

# **ROD AND WIRE MILL INTERIM MEASURE SUPPLEMENTAL INVESTIGATION REPORT**

**Revision 1 – April 8, 2020**

**TRADEPOINT ATLANTIC  
SPARROWS POINT, MARYLAND**

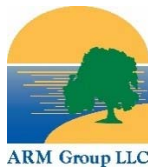
Prepared by:



**ENVIROANALYTICS GROUP**

1515 Des Peres Road, Suite 300  
Saint Louis, Missouri 63131

and



**ARM GROUP LLC**

9175 Guilford Road, Suite 310  
Columbia, Maryland 21046

ARM Project No. 20010103M

A handwritten signature in black ink, appearing to read "Stewart Kabis".

Stewart Kabis, P.G.  
Project Geologist

A handwritten signature in black ink, appearing to read "Neil Peters".

T. Neil Peters, P.E.  
Senior Vice President

## EXECUTIVE SUMMARY

On behalf of EnviroAnalytics Group (EAG), ARM Group LLC (ARM) prepared this Interim Measures (IM) Supplemental Investigation Report for the portion of the Tradepoint Atlantic Property designated as the Former Rod and Wire Mill Area (RWM).<sup>1</sup> The report adds new information to that contained in prior reports and provides information in response to comments received from the United States Environmental Protection Agency (USEPA) and the Maryland Department of the Environment (MDE).<sup>2</sup> The results described herein better define the nature and extent of constituents of concern in the RWM and will be used in a Corrective Measures Study (CMS) to optimize the corrective action and enhance, modify and or develop alternatives to existing interim measures, as needed.

The objectives of the supplemental investigation were to i) improve the understanding of groundwater conditions in the RWM, ii) address the comments made by MDE and EPA, and iii) provide additional information to support the evaluation and optimization of corrective actions for the groundwater conditions at the RWM. The objective of the offshore investigation was to evaluate the potential for contaminants in groundwater at the RWM to affect offshore locations. Each objective was attained as detailed in the report and summarized below.

The fundamental characteristics of interest regarding the RWM include:

- The constituents of concern are zinc and cadmium in groundwater.
- Generally, the subsurface geology at the RWM includes slag fill overlying natural soils, which include fine-grained sediments (clays and silts) and coarse-grained sediments (sands). Typically, the slag fill is directly underlain by a layer of silts/clays, and below this is a layer of coarse-grained sand. Deeper strata generally consist of alternating silt/clay and sand layers.
- The presence of slag fill and its effect on groundwater pH has significant implications with respect to the nature and extent of zinc and cadmium.
- Groundwater flow direction is controlled largely by topography. In the shallow zone, the predominant groundwater flow directions are to the west, northwest and southwest. In the intermediate zone, the potentiometric surface is nearly flat.
- There is a general downward vertical hydraulic gradient at inland and shoreline locations. The vertical gradient decreases to the south along the shoreline, and reverses to a slight upward vertical gradient toward the south.

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<sup>1</sup> The work, including quality assurance/quality control and data validation was performed in accordance with the RWM Interim Measure Supplemental Investigation Work Plan, Revision 1 dated March 7, 2019, and the Offshore Investigation Work Plan, Revision 1 approved March 5, 2019.

<sup>2</sup> USEPA's November 28, 2018 comments on "Rod and Wire Mill Interim Measures Progress Report – August 2018" identified elevated zinc levels, as a potential concern with respect to discharges to surface water. MDE's February 28, 2020 comments on "Rod and Wire Mill Interim Measures Progress Report – December 2018" recommended the installation of additional wells to the existing monitoring well network to address potential data gaps.



A conceptual site model (CSM), based on the above, was used to evaluate potential exposure risks and to refine the understanding of the nature and extent of constituents of concern. The CSM was developed based on the following considerations: i) the potential sources and release mechanisms for constituents with elevated concentrations; ii) the fate and transport of the constituents; iii) the media of concern; iv) potential pathways for human and ecological receptors, if any; and v) potential human populations and wildlife receptors that could be exposed to constituents of concern.

A summary of salient information derived from the supplemental investigation and CSM includes:

- Groundwater impacts around the perimeter of the RWM interim measure area were better defined and, based on new shoreline groundwater sampling points, reveal a larger area containing elevated concentrations of dissolved zinc and, to a lesser extent, cadmium.
- The trench investigation indicates that the permeable reactive wall treatment technology and the reagent is effective for upgradient groundwater, but it has limited ability to affect downgradient groundwater quality.
- The CSM revealed that the exposure pathways of interest are limited to potential recreational and commercial human exposure and aquatic wildlife exposure to surface water and sediment. Surface water was determined not to be a medium of concern.
- Cadmium is not a constituent of concern in the offshore environment nor is the discharge of groundwater to surface water a pathway of concern.
- Surface water samples contained low concentrations of zinc, well below the chronic NRWQC and as such surface water is not considered a medium of concern. Likewise, the discharge of zinc in groundwater to surface water is not a concern.
- Pore water zinc concentrations found offshore of the RWM are likely to have resulted from historical sources rather than current groundwater discharges from the RWM and groundwater discharges will not exacerbate pore water quality.

The information provided in the report will be used in the CMS to optimize the corrective action.

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## 1.0 INTRODUCTION

### 1.1 Introduction

ARM Group Inc. (ARM), on behalf of EnviroAnalytics Group (EAG), has prepared this Interim Measures (IM) Supplemental Investigation Report for a portion of the Tradepoint Atlantic Property that has been designated as the Former Rod and Wire Mill Area (RWM). In particular, this report expands on the previous Pre-Design Investigation Rod and Wire Mill Characterization Report (ARM, 2016), and the Rod and Wire Mill Interim Measures Progress Report – December 2018 (RM, 2019).

In an email received on November 28, 2018, the United States Environmental Protection Agency (USEPA) provided comments on the “Rod and Wire Mill Interim Measures Progress Report – August 2018” (ARM, 2018). The comments identified elevated zinc levels, as a potential concern with respect to discharges to surface water. In an email received on February 28, 2019, the MDE provided comments on the “Rod and Wire Mill Interim Measures Progress Report—December 2018” (ARM, 2018) that recommended the installation of additional wells to address data gaps in the RWM’s monitoring network. The progress report for the 2019 calendar year was submitted February 2020.

This report presents the results of additional data collection activities recently completed within the RWM in accordance with the RWM Interim Measure Supplemental Investigation Work Plan, Revision 1 dated March 7, 2019, and the Offshore Investigation Work Plan, Revision 1 approved March 5, 2019. The objectives of the supplemental investigation were to improve the understanding of groundwater conditions in the RWM, to address the concerns raised by MDE and EPA outlined in the comments mentioned above, and to provide additional information to support the evaluation and optimization of corrective actions for the groundwater conditions at the RWM. The objective of the offshore investigation was to evaluate the potential for contaminants in groundwater at the RWM to affect offshore locations.

### 1.1 Tradepoint Atlantic – Site Background

The Tradepoint Atlantic property is located in Baltimore County, Maryland within the southeastern corner of the Baltimore metropolitan area, and approximately nine miles from downtown. The property encompasses approximately 3,100 acres of land located on a peninsula situated on the Patapsco River near its confluence with the Chesapeake Bay, and physically positioned in the mouth of the heavily industrialized and urbanized Baltimore Harbor / Patapsco River region. **Figure 1** shows the location and boundaries of the Tradepoint Atlantic property.

From the late 1800s until 2012, the property was used for the production and manufacturing of steel. Iron and steel production operations and processes at the Site included raw material

handling, coke production, sinter production, iron production, steel production, and semi-finished and finished product preparation. In 1970, Sparrows Point was the largest steel facility in the United States, producing hot and cold rolled sheets, coated materials, pipes, plates, and rod and wire. The steelmaking operations at the facility ceased in fall 2012, and current plans for the Site include demolition and redevelopment over the next several years. Some portions of the site have already undergone remediation and/or redevelopment.

## 1.2 Former Rod and Wire Mill

The RWM (the Site) is located in the northwestern portion of the Tradepoint Atlantic property, and is the location of the former mills that produced rods and wire products from the 1940's to the early 1980's. **Figure 2** shows the location and boundaries of the RWM.

All manufacturing activities at the RWM ceased operation in the early 1980's, with the subsequent demolition of all structures between 1994 and 2000. Current ground cover includes slag aggregate that was placed in conjunction with the historical demolition program and recent development activities.

Manufacturing activities at the RWM included leaching of zinc ore and a subsequent treatment process to remove cadmium impurities. These activities resulted in zinc and cadmium contaminated soil and groundwater. The leaching process was implemented in large tanks located inside the north end of the former RWM building. In the 1950's through the early 1970's, the acidic leach residue was stored in the Northwest Pond until about 1959 when filters were installed to dewater the residues. Dewatered sludge generated from this process was temporarily stored on the ground outside the north end of the mill in the Former Sludge Bin Storage Area, the location of which is shown on **Figure 2**. Filtrate from the dewatering process was recycled to the wire plating process. Excess filtrate was discharged to the East Pond until 1971, after which it was sent to the Humphrey Creek Wastewater Treatment Plant (HCWWTP) for treatment. These operations ended in the early 1980's when the RWM was shut down.

Historically, as part of a series of site investigations conducted by the then owner, Bethlehem Steel Corporation, there were various Solid Waste Management Units (SWMUs) identified in the vicinity of the Rod and Wire Mill area during the mid-1980s and on through the early 1990s. Specifically, there were 8 SWMUs identified in the Description of Current Conditions Report – Bethlehem Steel Corporation – Sparrows Point report (DCC report), Section 3.3.4, prepared by Rust Environment & Infrastructure:

- SWMU 27: Rod Mill Remediation Area
- SWMU 28: Northwest Pond
- SWMU 29: East Pond
- SWMU 30: Rod Mill Equalization Tanks (2)

SWMU 38: Cadmium Treatment Trenches  
SWMU 39: Rod Mill Scale Pits (2)  
SWMU 44: Rod Mill Cooling Tower  
SWMU 45: Rod Mill Trenches/Sumps

As part of the Phase I Environmental Site Assessment conducted by Weaver Boos Consultants, LLC, in May 2014, the SWMUs were updated from the DCC report; there were six Recognized Environmental Conditions (RECs) identified in the RWM as still requiring further evaluation. The locations of the RECs are shown on **Figure 2** and further described as follows:

New REC	Former SMWU/AOC	Area Name	Explanation
<b>6A</b>	27	Rod Mill Remediation Area	Continuing interim measures (IM) are in place for cadmium/zinc impacted groundwater as per the Consent Decree. During the site visit the existing IM remediation system was observed. Based on this information, the potential for a material release which may impact the environment is present.
<b>6B</b>	28	[Filled] Northwest Pond	Continuing interim measures are in place for cadmium/zinc impacted groundwater as per the Consent Decree. During the site visit the existing IM remediation system was observed. Based on our review of historical source information and experience, the Northwest Pond may have potentially contained hazardous substances and/or petroleum products which may have resulted in a release to the environment.
<b>6C</b>	29	[Filled] East Pond	Continuing interim measures are in place for cadmium/zinc impacted groundwater as per the Consent Decree. During the site visit the existing IM remediation system was observed. Based on this information, the potential for a material release which may impact the environment is present.
<b>6D</b>	45	Rod Mill Trenches/Sumps	The DCC Report recommended further action was needed for this item which were identified as piping designed to transport process wastewater. Based on our review of historical source information and experience, the trenches/sumps may have potentially contained hazardous substances and/or petroleum products which may have resulted in a release to the environment.
<b>6E</b>	X	Unknown Aboveground Tank	The DCC Report recommended further action was needed for this item. Based on our review of historical source information and experience, the tank may have contained hazardous substances and/or petroleum products which may have resulted in a release to the environment.

General layout of the industrial buildings formerly located at the Site are shown on **Figure 3**.

### 1.3 RWM Interim Measures

In 1986, a soil and groundwater remediation program was initiated to address groundwater that exhibited elevated concentrations of cadmium and residual soil contamination within the Sludge Bin Storage Area. Remediation initially consisted of a soil flushing program with associated pumping and treatment of groundwater from shallow and intermediate wells.



