurements made in 10^{ths} of feet

TOC = from Top of PVC Casing
Grd = Ground Surface
TD = Total Depth

ATTACHMENT 3

Low Flow Sampling

~~Temporary Piezometers~~ Permanent Well

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: Area A Parcel A11	Project Number: 180556m-2-2
Piezometer Number: SW02-PZM000	Date: 11/20/18
Piezometer Diameter (in): 2	One Well Volume (gal): 1.914
Depth to Product (ft): NA	QED Controller Settings: ———
Depth to Water (ft): 6.43	Flow Rate (mL/min) 144
Product Thickness (ft): NA	Length of time Purged (min) 20
Depth to Bottom (ft): 17.56	Condition of well pad/cover: poor / OK

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
1421	0.0	6.43	14.3	6.97	0.638	6.34	42.4	20.4	
1426	0.2	7.67	14.3	6.91	0.637	5.46	58.0	15.7	
1431	0.37	7.84	14.1	6.91	0.636	5.25	66.5	17.2	
1436	0.58	7.90	14.4	6.91	0.636	5.16	70.4	17.4	
1441	0.75	8.01	14.5	6.92	0.637	5.03	74.4	18.0	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW02-PZM000	1455	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		TCL-SVOCs	2- 1 L Amber	none	Y
		Oil & Grease	2 - 1 L Amber	HCl	Y
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	None	N
		Matrix Spike			N
		Duplicate			N

Sampled By: LLP

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:	Area A Parcel A11	Project Number:	180556M-2-2
Well Number:	SW-087-MWS	Date:	11/19/18
Well Diameter (in):	2	One Well Volume (gal):	~~4~~ 3.03
Depth to Product (ft):	NA	QED Controller Settings:	—
Depth to Water (ft):	5.76	Flow Rate (mL/min)	~~400~~ 160
Product Thickness (ft):	NA	Length of time Purged (min)	20
Depth to Bottom (ft):	24.65	Condition of Pad/Cover:	Good / Good

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
1011	0.0	5.76	11.4	5.81	2.470	9.62	173.0	57.8	clear
1016	0.25	5.91	13.9	5.14	2.365	2.54	118.7	55.6	
1021	0.45	5.91	13.7	5.22	2.270	1.91	110.3	45.0	
1026	0.65	5.91	13.7	5.29	2.206	1.67	103.8	43.9	
1031	0.85	5.91	14.0	5.33	2.172	1.47	100.9	46.7	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-087-MWS	1035	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		~~PAH 8270C~~	2- 1 L Amber	none	Y
		Oil & Grease	2- 1 L Amber	HCl	Y
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	N
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	N
		PCB	2 - 1 L Amber	None	N
Matrix Spike					N
Duplicate					N

Sampled By: LLP

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 ~~Temporary Piezometers~~ Permanent Well

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: Area A Parcel A11	Project Number: 180556M-2-2
Well ~~Piezometer~~ Number: SW-088-MW5	Date: 11/19/18
Piezometer Diameter (in): 2	One Well Volume (gal): 3.18
Depth to Product (ft): NA	QED Controller Settings: —
Depth to Water (ft): 7.13	Flow Rate (mL/min) 189
Product Thickness (ft): NA	Length of time Purged (min) 40 min
Depth to Bottom (ft): 26.62	Condition of pad/cover: Good/Good

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
1349	0.0	7.13	13.7	4.38	3.992	4.17	192.0	106.8	
1354	0.20	7.37	13.5	4.38	4.044	2.32	190.2	128.4	
1359	0.40	7.16	13.5	4.25	4.611	1.73	192.5	264.3	
1404	0.65	7.16	13.6	3.94	6.261	1.47	202.7	199.7	
1409	0.90	7.16	13.7	3.86	8.578	1.60	205.9	272.1	
1414	1.15	7.16	13.5	3.76	8.819	1.31	198.8	206.8	
1419	1.40	7.16	13.5	3.78	8.235	1.16	197.2	176.1	
1424	1.75	7.16	13.4	3.78	7.969	1.12	196.2	137.3	
1429	2.00	7.16	13.4	3.76	7.845	1.10	194.9	140.1	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-088-MW5	1440	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		PAH ~~TCL-SVOCs~~	2- 1 L Amber	none	Y
		Oil & Grease	2 - 1 L Amber	HCl	Y
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	None	N
Matrix Spike					N
Duplicate					N