This pump and treat system was reconfigured in 2001 to provide groundwater recovery from two intermediate zone recovery wells (RW10-PZM020 and RW15-PZM020) that operated at a rate of between 5 and 12 gallons per minute (gpm). Recovered groundwater was transported via a pipeline to the HCWWTP for subsequent treatment and discharge in accordance with the National Pollutant Discharge Elimination System (NPDES) permit requirements for the Facility. The pump and treat system remained active until September 2016.

The current remedial approach utilizes in-situ treatment trenches designed to reduce dissolved metal concentrations in the intermediate zone within the identified source areas. Specifically, alkaline reagents (TerrabondMG – 40% by weight in conjunction with limestone aggregate – 60% by weight) were added into the intermediate groundwater zone as permeable reactive barrier trenches designed to intercept groundwater flowing to the west from select high concentration areas. The design and oversight of this remedial technique was completed by Advanced GeoServices (AGS) and is discussed in greater detail in the AGS Work Plan, Interim Measure Work Plan In-Situ Groundwater Treatment dated August 22, 2016. The design of this IM was to treat the concentrations of cadmium and zinc in the intermediate groundwater in the vicinity of the source areas in the Former East Pond and Sludge Bin Storage Areas, where most of the total remaining subsurface contaminant mass (solid and dissolved) is concentrated. The trenches are located to mitigate the releases from the source areas and contamination outside the trench area would attenuate over time after the mass loading from the source areas was addressed.

The treatment trenches were installed as staggered permeable “charges” of alkaline material placed directly in the aquifer (as an alternative to injection) to gradually distribute alkalinity into the intermediate zone groundwater to offset the acidity from other sources. The trenches were backfilled with reagent mix from a depth of 35 feet below ground surface (bgs) up to a depth approximately 12 feet bgs. Because of the “charge” design, groundwater does not have to pass through the trenches for the treatment to be effective. Spaces were left between each trench section to allow for transmission of groundwater through each area. The gaps between trench sections should allow for funneled flow in the event of potential mounding. Outward gradients and diffusion from the trenches distribute the alkalinity into the intermediate zone beyond the physical limits of each trench to raise the pH and immobilize dissolved metals even where flow may be through the space between trenches, around the ends of, or under the trenches. The construction of the trenches was completed in January 2017.

The soils and groundwater beneath the Former Sludge Bin Storage area contained the highest concentrations of cadmium in the RWM. A 130-foot by 130-foot section of this area was excavated to reduce the mass of cadmium in soil in this area. Approximately 1,252 cubic yards of soil was excavated from the top 2 feet of this area and disposed of off-site. TerrabondMG powder was then mixed into the soil from a depth of 2 feet to 7 feet bgs. After the soil was mixed with the TerrabondMG, the cadmium hot spot was capped with a 12-inch layer of the smaller gradation of steel mill slag.



Since the completion of the soil stabilization and trench installation, groundwater monitoring (which was conducted monthly through 2017 and quarterly in 2018) has been performed at upgradient, performance and perimeter wells to assess effectiveness. Interim Measures Progress Reports have been submitted to the EPA and MDE on a semi-annual basis. These progress reports summarize the results of the quarterly monitoring events.

The interim groundwater treatment goals are to increase the pH to precipitate the dissolved metals and achieve a reduction in dissolved concentrations of cadmium and zinc within the source areas when compared to pretreatment conditions. Ultimately the treatment goal will be to demonstrate that the concentration of the primary contaminants (cadmium and zinc) in groundwater discharging at the shoreline/property boundary are acceptable.

## 2.0 SITE INVESTIGATION ACTIVITIES

Information regarding the project organization, field activities (including installation, development and sampling), field equipment, sample handling and management procedures, the selected laboratory and analytical methods, quality control and quality assurance procedures, investigation-derived waste (IDW) management methods, and reporting requirements are described in detail in the approved RWM Interim Measure Supplemental Investigation Work Plan, Revision 1 dated March 7, 2019. All methods and protocols for this investigation followed the procedures outlined in the Quality Assurance Project Plan (QAPP) dated April 5, 2016, which was approved by the agencies to support the investigation and remediation of the Tradepoint Atlantic property.

### 2.1 Groundwater Investigation

#### 2.1.1 Well Installation

During this supplemental investigation, a total of 20 shallow zone and 22 intermediate zone temporary groundwater sample collection points (piezometers) were installed in accordance with the procedures referenced in the QAPP Worksheet 21 – Field SOPs, SOP No. 13 – Drilling and SOP No. 28 – Direct Push Installation and Construction of Temporary Groundwater Sample Collection Points (Rev. 01). The new temporary piezometers were constructed with either stick-up steel protective casing or flush mount surface protection.

The 42 piezometers were installed at the locations shown on **Figure 4**, and the rationale for each specific location is summarized below.

- Improve coverage of sentinel wells along the western property boundary.
- Fill spatial gaps in current coverage.
- Fulfill specific MDE request.
- Investigate conditions in the former northwest pond area.
- Investigate potential flow toward the northeast.
- Investigate upgradient (eastern) conditions.
- Investigate conditions within and immediately downgradient of a remedial trench.
- Install replacements for RW05-MW(I) and RW22-MW(I).

Intermediate monitoring wells RW05-MW(I) and RW22-MW(I) were inspected and developed in December 2018. Observations made during redevelopment of these wells indicated that the bottom five feet of RW05-MW(I) may have collapsed, while RW22-MW(I) had very poor recharge. The conditions in these wells may have resulted in groundwater samples that are not representative of the groundwater conditions in their respective vicinities. Replacements were proposed for these monitoring wells because the structural condition of both was poor and they

could no longer be relied upon to provide for representative groundwater samples.

Additionally, three pairs of monitoring wells were installed to replace historical monitoring wells that were previously abandoned as part of previous development activities. The locations of these wells are shown on **Figure 4**. All new monitoring wells were installed in accordance with the procedures referenced in the QAPP Worksheet 21 – Field SOPs, SOP No. 13 – Drilling and SOP No. 14 – Monitoring Well Construction in Unconsolidated Formations (Rev. 02).

The temporary piezometers and monitoring wells were installed using a Geoprobe<sup>®</sup> direct-push drill rig. Final depths and screen intervals correspond to the current on-site shallow and intermediate zone wells. During installation, each soil core was visually inspected and screened with a hand-held photoionization detector (PID) prior to logging soil types, which were recorded by a geologist in accordance with QAPP Worksheet 21 – Field SOPs, SOP No. 12 – Geologic Logging. Unless otherwise indicated, all Unified Soil Classification System (USCS) group symbols provided on the attached boring logs are from visual observations. Well construction and boring logs are provided in **Appendix A**.

During the performance of field work, it was necessary to shift some proposed well/piezometer locations due to equipment refusal and/or utility conflicts. If the Geoprobe tooling encountered refusal, the rig was shifted a few feet laterally and another attempt was made to install the piezometer or monitoring well. Several attempts were made at the locations of proposed piezometers RWC-MWS, RWC-MWI, and RWP-MWS. Given the multiple refusals that were encountered at depths below 5 feet bgs for RWC-MWS and RWC-MWI, and below 7 feet bgs for RWP-MWS, piezometers were ultimately not installed at any of these three locations.

### 2.1.2 Well Development

The newly installed temporary piezometers and monitoring wells were developed in accordance with QAPP Worksheet 21 – Field SOPs, SOP No. 15 – Well Development. After development, the depth to bottom in each well was recorded to compare to the original drilled depth. Well Development Forms for the historical wells and newly installed monitoring wells have been included in **Appendix B**.

### 2.1.3 Water Level Measurements

The piezometers and monitoring wells used in this investigation were surveyed by a Maryland-licensed surveyor to obtain top of casing (TOC) elevation data. Supporting documentation from the surveys is included as **Appendix C**. A synoptic round of groundwater measurements was collected on May 2, 2019 from each piezometer and monitoring well included in the monitoring network. Surveyed top of casing (TOC) for all applicable locations can be found in **Table 1**, along with the depth to water (DTW) measurements from this date, and the calculated groundwater

elevation. The hydrogeologic zones of each listed well are also indicated.

#### 2.1.4 Groundwater Sampling

Groundwater samples were collected from the new temporary piezometers, new monitoring wells, and the existing monitoring wells in accordance with the procedures referenced in Worksheet 21 – Field SOPs, SOP No. 007 – Low Flow Groundwater Sampling provided in Appendix A of the QAPP. A total of 74 samples were collected for the RWM Interim Measure Supplemental Investigation. Of the 74 total sample collection points that were sampled as part of the study area, 36 were screened in the shallow hydrogeologic zone, 37 were screened in the intermediate hydrogeologic zone, and 1 was screened in the deep hydrogeologic zone. A groundwater sample was also collected from RW21-MW(S), a non-aqueous phase liquid (NAPL) monitoring well installed in the shallow zone. Although this well was originally installed to monitor NAPL thickness, it has had little or no measured NAPL over several of the most recent measurements.

Groundwater samples were collected using laboratory supplied sample containers and preservatives, a peristaltic pump, dedicated polyethylene tubing, a YSI water quality meter with a flow-through cell, and a turbidity meter. The purge logs have been included in **Appendix D**. Calibration of the YSI meter was performed before the start of each day of the sampling event. Appropriate documentation of the YSI meter calibration has also been included in **Appendix D**.

All groundwater samples were analyzed for total and dissolved metals (zinc and cadmium only) via method 6010C, alkalinity via method SM2320, and acidity via method SM2310. Groundwater samples submitted for analysis of dissolved metals were filtered in the field with an in-line 0.45-micron filter. Samples were placed directly into laboratory-supplied preserved sample bottles and placed on ice in coolers to be transported to the laboratory under a completed Chain of Custody.

Sampling of RWA-MWS, RWA-MWI, RWB-MWS, RWB-MWI, RW22R-MWS, and RW22R-MWI for total and dissolved zinc and cadmium was repeated to provide confirmation data for groundwater concentrations identified during the initial sampling event.

#### 2.2 Trench Investigation

Soil borings were completed at the locations shown on **Figure 4** in order to assess conditions of the alkaline charge material in the remediation trenches. The soil borings were installed in accordance with the procedures referenced in the QAPP Worksheet 21 – Field SOPs, SOP No. 09 – subsurface Soil Sampling. The location for RWT-SB was adjusted from the proposed location to avoid several stormwater drainage pipes in the subsurface, based on visual observations of the recovered soil, none of the attempts at the shifted locations were successful in recovering any of the trench material, and therefore no samples were collected.

Composite soil samples of trench material below the water table were collected from boring locations RWJ and RWU, and submitted to the laboratory for analysis for total metals (zinc and cadmium only) via method 6010C, net neutralization potential via method Modified Sobek 3.2, and cation exchange capacity via EPA SW846 method 9081. All down-hole soil sampling equipment was decontaminated after soil sampling had been concluded at a location in accordance with the procedures and methods referenced in the QAPP Worksheet 21 – Field SOPs, SOP No. 016 – Equipment Decontamination.

Composite soil samples of trench material were collected and submitted to JLT Laboratories, Inc. for sieve analysis, hydrometer analysis, and Atterburg Limits with laboratory soil classifications.

Additionally, grab groundwater samples were collected from locations RWJ-SB and RWU-SB utilizing a peristaltic pump and polyethylene tubing. The grab groundwater samples were analyzed for pH, dissolved metals (zinc and cadmium only) via method 6010C, alkalinity via method SM2320, and acidity via method SM2310.

## 2.3 Pore Water Investigation

Pore water sample locations were arranged in eight transects at offshore locations in Bear Creek adjacent to the RWM Area as depicted on **Figure 5**. Six transects south of Interstate 695 have sampling locations at distances approximately 10 feet, 75 feet, and 150 feet from the shoreline. Two transects located north of Interstate 695 had sampling locations at distances approximately 10 feet, 50 feet, and 75 feet from the shoreline, as it was anticipated that sandy substrate did not extend as far from the shoreline in this area as it extended in the area south of the Interstate 695 bridge. Additional pore water samples were collected at locations PW-D02 and PW-DE01 which had previously been sampled in the offshore study conducted for the USEPA (EA, 2016). These samples were collected to determine if pore water concentrations have changed since the previous investigation.

Sampling was attempted at each of the planned pore water sampling locations shown on **Figure 5**. At each location, attempts were made to drive separate push-point samplers to depths of 9-inches and 3 feet below the sediment-water interface. Pore water sampling was not successful at many of the proposed locations because of refusal of the sampler on hard (rocky) substrate, or the presence of low permeability fine-grain sediments at the proposed sample interval which clogged the screen of the sampler. In some cases, the sample was collected from a depth of 2 feet below the sediment-water interface when a sample could not be collected from a depth of 3 feet. **Figure 5** notes the planned locations and relative depths where sampling was unsuccessful, as well as the reason that the pore water sample could not be collected from the sample interval. **Table 2** provides a summary of pore water sampling locations. **Appendix E** provides a photographic summary of common sampling issues that prevented pore water sample collection at various locations.

Where successful, separate push-point samplers were advanced to depths of 9-inches and 3 feet below the sediment-water interface. Each push-point sampler was equipped with a spiked sampling flange to secure the instrument to the sediment floor, gauge the proper depth of the sampler below the sediment surface, and to serve as a surface seal to prevent intrusion of surface water into the sampler. All pore water samples were collected using disposable tubing.

Pore water samples were collected in accordance with the procedures referenced in SOP No. 29 – Pore Water Sampling, and SOP No. 006 – Groundwater Sampling in the approved QAPP (Revision 3). Prior to filling sampling containers with pore water from the push-point sampler, water quality parameters (temperature, pH, dissolved oxygen, conductivity, oxidation-reduction potential) of surface water and of pore water were monitored simultaneously to verify the push-point sampler was sealed and isolated from the surface water. The pore water samples were field filtered, placed directly into laboratory-supplied preserved sample bottles, and placed on ice in coolers to be transported to the laboratory under a completed Chain of Custody.

All pore water samples were analyzed for dissolved zinc and cadmium, hardness, and pH. Analytical methods, sample containers, preservatives, and holding times for the sample analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times.

## **2.4 Surface Water Investigation**

Following receipt of the analytical laboratory data for the pore water samples, the preliminary results were shared with the MDE and the USEPA at a meeting on June 6<sup>th</sup>, 2019. The agencies subsequently requested the collection of supplemental surface water samples from the offshore areas of the RWM.

Seven surface water samples were collected offshore of the RWM at locations that corresponded with pore water sampling locations with elevated analytical data. Surface water samples were collected at a depth of two feet below the water surface. In some sampling locations, the total depth below the water surface was three feet. At these locations, surface water samples were collected at a depth of 1.5 feet below the water surface to prevent entrainment of particles from the bottom-water interface. All surface water samples were collected in accordance with the procedures referenced in SOP No. 4 – Surface Water Sampling. Samples were analyzed for dissolved zinc and total hardness.

## **2.5 Laboratory Analysis**

Samples were sent by courier to Pace Analytical Services, Inc. (PACE). of Greensburg, Pennsylvania to perform the laboratory analysis. Analytical methods, sample containers, preservatives, and holding times for the sample analyses are listed in the QAPP Worksheet 19 & 30 – Sample Containers, Preservation, and Holding Times. Quantitation limits and project action limits for cadmium and zinc analyses are provided in QAPP Worksheet 15 – Project Action

Limits and Laboratory-Specific Detection/Quantitation Limits. All PACE laboratory reports are included as an electronic attachment. Laboratory reports from JLT Laboratories, Inc. containing the geotechnical results for trench soil samples are also included as an electronic attachment.

## 2.6 Quality Assurance and Quality Control Samples

Quality control (QC) samples for the entire field effort are collected during field studies for various purposes, among which are to isolate site effects (control samples), to define background conditions (background sample), and to evaluate field/laboratory variability (spikes and blanks, duplicates, etc.).

The following QC samples were submitted for analysis to support the data validation:

- Blind Field Duplicate – at a rate of one duplicate per twenty samples
- Matrix Spike/Matrix Spike Duplicate – at a rate of one per twenty samples
- Field Blank – at a rate of one per twenty samples

The QC samples were collected and analyzed in accordance with the QAPP Worksheet 12 – Measurement Performance Criteria, QAPP Worksheet 20 – Field Quality Control and QAPP Worksheet 28 – Analytical Quality Control and Corrective Action. A summary of QA/QC samples collected is included in **Appendix F**.



### 3.0 ANALYTICAL RESULTS

#### 3.1 Shallow Groundwater

**Figure 6** maps the distribution of zinc concentrations in the shallow zone of the RWM. The highest measured concentration was at RWN-MWS (978,000 micrograms per liter, or  $\mu\text{g/L}$ ). This well is located upgradient of the western-most remediation trench in the historical sludge bin storage source area. Zinc was also measured in relatively high concentrations north of the remediation trenches as shown in well RW21-MWS (282,000  $\mu\text{g/L}$ ).

Cadmium concentrations in the shallow zone are shown on **Figure 7**. RWN-MWS had the highest detected concentration of cadmium at 13,000  $\mu\text{g/L}$ . No elevated cadmium concentrations were identified downgradient of the western-most remediation trench in the shallow zone. North of the trenches, cadmium was elevated ( $>100 \text{ ug/L}$ ) in RW21-MWS and RWI-MWS in the former Northwest Pond source area, and in RW22R-MWS.

Shallow zone acidity and alkalinity values, plotted spatially on **Figure 8**, show some variability. Acidity values were below the detection limit for over half of the sampled wells. The highest acidity measurement occurred at RWN-MWS (1,480 milligrams per liter, or  $\text{mg/L}$ ). The highest acidity measurement downgradient of the permeable reactive barrier trenches is RW22R-MWS, at 366  $\text{mg/L}$ . Alkalinity values do not appear to have a spatial trend, but 12 of the well samples had values that exceeded 100  $\text{mg/L}$ .

Measurements of pH in the shallow groundwater zone, shown on **Figure 9**, ranged from 4.85 to 12.16. Values of pH were generally higher in wells near the shoreline and closest to the remediation trenches. The two highest pH values, RWJ-MWS and RW24-MWS (12.09 and 12.16 respectively), were the two locations closest to a remediation trench. Additionally, RW18-MW(S) had a relatively high pH and is located downgradient of a trench. The lowest measured pH value (4.85) was at RWR-MWS, located upgradient of the trenches.

Eh is a hydrologic parameter that reflects the oxidation-reduction potential (ORP) of a water sample. In conjunction with pH, temperature, pressure, and parameter concentration, Eh determines the thermodynamic stability of a particular chemical species within an aqueous solution. Positive values indicate more oxidizing conditions and negative values indicate more reducing conditions. Eh was calculated based on field-measured ORP and water temperature values. Values for Eh in the shallow zone ranged between -106 and 377 millivolts (mV). **Figure 10** shows that, while there is some spatial variability, most shallow groundwater wells produced oxidizing water samples. Some exceptions to this trend are observed at wells RWG-MWS, located at the furthest southwest extent of the survey area, in addition to wells RWH-MWS and RW16-MW(S), located to the north of the remediation trenches. These samples are only slightly reducing. The most negative calculated Eh value was that from well RWJ-MWS, which is located closest to



the western-most remediation trench. However, as distance from the remediation trench increases, so does shallow zone Eh. All groundwater data for shallow zone wells are summarized in **Table 3**.

### 3.2 Intermediate Groundwater

Intermediate groundwater zinc concentrations, mapped spatially on **Figure 11**, generally decrease from east to west across the RWM. Zinc concentration was highest in and around the former East Pond source area, with RW19-MW(I) measuring 7,280,000 µg/L. Zinc concentrations are above 600,000 µg/L in RW21-MWI and RWI-MWI, which indicates that the contaminant distribution in the intermediate zone extends beyond the northern limits of the treatment trenches, and that the former northwest pond source area may have acted as a source of contaminant mass to the intermediate zone groundwater. Based on the low concentration in RW22R-MWI, the relatively high zinc concentration in RWA-MWI appears to be an isolated zone separated from the high concentrations noted around the former northwest pond source area. At RWJ-MWI, zinc concentrations are relatively low (1,580 µg/L) in the groundwater that has passed through the final remediation trench. Concentrations of zinc above 100,000 µg/L extend westward along an axis from RWL-MWI, downgradient of the westernmost treatment trench, to RWE-MWI. The elevated zinc levels in the perimeter wells along the shoreline, are bounded to the south by a low concentration observed in RWG-MWI.

Intermediate zone cadmium concentrations, shown on **Figure 12**, vary significantly across the RWM. The highest cadmium concentration was recorded in RWI-MWI, located to the north of the western-most remediation trench, within the former northwest pond source. There are also relatively high concentrations southwest of the western-most trench at RW23-MWI (2,270 µg/L) and RW05-MWI (2,570 µg/L), with the elevated cadmium occurring generally south of the area. The extent of the elevated cadmium is limited to the south by relatively low concentrations observed in wells RW01-MW(I) and RWG-MWI. As with zinc, the high detection at the northwestern-most corner of the Site at RWA-MWI (6,830 µg/L) appears to be isolated from the known source areas.

**Figure 13** maps acidity and alkalinity trends within the intermediate zone. Acidity values are significantly higher compared with the shallow zone. In general, the acidity greatly exceeds the alkalinity in all of the wells outside the remediation trench area. The highest acidity values are in the wells in and around the former east pond source area, located upgradient of most of the remediation trenches. RW21-MWI and RW09-MWI, located in and around the former northwest pond source area, also have relatively high acidity values (1,980 and 900 mg/L respectively). Notably, the acidity within the former sludge bin storage source area is low. Some wells located near the shoreline, such as RWA-MWI and RWE-MWI have relatively high acidity values (832 and 528 mg/L respectively). Alkalinity values are significantly lower in the intermediate zone than in the shallow zone. The highest measured alkalinity value is at RWI-MWI (184 mg/L), a

well that is located to the north of the remediation trenches. In wells RWJ-MWI, RWK-MWI and RWL-MWI, which are closely spaced and located progressively further from the western-most trench, alkalinity values remain consistently low while acidity values increase from 10 to 452 mg/L.

Measurements of pH within the intermediate zone, as shown on **Figure 14**, are generally less variable in comparison to the shallow zone but exhibit a similar spatial distribution. The two highest pH values (9.88 and 10.25) are located at RW16-MW(I) and RW13-MW(I). Both wells are located downgradient of remediation trenches. The lowest pH value (5.19) was measured at RW1P-MWI, located to the northeast of the remediation trenches, near the former East Pond source area.

Calculated Eh values from intermediate zone well water samples, as shown in **Figure 15**, are spatially variable. Overall, these intermediate-zone Eh values are significantly higher than their shallow zone counterparts, ranging from -76 to 337 mV. A positive Eh value was calculated for well RWG-MWI despite the relatively low value observed in the shallow well. Some of the highest Eh values are located in between the remediation trenches. The only negative Eh value, indicative of reducing conditions, is located at RWJ-MWI. This well follows a similar trend to the shallow zone, with Eh values that increase rapidly with distance from the permeable reactive barrier trench. All groundwater data for intermediate zone wells are summarized in **Table 4**.

### 3.3 Pore Water

**Figure 16** shows the locations and results for the 16 locations where pore water samples were successfully collected. The results are summarized in **Table 5**.

Cadmium results were all low, with the maximum concentration (10.9 µg/L in RW-006-PW-2) only slightly exceeding the National Recommended Water Quality Criteria (NRWQC) of 7.9 µg/L for saltwater chronic aquatic life protection. For zinc, no exceedances of the NRWQC of 81 µg/L for saltwater chronic aquatic life protection were identified in the five transects along the northern portion of the shoreline. Elevated levels of zinc were identified in three locations (RW-006-PW, RW-007-PW, and RW-008-PW) located in the southern portion of the shoreline, in the vicinity of the well RW05 well pair and the newly installed RWE and RWF locations on-shore.