Sampled By: LLP

Comments: Conductivity did not settle in limits

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: Area A Parcel A11	Project Number: 180556M-2-2
Well Number: SW-089-MWS	Date: 1-29-19
Well Diameter (in): 2	One Well Volume (gal):
Depth to Product (ft): NA	QED Controller Settings: —
Depth to Water (ft): 8.32	Flow Rate (mL/min) 189
Product Thickness (ft): NA	Length of time Purged (min) 35
Depth to Bottom (ft): 31.20	Condition of Pad/Cover: Good / Good

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
1019	0.0	8.32	9.8	3.66	3.714	8.37	152.4	1569.7	
1024	0.25	8.28	9.4	3.74	3.245	5.01	147.0	700.3	
1029	0.50	8.25	9.5	3.81	3.009	3.78	146.5	450.3	
1034	0.75	8.24	9.4	3.74	2.897	3.14	147.0	411.1	
1039	1.00	8.24	9.4	3.74	2.898	2.89	147.0	383.2	
1044	1.25	8.24	9.5	3.73	2.898	2.55	147.0	341.2	
1049	1.50	8.24	9.7	3.72	2.956	2.36	147.0	312.1	
1054	1.75	8.24	9.7	3.71	2.990	2.18	147.1	290.3	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-089-MWS	1100	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		PAH ~~TCL-SVOCs~~	2- 1 L Amber	none	Y
		Oil & Grease	2- 1 L Amber	HCl	Y
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	N
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	N
		PCB	2 - 1 L Amber	None	N
		Matrix Spike			N
		Duplicate			N

Sampled By: LLP

Comments: Turb not stable

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
~~Temporary Piezometers~~ Permanent Wells

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: Area A Parcel A11	Project Number: 180556m-2-2
~~Piezometer~~ Well Number: SW-090-MW05	Date: 11/20/18
Piezometer Diameter (in): 2	One Well Volume (gal): 3.48
Depth to Product (ft): NA	QED Controller Settings: —
Depth to Water (ft): 5.67	Flow Rate (mL/min) 178
Product Thickness (ft): NA	Length of time Purged (min) 30
Depth to Bottom (ft): 27.05	Condition of well pad/cover: Good/Good

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
904	0.0	5.67	14.7	3.66	3.825	4.24	198.8	219.7	
909	0.25	5.70	14.4	3.72	3.833	2.19	184.9	211.6	
914	0.50	5.72	14.4	3.82	3.803	1.96	195.5	211.0	
919	0.70	5.72	14.2	3.91	3.778	1.67	189.0	358.7	
924	0.90	5.72	14.6	3.83	3.794	1.55	191.6	331.7	
929	1.15	5.72	14.8	3.87	3.789	1.41	198.3	299.8	
934	1.40	5.72	14.7	3.86	3.790	1.33	205.8	286.4	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-090-MW05	935	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		~~PAH~~ ~~TRL~~ SVOCs	2- 1 L Amber	none	Y
		Oil & Grease	2 - 1 L Amber	HCl	Y
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	None	N
Matrix Spike					N
Duplicate					N

Sampled By: LLP

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
~~Temporary Piezometers~~ permanent wells

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: 180556m-2-2 ⟹	Project Number: Area A Parcel A11
well ~~Piezometer~~ Number: SW-091-MWS	Date: 11/19/18
Piezometer Diameter (in): 2	One Well Volume (gal): 3.28
Depth to Product (ft): NA	QED Controller Settings: —
Depth to Water (ft): 7.37	Flow Rate (mL/min) 265
Product Thickness (ft): NA	Length of time Purged (min) 20
Depth to Bottom (ft): 27.52	Condition of pad/cover: Good / Good