Two pore water samples were collected from locations that had been previously sampled by EA in 2015. EA had previously reported zinc at 22 µg/L in PW-D02. The re-sample (PW-D02-1) confirmed low levels of zinc (2.7 µg/L) at this location. Cadmium was not detected at this location in either sample. At location PW-DE01, EA had reported a cadmium concentration of <10 µg/L and a zinc concentration of 160 µg/L. The re-sample of this location (sample PW-DE01-1) was non-detect for both metals. However, both zinc and cadmium were reported at the 2-foot depth in sample RW-006-PW-2, nearby. A comparison of the results from the 2015 results to the

current results does not indicate any significant change in the pore water levels at these locations.

### 3.4 Surface Water

**Figure 17** shows the locations and results for the seven locations where surface water samples were collected. The results are summarized in **Table 6**. Total hardness was observed between 572,000  $\mu\text{g/L}$  (RW-004-SW-2) and 623,000  $\mu\text{g/L}$  (RW-006-SW-1.5 and RW-022-SW-1.5). Dissolved zinc was observed at concentrations between 7.4  $\mu\text{g/L}$  (RW-006-SW-1.5) and 13.7  $\mu\text{g/L}$  (RW-008-SW-1.5), indicating that dissolved zinc is present at concentrations below the surface water criteria offshore of the RWM.

### 3.5 Trench Material

The remediation trenches were filled with an alkaline charge reagent blend. The reagent blend consisted of ASHTO #57 crushed limestone aggregate (60% by weight) and TerrabondMG powder (40% by weight). Approximately 5,500 cubic yards (CY) of limestone and approximately 3,150 CY of TerrabondMG were used in the construction of the remediation trenches. An additional 625 CY (estimated) was used for restoration of hot spot excavations.

Bulk samples of the trench fill material were collected for geotechnical analysis to assess whether the continued effectiveness of the material since installation and if it is still permeable. Samples were sent to JLT Laboratories, Inc. for grain size analysis to assess permeability. The results indicate that the material consists of over 60% gravel, with the majority of it being fine gravel. Sand and fines represent the remainder of the aggregate, with silt and clay representing 16-17% of the aggregate material in the trench fill. Thus, based on particle size distribution with the bulk of the material being gravel and only a small percentage of the material being silt or smaller, the material is expected to be more permeable than the surrounding soil in the intermediate zone, which is comprised dominantly of interbedded sand and silt.

Three samples of the trench material, composited from multiple depths in the trenches, were collected for analysis for zinc and cadmium to determine if the alkaline charge material appeared to be enriched by metal precipitates. The results from these analyses are presented below:

Boring Location	Sample Interval (feet bgs)	Zinc (mg/kg)	Cadmium (mg/kg)	Neutralization Potential (Ton/1000)	Cation Exchange Capacity (meq/100g)
RWJ-SB	12.5-25.5	184	0.92 J	485	8.4
RWJ-MWI	12.5-35	270	12.8	93.2	1.8 J
RWU-SB	12.8-23	161	0.73 J	744	9.2

The neutralization potential measures the tons of  $\text{CaCO}_3$  equivalent per 1000 tons of reagent material. This ranged from a low of 93.2 to a high of 744, with a mean of approximately 440 tons

CaCO<sub>3</sub> per 1000 tons of reagent. RWJ-MWI did not appear to be fully in the trench, so this value is likely not representative of the reagent material. Thus, it appears that there is an abundance of neutralization capacity remaining in the reagent material after 2 years in place.

The zinc and cadmium were not highly elevated in the samples of the trench material, indicating that the material does not appear to be fouled with metal precipitate.

Wells RWJ-MWI, RWK-MWI and RWL-MWI were placed in close proximity and located progressively further from the western-most trench to assess the near-field effect of the remediation trenches. **Figure 18** shows the locations and spacing of these wells relative to the trench, along with the zinc and cadmium concentrations in the wells. As indicated in the figure, intermediate groundwater upgradient of the trench contains over 100,000 µg/L dissolved zinc. The zinc concentration in the well immediately downgradient of the trench (RWJ-MWI) was 1,580 µg/L. However, as the distance downgradient from the trench increased, the zinc concentration was observed to increase such that the zinc concentration was back over 100,000 µg/L 26 feet from the trench at RWL-MWI. It appears that the permeable reactive barrier treatment technology and the reagent is effective, but that the effect is limited in extent. The limited extent may be related to slow movement of alkalinity through the intermediate groundwater zone, consumption of alkalinity within the zone, or perhaps a combination of factors.

## 4.0 DATA USABILITY ASSESSMENT

All data validation procedures were carried out in accordance with the QAPP Worksheet 34 – Data Verification and Validation Inputs, QAPP Worksheet 35 – Data Verification Procedures and QAPP Worksheet 36 – Data Validation Procedures.

Quality assurance and quality control (QA/QC) samples were collected during field studies to evaluate field/laboratory variability. A summary of QA/QC samples associated with this investigation has been included as **Appendix F**. The following QC samples were submitted for analysis to support the data validation:

- Blind Field Duplicate – at a rate of one duplicate per twenty samples
- Matrix Spike/Matrix Spike Duplicate – at a rate of one per twenty samples
- Field Blank – at a rate of one per twenty samples

Each of these QA/QC samples was analyzed for cadmium (total and dissolved) and zinc (total and dissolved). QA/QC samples associated with the pore water sampling investigation were also analyzed for hardness. The QC samples were collected and analyzed in accordance with the QAPP Worksheet 12 – Measurement Performance Criteria, QAPP Worksheet 20 – Field Quality Control and QAPP Worksheet 28 – Analytical Quality Control and Corrective Action.

### 4.1 Data Verification

A verification review was performed on documentation generated during sample collection and analysis. The verification included a review of field log books, field data sheets, and chain-of-custody (COC) forms to ensure that all planned samples were collected, and to ensure consistency with the field methods and decontamination procedures specified in the QAPP Worksheet 21 – Field SOPs and Appendix A of the QAPP. In addition, calibration logs were reviewed to ensure that field equipment was calibrated and/or checked once per day. The logs have been provided in Appendix D.

The laboratory deliverables were reviewed to ensure that all records specified in the QAPP as well as necessary signatures and dates are present. Sample receipt records were reviewed to ensure that the sample condition upon receipt was noted, and any missing/broken sample containers (if any) were noted and reported according to plan. The data packages were compared to the COCs to verify that results were provided for all collected samples. The data package case narratives were reviewed to ensure that all exceptions (if any) are described.

### 4.2 Data Validation

The complete analytical dataset underwent USEPA Stage 2B data validation for the environmental sample analyses performed by PACE and supporting Level IV Data Package information by

Environmental Data Quality Inc. (EDQI). The full Data Validation Reports (DVRs) provided by EDQI have been included as an electronic attachment.

Sample analyses have undergone an analytical quality assurance review to ensure adherence to the required protocols. The Stage 2B review was performed as outlined in “Guide for Labeling Externally Validated Laboratory Analytical Data for Superfund Use”, EPA-540-R-08-005. Results were validated or qualified according to general guidance provided in “USEPA National Functional Guidelines for Inorganic Superfund Data Review (ISM02.1)”, USEPA October 2013. Region III references this guidance for validation requirements. This document specifies procedures for validating data generated for Contract Laboratory Program (CLP) analyses. The approved QAPP dated April 5, 2016 and the quality control requirements specified in the methods and associated acceptance criteria were also used to evaluate the non-CLP data.

### 4.3 Data Usability

The data were evaluated with respect to the quality control elements of precision, bias, representativeness, comparability, completeness and sensitivity relative to data quality indicators and performance measurement criteria outlined in QAPP Worksheet 12 – Measurement Performance Criteria. The following discussion details deviation from the performance measurement criteria, and the impact on data quality and usability.

The measurement performance criteria of precision and bias were evaluated in the data validation process as described in the DVRs. Where appropriate, potential limitations in the results have been indicated through final data flags. These flags indicate whether particular data points were quantitative estimates, biased high/low, associated with blank contamination, etc. Individual data flags are provided with the results in the detection summary tables and on exceedance figures. A qualifier code glossary is included with each data validation report provided by EDQI. Particular results may have been marked with the “R” flag if the result was deemed to be unreliable and was not included in any further data evaluation. None of the results were flagged with an “R” qualifier during data validation. A discussion of data completeness (the proportion of valid data) is included below.

Representativeness is a measure of how accurately and precisely the data describe the Site conditions. Representativeness of the samples submitted for analysis was ensured by adherence to standard sampling techniques and protocols, as well as appropriate sample preservation prior to analysis. Sampling was conducted in accordance with the QAPP Worksheet 21 – Field SOPs and Appendix A of the QAPP. Specific Field SOPs applicable to the assessment of representativeness include Field SOP Numbers 006, 007, 009, 010, 011, 012, 013, 014, 016, 017, 018, 019, 020, 024, 027, and 029. Review of the field notes and laboratory sample receipt records indicated that collection of groundwater, pore water, and surface water at the Site was representative, with no significant deviations from the SOPs.

Comparability describes the degree of confidence in comparing two sets of data. Comparability is maintained across multiple datasets by the use of consistent sampling and analytical methods across multiple project phases. Comparability of sample results was ensured through the use of approved standard sampling and analysis methods outlined in the QAPP. QA/QC protocols help to maintain the comparability of datasets, and in this case were assessed via blind duplicates, blank samples, and spiked samples, where applicable. No deviations from the QAPP were noted in the data set.

Sensitivity is a determination of whether the analytical methods and quantitation limits will satisfy the requirements of the project. The laboratory reports were reviewed to verify that reporting limits met the quantitation limits for specific analytes provided in QAPP Worksheet #15 – Project Action Limits and Laboratory-Specific Detection/Quantitation Limits. In general, the laboratory reporting limits met the detection and quantitation limits specified in the QAPP.

Completeness is expressed as a ratio of the number of valid data points to the total number of analytical data results. Non-usable (“R” flagged) data results were determined through the data validation process. The approved QAPP specifies that the completeness of data is assessed by professional judgement, but should be greater than or equal to 90%. Data completeness for each compound is summarized in **Appendix G**. All analytes evaluated had a computed completeness ratio of 100%. Based on the completeness evaluation, there were no significant data gaps.



## 5.0 CONCEPTUAL SITE MODEL

The results from this supplemental investigation were evaluated to update the Conceptual Site Model (CSM) for the Rod and Wire Mill Area. The CSM identifies exposure pathways with the potential to link receptors (e.g., humans and wildlife) to elevated chemical constituent concentrations observed in the groundwater and offshore environment and that therefore require assessment.

The CSM identifies:

- the potential sources and release mechanisms for chemicals with elevated concentrations
- the fate and transport of these chemicals
- the media of concern
- potential pathways for human and ecological receptors and where there is no complete pathway
- potential human populations and wildlife receptors that could be exposed.

### 5.1 Site Geology

In general, the subsurface geology at the RWM includes slag fill overlying natural soils, which include fine-grained sediments (clays and silts) and coarse-grained sediments (sands). At most of the Site, the slag fill is directly underlain by a layer of silts/clays, and below this is a layer of coarse-grained sand. Subsequent layers moving downward generally consist of alternating silt/clay layers and sand layers.

Cross-sections were developed from the site boring logs to illustrate the site-specific lithologies. **Figure 19** shows the locations of the cross-sections. Cross-section A-A' (**Figure 20**) depicts the subsurface along the western boundary of the Site from north to south. Cross sections B-B' (**Figure 21**), C-C' (**Figure 22**), and D-D' (**Figure 23**) depict the subsurface in the northern, southern, and central portions of the Site, respectively, from west to east. Cross-section D-D' shows the locations and construction of four of the existing treatment trenches. Cross-section C-C' also shows the locations and construction of two of the existing treatment trenches. Cross-sections E-E' (**Figure 24**) and F-F' (**Figure 25**) depict the subsurface from north to south along the central and eastern boundaries of the Site, respectively.