PURGING RECORD

Little crack

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
1130	0.20	7.37	13.3	4.48	2.036	5.22	121.2	594.3	
1135	0.50	7.42	13.1	4.41	2.055	3.01	124.0	524.7	
1140	0.80	7.42	13.1	4.41	2.100	2.38	134.2	447.4	
1145	1.10	7.42	13.0	4.41	2.132	2.13	142.1	400.6	
1150	1.40	7.42	13.0	4.41	2.171	1.90	151.7	368.2	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-091-MWS	1200	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		~~PAH 8270SIM~~	2- 1 L Amber	none	Y
		Oil & Grease	2 - 1 L Amber	HCl	Y
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	None	N
		Matrix Spike			N
		Duplicate			N

Sampled By: LLP

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
~~Temporary Piezometers~~ Permanent Well

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: Area A Parcel A11	Project Number: 180556m-2-2
Piezometer Number: SW-092-MWS	Date: 11/20/18
Piezometer Diameter (in): 2	One Well Volume (gal): 3.20
Depth to Product (ft): NA	QED Controller Settings: —
Depth to Water (ft): 7.17	Flow Rate (mL/min) 161
Product Thickness (ft): NA	Length of time Purged (min) 20
Depth to Bottom (ft): 26.81	Condition of pad/cover: Good / Good

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
1018	0.0	7.17	14.5	4.07	5.124	3.05	232.4	39.2	
1023	0.25	8.23	14.7	4.09	5.018	2.38	239.2	35.8	Slightly Sicky
1028	0.45	8.40	14.5	4.10	4.969	2.08	243.8	44.2	
1033	0.65	8.51	14.4	4.11	4.923	1.96	244.7	45.3	
1038	0.85	8.55	14.3	4.12	4.869	1.89	244.5	48.9	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-092-MWS	1045	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		~~PAH's 8270 SVOCs~~	2- 1 L Amber	none	Y
		Oil & Grease	2 - 1 L Amber	HCl	Y
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	None	N
		Matrix Spike			N
		Duplicate			N

Sampled By: LLP

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: Area A parcel A11	Project Number: 180556m-2-2
Well Number: SW ~~###~~-093-mw5	Date: 1-29-19
Well Diameter (in): 2	One Well Volume (gal):
Depth to Product (ft): NA	QED Controller Settings: ——
Depth to Water (ft): 8.25	Flow Rate (mL/min) 200
Product Thickness (ft): NA	Length of time Purged (min) 30
Depth to Bottom (ft): 27.12	Condition of Pad/Cover: corner / Good broken

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
857	0.0	8.25	11.0	4.30	4.419	8.32	152.4	150.5	
902	0.30	8.27	10.5	4.19	2.680	5.17	144.4	224.9	
907	0.60	~~8.28~~	10.3	~~4.39~~ 4.31	2.054	3.84	124.3	225.7	
912	0.85	8.28	10.0	4.38	1.949	3.42	121.0	227.5	
917	1.10	8.28	10.0	4.36	1.878	3.01	118.0	224.0	
922	1.35	8.28	10.2	4.34	1.856	2.79	116.9	235.4	
927	1.60	8.28	9.9	4.29	1.843	2.55	116.6	230.3	

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW ~~###~~ 093-mw5	935	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		TCL-SVOCs	2- 1 L Amber	none	Y
		Oil & Grease	2- 1 L Amber	HCl	Y
		~~Diss~~ TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	~~Y~~ N
		Total Cyanide	1 - 250 mL Plastic	NaOH	Y
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	Y
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	none	Y
		PCB	2 - 1 L Amber	None	N
		Matrix Spike			N
		Duplicate			N

Sampled By: LLP

Comments: also avail cyanide

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
~~Temporary Piezometers~~ permanent well

ARM Group Inc.
Earth Resource Engineers and Consultants

Project Name: Area A Parcel A11	Project Number: 180556m-2-2
Piezometer Number: SW-094-MWS	Date: 11/20/19
Piezometer Diameter (in): 2	One Well Volume (gal): 3.54
Depth to Product (ft): NA	QED Controller Settings: ——
Depth to Water (ft): 5.15	Flow Rate (mL/min) 201
Product Thickness (ft): NA	Length of time Purged (min) 35
Depth to Bottom (ft): 26.85	condition of pad/cover: cracked / good