### 5.2 Site Hydrogeology

Groundwater occurrence at the Site has been segregated into three zones identified as the shallow, intermediate and deep hydrogeologic zones. The Site-Wide Investigation Groundwater Study Report (SWI) completed by CH2M-Hill in 2001 incorporated a detailed, three-dimensional, hydrogeologic model that enumerated the alternating subsurface sediment layers at



the Site as Clay 1, Sand 1, Clay 2, Sand 2, and so on. This naming system is particularly convenient for discussing the hydrogeology at the Site. At most of the Site, the shallow zone is considered to be the groundwater found in the surficial slag unit and/or the uppermost sand unit (Sand 1). In some areas of the Site, a silt/clay layer (Clay 1) lies directly underneath the surficial slag unit. In other areas of the Site, the Clay 1 unit is not found directly beneath the slag fill, and the slag fill is directly underlain by and connected to the Sand 1 unit. In these areas, the slag fill and Sand 1 form a single groundwater flow system. The screens of shallow zone wells are installed within the surficial slag layer or Sand 1. Examples of the uppermost three lithologic units at the Site (Slag, Clay 1, Sand 1) can be seen on all cross sections (**Figures 20-25**).

Beneath Sand 1 lies another silt/clay layer (Clay 2), followed by another sand layer (Sand 2). Sand 2 can be seen on all three cross sections. The intermediate zone is considered to be the groundwater found in Sand 2, with screens of most intermediate zone wells being installed within this sand unit.

Beneath Sand 2 lies yet another silt/clay layer (Clay 3), followed by another sand layer (Sand 3). The lower (or deep) hydrogeologic zone is considered to be the groundwater found in Sand 3. The deep zone was not a focus in this groundwater investigation.

The cross sections indicate the screened intervals of the wells or well pairs in the shallow and intermediate flow zones. The water levels in the shallow and intermediate zones are also indicated on the cross sections. The water levels indicate a downward vertical gradient over most of the site, although the gradient reverses to a slight upward gradient near the shoreline in cross section C-C' in the vicinity of RW05R-MWI, and on the southern end of cross section A-A'.

### 5.3 Groundwater Flow

A synoptic round of groundwater level measurements was collected on May 2, 2019. Based on the field measurements, groundwater potentiometric surface maps were constructed for the shallow and intermediate hydrogeologic zones. Potentiometric maps for the shallow and intermediate zones have been included on **Figure 26** and **Figure 27**, respectively.

In the shallow zone, the predominant flow directions are to the west, northwest and southwest. In the northern portion of the Site, groundwater flow is to the north near the former northwest pond. Groundwater also flows north near RWM-MWS. Groundwater flows to the south near RWR-MWS and near RW11-MWS. Groundwater flows radially from a small mound centered on RW23-MWS. In the intermediate zone, the potentiometric surface is nearly flat, with extremely little variation (less than a half foot of difference) amongst most calculated groundwater elevations across the Site.

The hydraulic gradient for each groundwater zone was estimated using the water level data for the upgradient well pairs (RWQ & RWS) and the downgradient shoreline well pairs (RWA, RWB,

RWD, & RWE). The distance between the upgradient and shoreline wells is approximately 1,100 ft. For the shallow zone, upgradient wells (RWQ & RWS) had an average water level of 6.06 feet (ft) above mean sea level (amsl). Shoreline wells (RWA, RWB, RWD, & RWE) had an average water level of 1.46 ft amsl. The hydraulic gradient in the shallow zone is a difference of 4.60 ft over the 1,100 ft distance, or a gradient of 0.004 ft/ft. For the intermediate zone, upgradient wells (RWQ & RWS) had an average water level of 1.26 ft amsl. Shoreline wells (RWA, RWB, RWD, & RWE) had an average water level of 0.94 amsl. The hydraulic gradient in the intermediate zone is a difference of 0.32 ft over the 1,100 ft distance, or a gradient of 0.0003 ft/ft.

Hydraulic conductivity values determined in previous modeling studies (CH2M Hill, 2001) were used to estimate the groundwater velocities. The equation for groundwater velocity is:

$$V = \frac{Ki}{n}$$

where  $V$ =groundwater velocity,  $K$ =hydraulic conductivity,  $i$ =hydraulic gradient, and  $n$ =porosity. A porosity of 0.36 can be used for both hydrogeologic units based on the findings in the “Pre-Design Investigation Rod and Wire Mill Area Characterization Report” (ARM, 2016). Slug tests documented in the PDI produced an average value for  $K$  in the shallow zone of 8.33 feet per day, and an average value for  $K$  in the intermediate zone of 16.24 feet per day. These values yield:

$$V_{\text{shallow}} = \frac{Ki}{n} = \frac{8.33 \times 0.004}{0.36} = 0.093 \text{ ft/day or } 33.8 \text{ ft/year}$$

$$V_{\text{intermediate}} = \frac{Ki}{n} = \frac{16.24 \times 0.0003}{0.36} = 0.0135 \frac{\text{ft}}{\text{day}} \text{ or } 4.94 \text{ ft/year}$$

There is a downward vertical hydraulic gradient inland at the upgradient well pairs of an average of 4.8 feet (6.06 ft – 1.26 ft). At the shoreline well pairs, there is an average downward gradient of 0.52 feet (1.46 ft – 0.94 ft). The vertical gradient decreases to the south along the shoreline, and reverses to a slight upward vertical gradient in the southernmost well pairs (RWF, RW01, and RWG), indicating that this area is likely serving as or close to a discharge area for the intermediate zone groundwater.

A cluster of well pairs (RWJ, RWK, and RWL) was placed close to the westernmost treatment trench. The water level in the shallow well RWJ-MWS placed in the treatment trench, is slightly lower than in the surrounding shallow wells. The water level in intermediate zone well RWJ-MWI in the trench is about 1 ft higher than in the surrounding intermediate zone wells. This indicates that shallow groundwater may be migrating downward to the intermediate zone through the permeable trenches. Increased head in the trench helps to increase the “injection” and spread of alkaline materials into the aquifer. The observed groundwater gradient away from the trench in the intermediate zone indicates that treated water is being effectively distributed and that the adjusted pH is migrating properly. Outward gradients from the trenches will distribute the

alkalinity dissolved into the water moving through the trenches out into the intermediate zone beyond the physical limits of the trenches to raise the pH and immobilize dissolved metals in any groundwater flowing through gaps between trenches or around the ends of the trenches.

## 5.4 Contaminant Source Areas

Previous studies identified elevated concentrations of zinc and cadmium in the soil in the former East Pond and Sludge Bin Storage areas as the source of the contaminants of concern, zinc and cadmium, in the groundwater, and previous interim measures were designed to address these source areas.

**Appendix H** provides figures extracted from the Report of 1997 Remediation and Monitoring Activities (Bethlehem Steel, 1998). These figures show the reported cadmium concentrations identified in the initial investigations in 1987. As indicated in the figures from that previous report, cadmium concentrations in the intermediate zone in excess of 10 milligrams per liter (mg/L) (or 10,000 micrograms per liter,  $\mu\text{g/L}$ ) were shown to extend west almost to Riverside Drive in 1987. Zinc concentrations were not available for 1987 but are provided in a table for 1997, and the 1997 values have been indicated in red (in  $\mu\text{g/L}$ ) on the well location map from the 1997 report. At that time, the concentration of zinc in the wells closest to Riverside Drive ranged from 5.2 mg/L (5,200  $\mu\text{g/L}$ ) to 360 mg/L (360,000  $\mu\text{g/L}$ ). The 1997 concentrations of zinc in the northernmost wells ranged from 320,000  $\mu\text{g/L}$  to 2,300,000  $\mu\text{g/L}$ .

The supplemental investigation results confirm the former East Pond to be the primary source of zinc in the intermediate groundwater zone. The highest zinc concentration in the shallow zone was located in the former Sludge Bin Storage area. Elevated concentrations of zinc were also identified in the vicinity of the former Northwest Pond. However, the concentrations in this area were an order of magnitude lower than observed in the intermediate zone in the former East Pond area. The maximum cadmium concentration on the Site was observed in the shallow zone in the former Sludge Bin Storage area, with no significant detections occurring in the shallow zone outside the former Sludge Bin Storage area. Elevated cadmium concentrations were notably absent in the intermediate zone in the Sludge Bin Storage area, within the area of the treatment trenches, but were detected in several areas of the Site. Based on the historical cadmium distribution shown in Appendix H, and the remaining high concentration of cadmium in the shallow zone in RWN-MWS, it is likely that the Sludge Bin Storage area was the primary original source of cadmium in the intermediate zone and the widespread elevated levels of cadmium are residual levels associated with historic releases from the Sludge Bin Storage area.

## 5.5 Migration Pathways and Contaminant Distribution

The Interim Measure Work Plan – In-Situ Groundwater Treatment (Advanced GeoServices Corp., August 2016) presented a CSM that focused on a source of acidity to the local groundwater that lowered pH and increased the solubility of cadmium and zinc and mobilized these metals creating the groundwater zone containing these metals. The acidity is neutralized by alkaline slag in the shallow groundwater zone; however, slag is not present and neutralization does not occur in the intermediate zone aquifer where the elevated zinc and cadmium is observed in groundwater. Therefore, the IM design was based on reactive trenches to treat contaminant migration in the intermediate zone from known source areas so that the concentrations of contaminants downgradient from the trench area attenuate over time after the mass loading from possible source areas was reduced.

**Figure 28 through 31** present extended zinc and cadmium distributions for the shallow and intermediate zones, utilizing additional data from surrounding wells obtained from previous investigations. Elevated zinc and cadmium concentrations are present downgradient of the trench area. **Figure 28** shows that, while zinc is detected in several of the shallow wells outside the interim measure area, the elevated zinc distribution zone is delineated to the northern portion of the former rod and wire mill footprint. Similarly, **Figure 29** shows that there were no elevated levels of cadmium detected in the shallow zone outside the interim measure area.

**Figure 30** shows the interpolated extent of the zinc distribution in the intermediate zone. **Figure 30** incorporates data from intermediate zone wells sampled during previous investigations in surrounding areas and provided data points where zinc concentrations are low. Well GL-12(-17) to the north, well SW-082-MWI to the east and well HI02-PZM032 to the south are below the NRWQC of 81 ug/L and provide outer limits on the zone in these directions. These points allow the interpolation of the extent of the zone that may exceed the NRWQC, as shown in **Figure 30**. The interpolated extent of the zone shown in **Figure 30** likely overstates the actual zone size to the north and south since there was no zinc detected in the nearest wells in these directions. The gradient in the intermediate zone is relatively flat, but the water levels in the eastern portion of the Site are slightly higher than the water levels along Bear Creek, indicating a general westerly flow direction toward the creek. If high concentrations of dissolved zinc actually did extend as far to the north or south as is indicated in **Figure 30**, it would be expected that zinc impacts would be observed downgradient (i.e., west) of the northern and southern extents shown on **Figure 30**. However, there were no detections of zinc in pore water samples north of the Key bridge west of the northern extent, and the shoreline wells to the southwest indicate that the zone does not extend as far south as RWG-MWI. Similarly, **Figure 31** shows the interpolated limits of the cadmium distribution in the intermediate zone, but likely overstates the lateral extent.

The vertical distribution of contaminants is shown on the geologic cross-sections depicted in **Figures 20 – 25**. The cross-section locations are indicated on Figure 19. The deepest well installed in this area is RW06R-MWD, shown on cross-section D-D' (**Figure 23**), with a screened interval from elevation of approximately -40 to -50 feet (lower zone). This downgradient lower zone well had no cadmium detected and only 24.3 µg/L of zinc, while elevated levels of zinc and cadmium were detected in the paired intermediate zone well RW06R-MWI, screened from -18 to -28 feet. This well pair serves to define the lower limit of the groundwater impact downgradient of the source areas. As indicated on cross-section C-C' (**Figure 22**), the trenches were installed to an elevation of approximately -24 feet. Well RWS-MWI in this section shows that elevated zinc could extend below the bottom depth of the trenches; however, as discussed previously, the groundwater does not need to flow through the trench to be treated. Due to the vertical gradients, the alkaline reagent would be distributed downward from the trench as well as outward with the groundwater flow.

## 5.6 Potential Exposure Pathways

An exposure pathway describes the mechanism by which a potential receptor contacts chemicals present in the area. A complete exposure pathway requires the following four components:

- a source and mechanism of chemical release to the environment
- an environmental transport medium for the released chemical
- a point of potential contact with medium containing chemicals
- an exposure route (e.g., ingestion or dermal absorption) at the point of exposure.

All four components must exist for an exposure pathway to be complete and for exposure to occur. Where a pathway is incomplete, no exposure can occur and thus the condition poses no risk to a receptor.

The Site is currently developed for industrial use. The area is provided with municipal potable water and a groundwater use restriction will be imposed. Therefore, an industrial worker would not be exposed to the groundwater. Since the constituents of concern are zinc and cadmium, volatilization from the groundwater is not a viable transport mechanism of concern.

The groundwater ultimately discharges to Bear Creek. EA reported in their 2016 report that Bear Creek adjacent to the Sparrows Point facility, is a low frequency use recreational area overall. Other areas that present a more attractive area for recreational use are present in close proximity but not adjacent to the Sparrows Point peninsula. The shoreline is largely covered by slag, rock, and *Phragmites*, making the shoreline generally unattractive for use and difficult to access on foot. Access by boat is also made more difficult by shallow water and a lack of boat ramps or docking facilities. It is therefore expected that people will visit the shoreline infrequently and for short periods of time. Fishing from shore was observed in the far northern portion of the TPA site

shoreline, where nearby road access and near-shore deep water are present. Additionally, the offshore environments are not controlled, and access to these areas is not limited. The land across Bear Creek north of the Key Bridge consists of residential properties, most with private boat piers, and with a number of attractive shoreline parks. This shoreline opposite from the TPA site is used for boating, swimming, and fishing. Recreational boat traffic in the channel that runs offshore is also common. Bottom trawling from vessels in the channel was reported by EA. Based on the observed and potential human uses, two populations were identified as potential receptors: recreational users and commercial watermen. White perch, Atlantic silversides, blue crabs, and other fish species were found in fish surveys completed adjacent to the Sparrows Point Peninsula (EA 2016).

Therefore, the exposure pathways of concern are potential recreational and commercial human exposure and aquatic wildlife exposure to surface water and sediment. This supplemental investigation included the collection of surface water and sediment pore water samples to assess these potential exposures. **Figure 32** is a conceptual cross-section showing the potential migration pathways, sample locations, and the relationship between the shallow and intermediate groundwater zones and the offshore environment.

There were no exceedances of the chronic NRWQC for zinc in the surface water samples collected offshore. Therefore, surface water is not considered a medium of concern.

Pore water samples show no exceedances of the chronic aquatic life NRWQC for cadmium in the upper 1 ft samples, and only one slight exceedance (10.9 µg/L) was identified in any of the pore water samples (in a 2-foot depth sample). Therefore, cadmium is not a constituent of concern in the offshore environment and the discharge to Bear Creek of cadmium in groundwater is not a pathway of concern. There were no exceedances of the chronic aquatic life NRWQC for zinc in pore water in the northern portion of the site. Therefore, the discharge to Bear Creek of zinc in groundwater is not a concern in the northern portion of the Site.

Exceedances for zinc in pore water were limited to three sample locations in the southern portion of the shoreline. The observed pore water zinc concentrations are similar to or higher than the perimeter well groundwater concentrations. As such, lines of evidence are present that continued groundwater discharges will not exacerbate the identified pore water impacts. The highest concentration of zinc in the pore water samples (122,000 µg/L in RW-007-PW-3) is slightly higher than the zinc concentration in RWE-MWI (112,000 µg/L) and is approximately twice the concentrations present in RW05R-MWI or RWF-MWI. Levels of zinc were higher in the shallow zone in this area relative to most of the site, however the highest level (39,100 µg/L in RWF-MWS) was just a third of the maximum pore water concentration. Increases in groundwater concentrations in perimeter wells in this area have been noted since 2017. However, based on the groundwater velocity estimates of 5 feet/year or less for the intermediate zone, it is not feasible that pore water impacts observed at a distance of up to 300 feet offshore could have migrated from



areas of on-shore groundwater impact over a two-year period. In addition, since the zinc concentrations in the perimeter wells are no higher than the existing concentrations in the pore water, continued migration is not expected to result in increases in the current offshore pore water concentrations. It is likely that these pore water concentrations represent historical offshore impacts.

Previous offshore studies conducted in the surface water bodies surrounding the Sparrows Point peninsula collected zinc concentrations from surficial sediment samples. The Phase I Offshore Investigation Report (EA Engineering, Science and Technology, Inc., 2016) presents zinc concentrations from a number of sediment samples collected in Bear Creek. The Final Trip Report – Sparrows Point Southeast Area Sediment Assessment Second Round of Sample Collection (Weston Solutions, Inc., 2018) presents zinc concentrations from a number of sediment samples collected in Jones Creek, Old Road Bay, and the Patapsco River. Select figures from these two reports showing zinc concentrations in sediment samples have been included as **Appendix I**. The results from both of these reports show that zinc is detected at a majority of locations at concentrations greater than 1,000 milligrams per kilogram (mg/kg). Measurements near the center of Bear Creek range from 2,000-4,200 mg/kg. The levels found in samples collected directly offshore of the RWM represent some of the lowest concentrations of zinc (290-670 mg/kg) observed around the peninsula. This strongly indicates that the presence of zinc in pore water offshore of the RWM is from historical sources that affected the broader area surrounding the whole Sparrows Point peninsula as opposed to current groundwater discharges from the RWM.

## 6.0 FINDINGS

This supplemental investigation has adequately defined the nature and extent of constituents in groundwater and within potential offshore areas associated with the RWM to facilitate a Corrective Measures Study (CMS). The purpose of the CMS will be to develop and evaluate the corrective action alternative(s) and to recommend additional corrective measures as necessary to supplement the currently implemented remedies in order to meet corrective action objectives.

The groundwater impacts at the perimeter of the RWM interim measure area were found to be more extensive than indicated by previous investigations, extending outside the suspected source areas that were targeted by the permeable reactive treatment trench interim measure that was implemented in 2017.

The trench investigation indicates that the permeable reactive wall treatment technology and the reagent is effective for containing the migration of contaminants from the specific source areas that were the focus of the pre-design investigation (the former sludge bin storage area and former east pond). The effectiveness of the IM downgradient of the trench areas is still yet to be defined for significant distances predominantly based on the slow movement of groundwater. Groundwater concentrations in the newly installed shoreline groundwater sampling points confirmed the presence of elevated levels of dissolved zinc and, to a lesser extent, cadmium. Due to the slow groundwater velocity and limitations on the quantity of soluble alkalinity that can migrate from the trenches, the existing interim measure is unlikely to reduce concentrations in the area downgradient of the trenches in the near term.

. As noted, the intent was that the IM trenches would mitigate any releases from the source areas and the contaminants in the zones outside the trench area would attenuate over time after the source mass loading was reduced. In the design of the treatment trench approach, the groundwater velocities were expected to be slow, in the range of 5 to 10 feet per year. Paving in the area has reduced aquifer recharge from precipitation, causing further reduction of groundwater velocity. Therefore, the elevated levels identified in some of the new downgradient wells would not be expected to be the result of increased migration from the upgradient source areas. Rather, the reduction in aquifer recharge allows for greater equilibration between the groundwater and residual contamination already present in the aquifer matrix downgradient of the trenches due to reduced groundwater velocity and greater contact time. .

In surface water samples collected for this investigation, concentrations of zinc were 13.7 µg/L or less, well below the chronic NRWQC (81 µg/L). Therefore, surface water is not considered a medium of concern. Pore water sample results show that the groundwater has not adversely impacted pore water over most of the shoreline. Exceedances of the NRWQC for zinc in pore water were limited to three sample locations in the southern portion of the shoreline. The observed pore water concentrations are similar to or higher than the perimeter well groundwater



concentrations, such that any groundwater discharges would not exacerbate the identified current pore water levels. Furthermore, results from sediment samples in previous studies indicate that zinc found offshore of the RWM is much more likely to have resulted from historical sources that affected the broader area surrounding the whole Sparrows Point peninsula as opposed to current groundwater discharges from the RWM.

This investigation has identified elevated intermediate zone groundwater concentrations in some areas outside the effective treatment zone of the current interim measure that require further evaluation in the Corrective Measures Study. Modifications to, or alternatives to the existing interim measure, will be evaluated in the proposed Corrective Measures Study to determine the appropriate final corrective action.

## 7.0 REFERENCES

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## FIGURES

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Property Boundary

Rod & Wire Mill (RWM)

Trade Point Atlantic  
Location Map  
June 06, 2019

Figure  
1



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Engineers and Scientists

0 500 1,000 2,000  
Feet

TradePoint Atlantic  
Baltimore County, MD  
EnviroAnalytics Group

ARM Project No. 190288M  
& No. 19034FM





Original Interim Measure Area Boundary  
 Permeable Reactive Barrier Trench  
 Historical Source Area  
 Parcel Boundary

ID	SWMU/AOC	Finding	REC	Description
1	27	131	REC-6A	Remediation Area
2	28	132	REC-6B	Northwest Pond
3	29	133	REC-6C	East Pond
4	30	134	Non-REC	Equalization Tanks
5	38	142	Non-REC	Cadmium Treatment Trenches
6	39	143	Non-REC	Scale Pit
7	39/44	143/148	Non-REC	Scale Pit/Cooling Tower
8	45	149	REC-6D	Site-Wide Trenches/Sumps
9	X	160	REC-6E	Unknown Aboveground Tank

**Rod & Wire Mill**  
**Interim Measures Location**  
**with RECs & SWMUs**

**Figure**  
**2**

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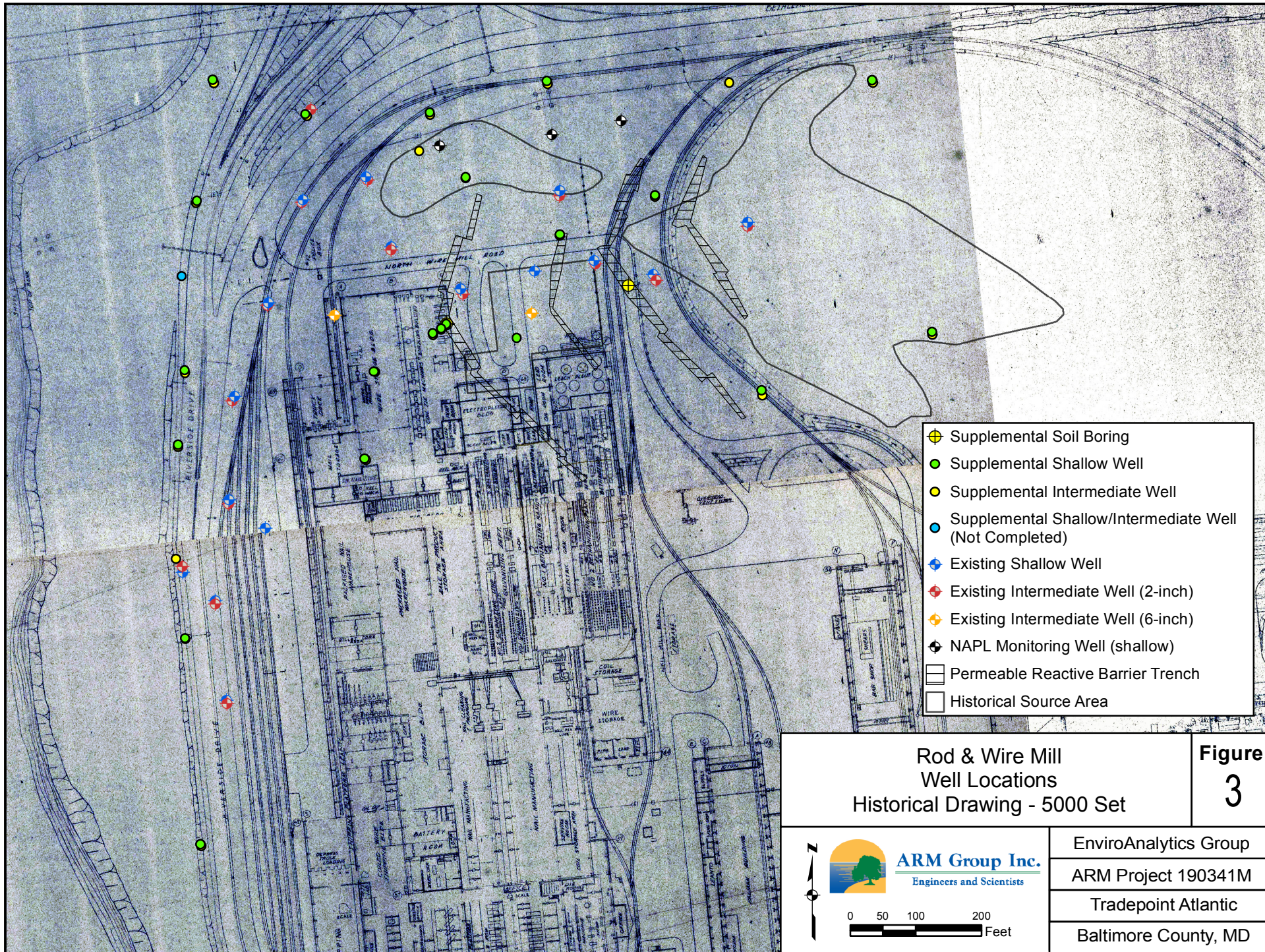
EnviroAnalytics Group