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
1134	0.0	5.15	14.4	9.21	0.400	1.91	11.8	331.7	clear
1139	0.30	5.15	14.3	9.24	0.399	1.67	0.5	333.3	"
1144	0.60	5.15	13.9	9.25	0.399	1.49	-7.4	202.7	"
1149	0.85	5.15	13.8	9.27	0.399	1.40	-19.6	70.6	"
1154	1.10	5.15	13.7	9.26	0.398	1.33	-38.3	29.7	"
1159	1.35	5.15	14.0	9.26	0.398	1.26	-56.5	21.0	"
1204	1.60	5.15	14.0	9.27	0.399	1.23	-64.6	19.1	"
1209	1.85	5.15	13.8	9.27	0.398	1.20	-70.9	18.8	"

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-094-MWS	1220	TCL-VOCs	3 - 40 mL VOA	HCl	Y
		TPH-GRO	3 - 40 mL VOA	HCl	Y
		TPH-DRO	2 - 1 L Amber	none	Y
		PAH ~~TCL-SVOCs~~	2- 1 L Amber	none	Y
		Oil & Grease	2 - 1 L Amber	HCl	Y
		Total Cyanide	1 - 250 mL Plastic	NaOH	N
		TAL-Metals & Mercury (Dissolved) **Field Filtered**	1 - 250 mL Plastic	HNO3	N
		Hexavalent Chromium (Dissolved) **Field Filtered**	1 - 250 mL Plastic	None	N
		Matrix Spike			N
		Duplicate			N

Sampled By: LCP

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: All Gw Delin	Project Number: 180556M
Well Number: SW-095-MWS	Date: 11-1-19
Well Diameter (in): 1	One Well Volume (gal):
Depth to Product (ft): no H2O	QED Controller Settings:
Depth to Water (ft): 9.23	Flow Rate (mL/min)
Product Thickness (ft): —	Length of time Purged (min)
Depth to Bottom (ft): 27.51	Condition of Pad/Cover: new /

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
1231		9.33	15.33	5.69	0.731	0.99	-87.4		
1236		9.34	15.25	5.78	0.727	0.43	-105.6		
1241		9.34	15.06	5.73	0.708	0.40	-106.5		
1246		9.35	15.05	5.68	0.703	0.36	-105.3		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-095-MWS	1251	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:
Duplicate & MS/MSD collected here

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: All Gw Delin.	Project Number: 180556M
Well Number: SW-096-MWS	Date: 11-1-19
Well Diameter (in): 1	One Well Volume (gal):
Depth to Product (ft): no NAPL	QED Controller Settings:
Depth to Water (ft): 10.31	Flow Rate (mL/min)
Product Thickness (ft): —	Length of time Purged (min)
Depth to Bottom (ft): 30.49	Condition of Pad/Cover: new /

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
1043		10.40	15.21	5.52	1.761	1.14	-34.2	~~1047~~ 1	
1048		10.40	15.22	4.54	2.105	0.88	-46.3	236 2	
1053		10.40	15.11	4.48	2.121	0.89	-64.9		
1058		10.41	15.03	4.43	2.156	0.79	-76.9		
1103		10.40	14.95	4.40	2.130	0.68	-91.5		
1108		10.41	15.01	4.34	2.129	0.61	-54.8		
1113		10.41	15.02	4.32	2.124	0.62	-55.1		

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-096-MWS	1114	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: All Gw Delin.	Project Number: 180556M
Well Number: SW-097-MW5	Date: 11-1-19
Well Diameter (in): 1	One Well Volume (gal): 0.52
Depth to Product (ft): n/a	QED Controller Settings:
Depth to Water (ft): 29.51	Flow Rate (mL/min)
Product Thickness (ft): —	Length of time Purged (min)
Depth to Bottom (ft): 42.27	Condition of Pad/Cover: new /

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
	1.5		13.73	6.48	1.421	~~0.48~~ 0.48	-155.9	1278.7	very turbid

MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
SW-097-MW5	0945	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: Used inertia pump to purge 3 well volumes, then filled the flow thru cell to collect parameter readings

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
12.76 ft x 0.041 gal/ft = 0.52 (gal)