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Tradepoint Atlantic

Baltimore County, MD





Rod & Wire Mill  
Well Locations  
Historical Drawing - 5000 Set

**Figure**  
**3**



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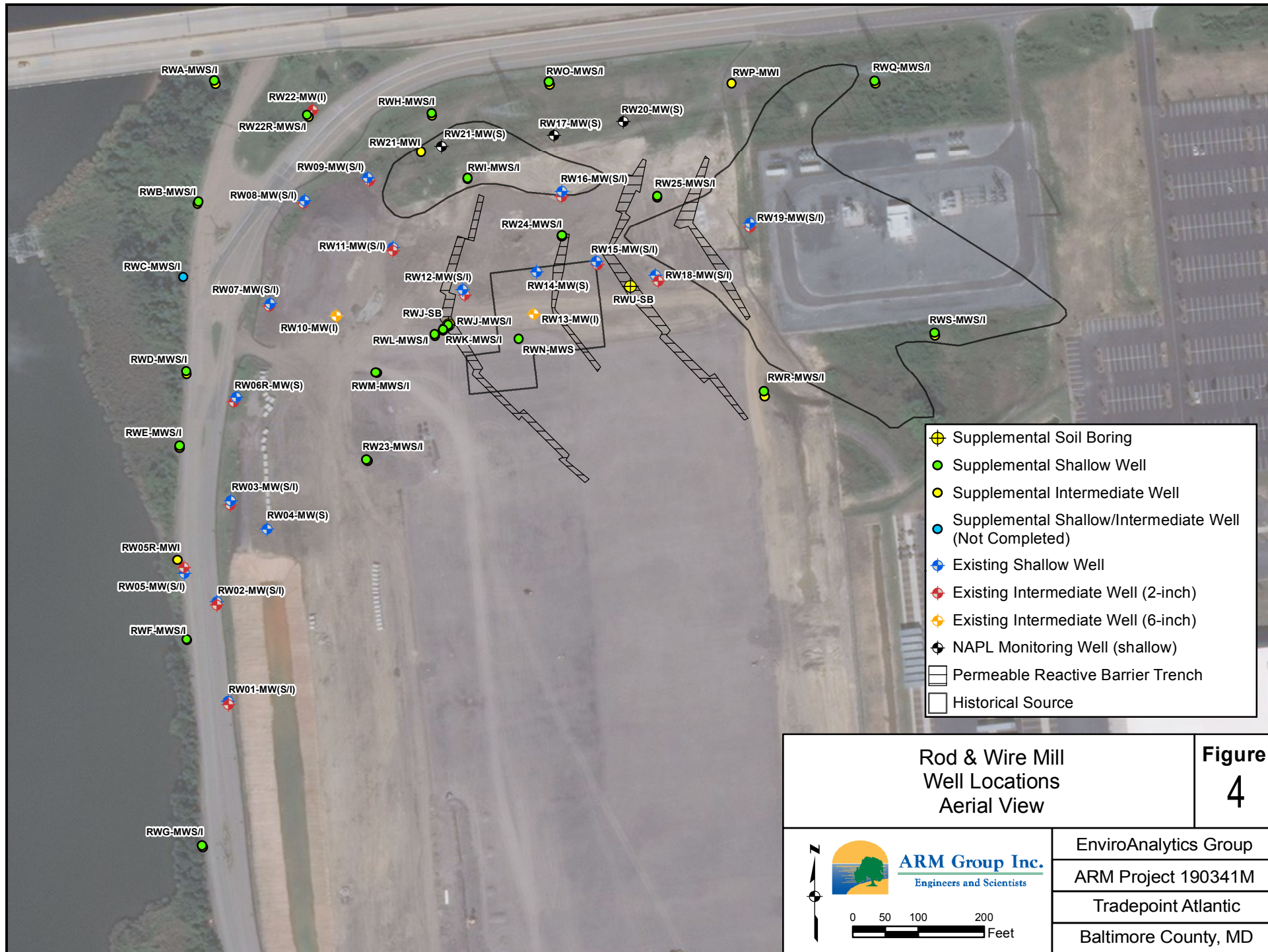
EnviroAnalytics Group

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Tradepoint Atlantic

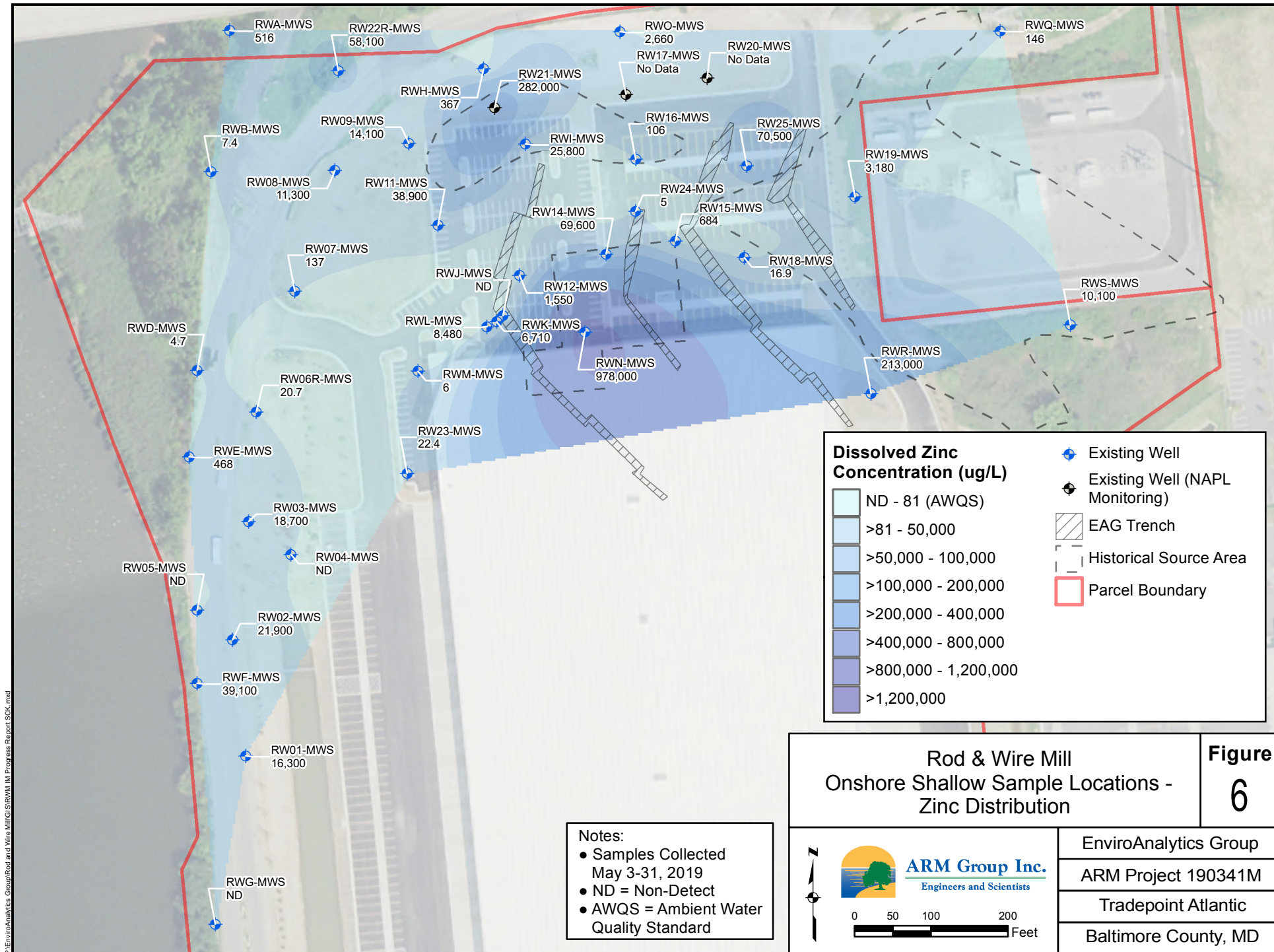
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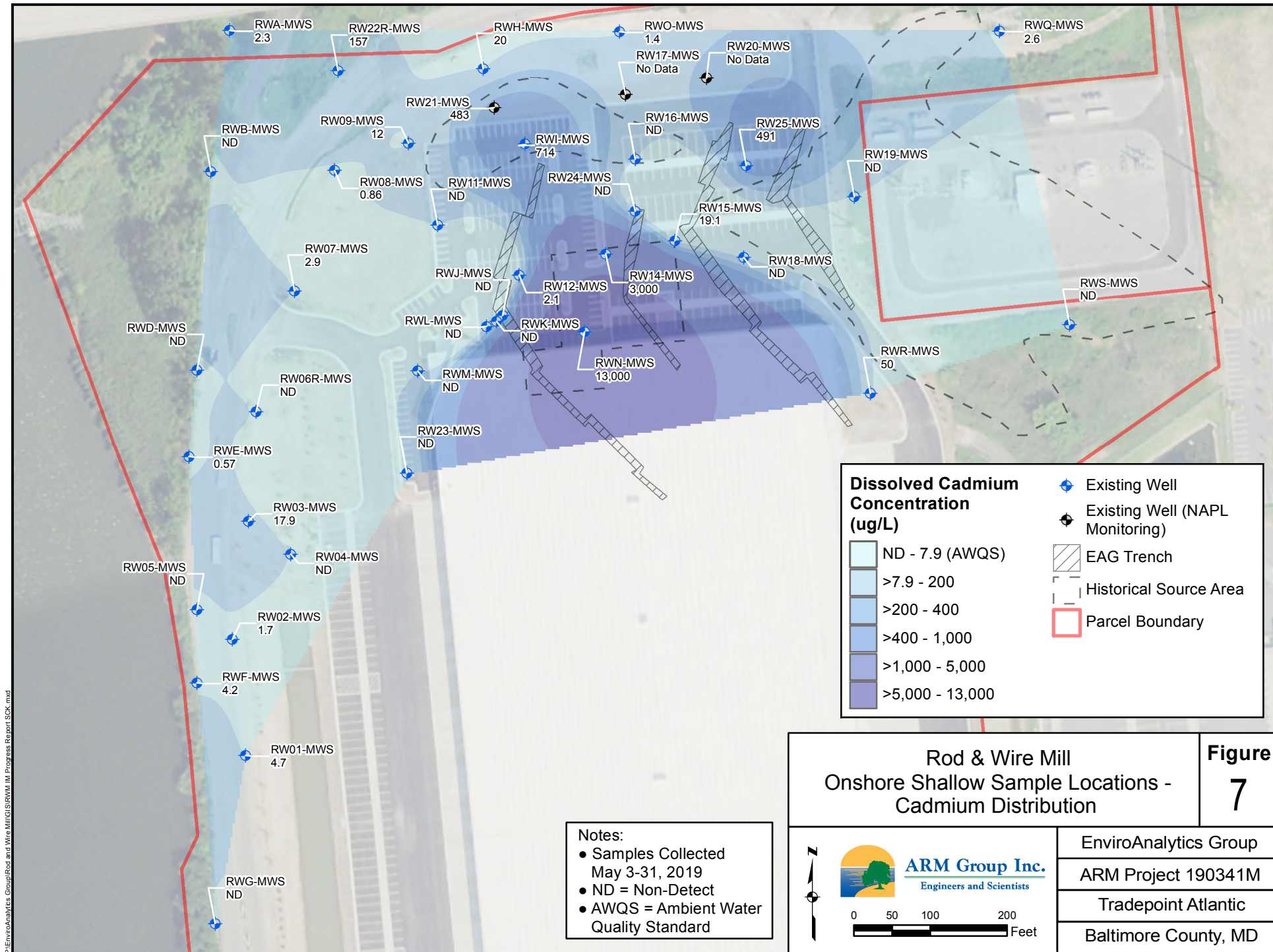








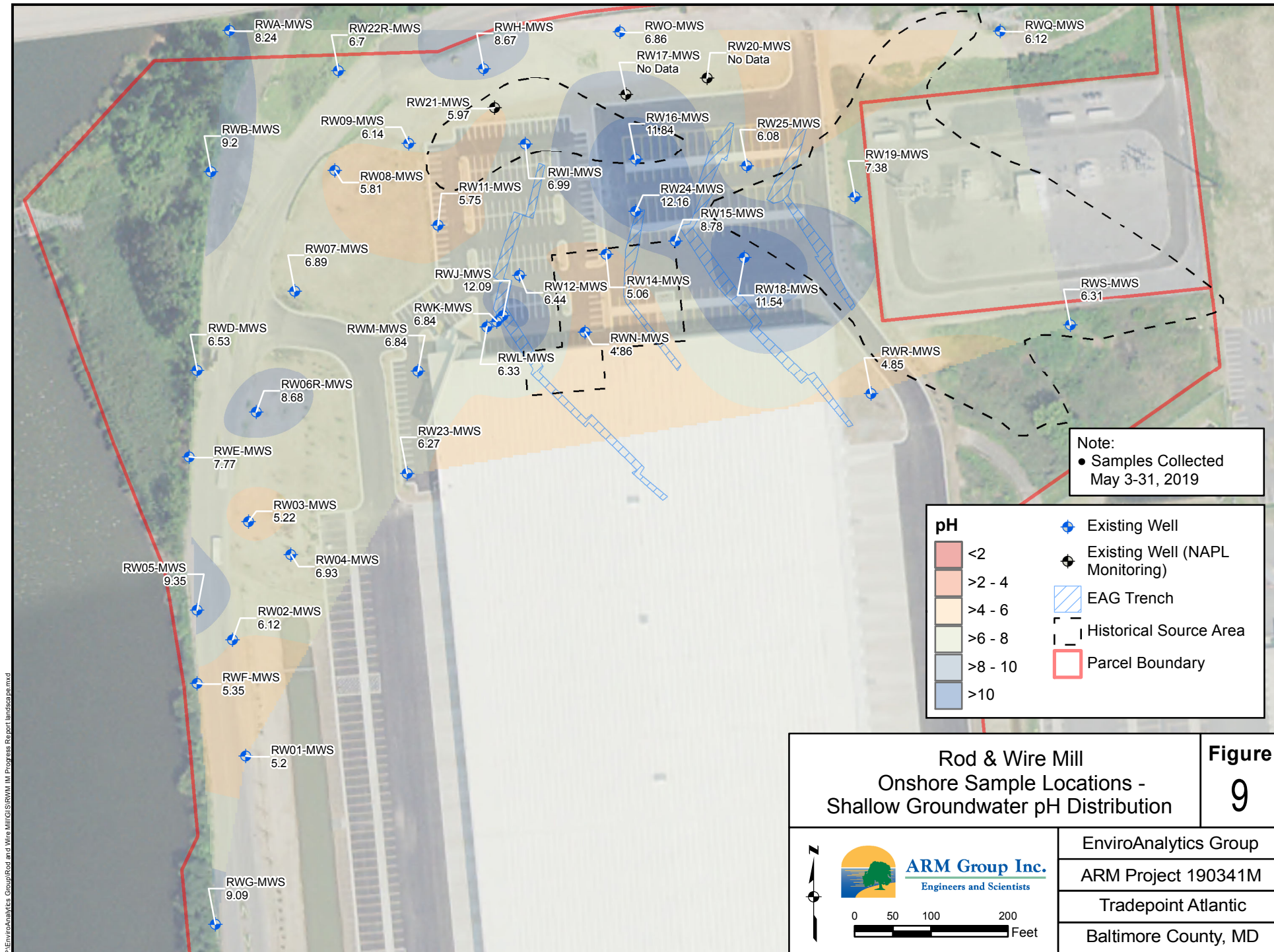


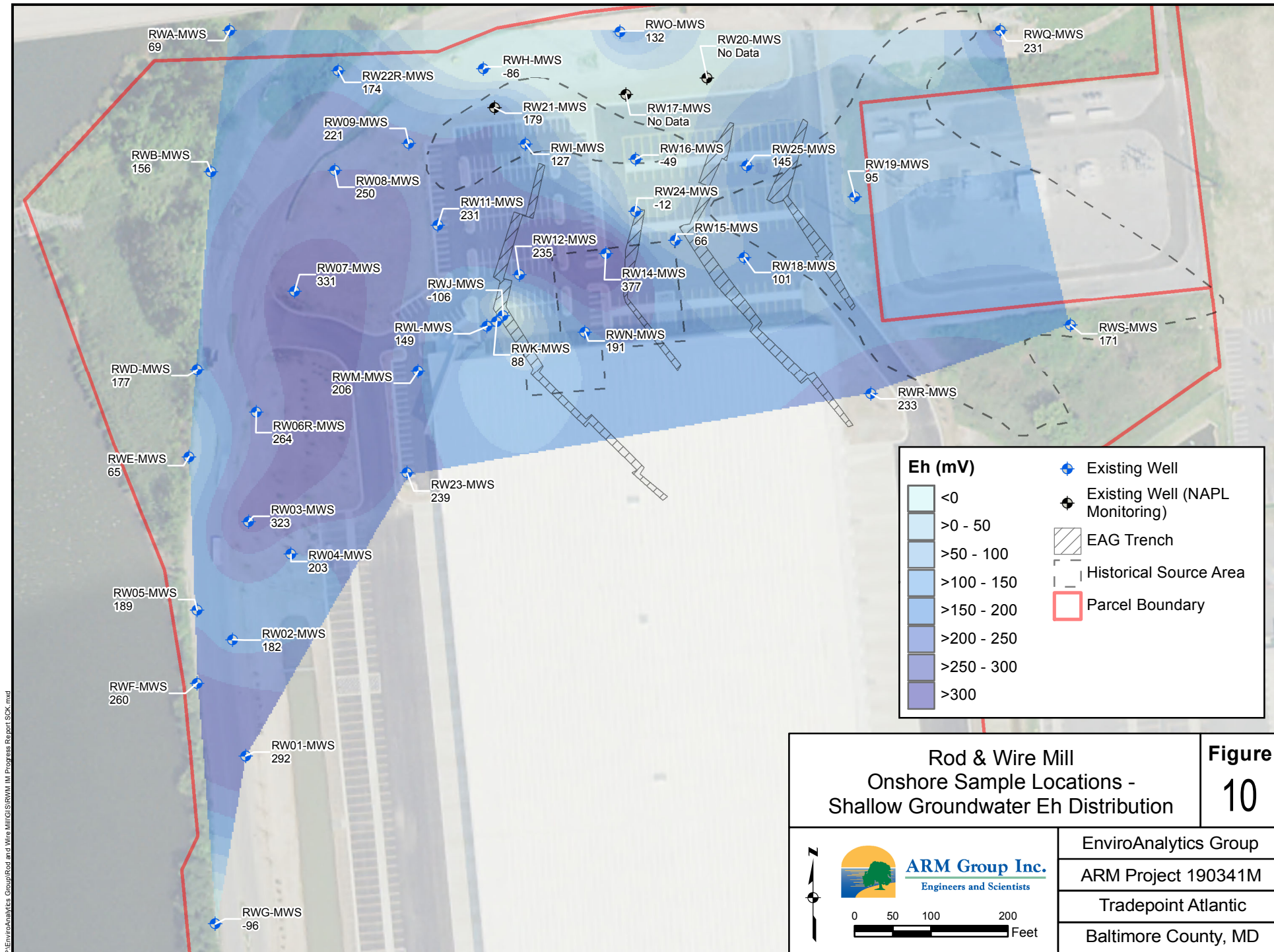




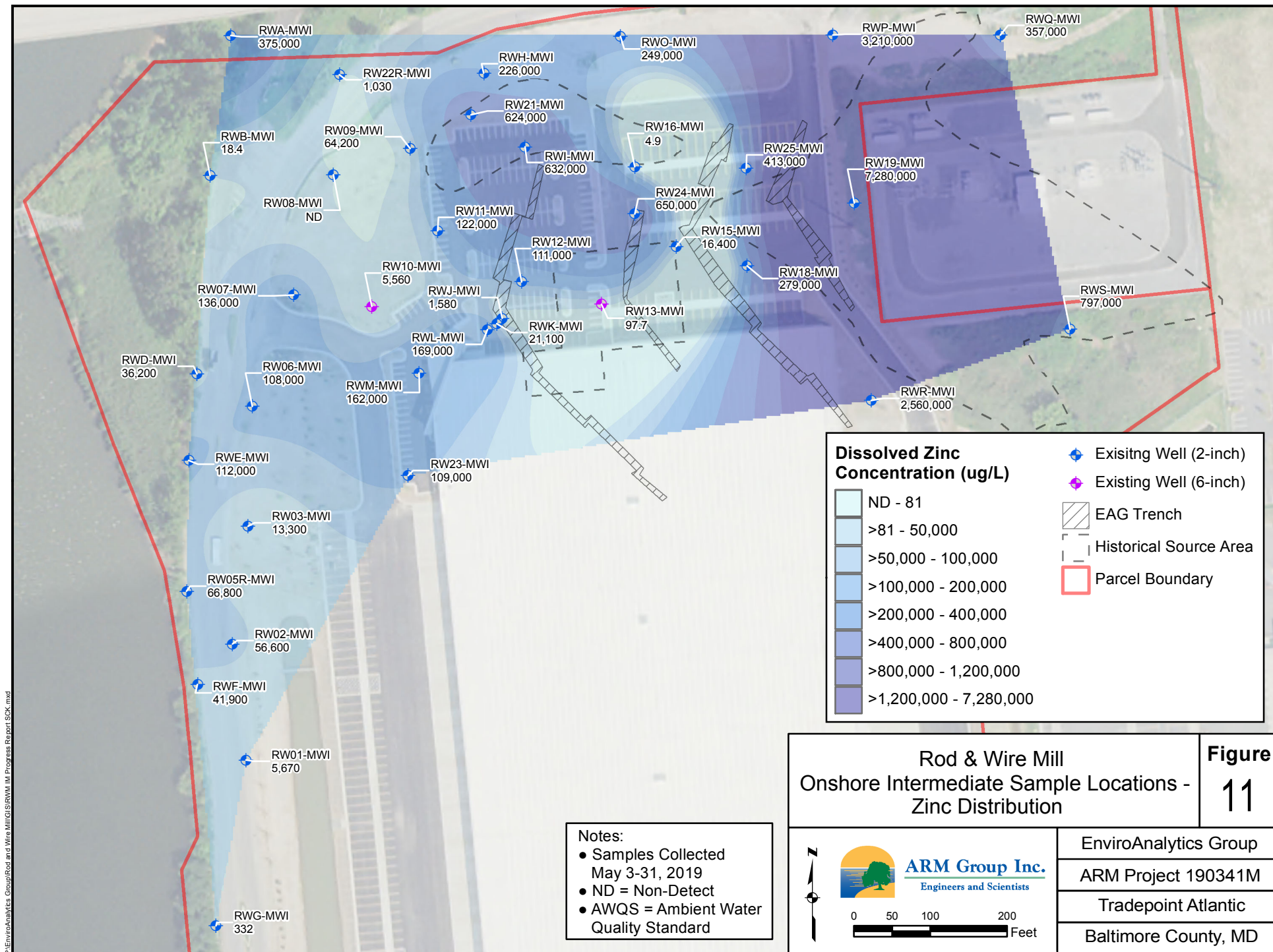




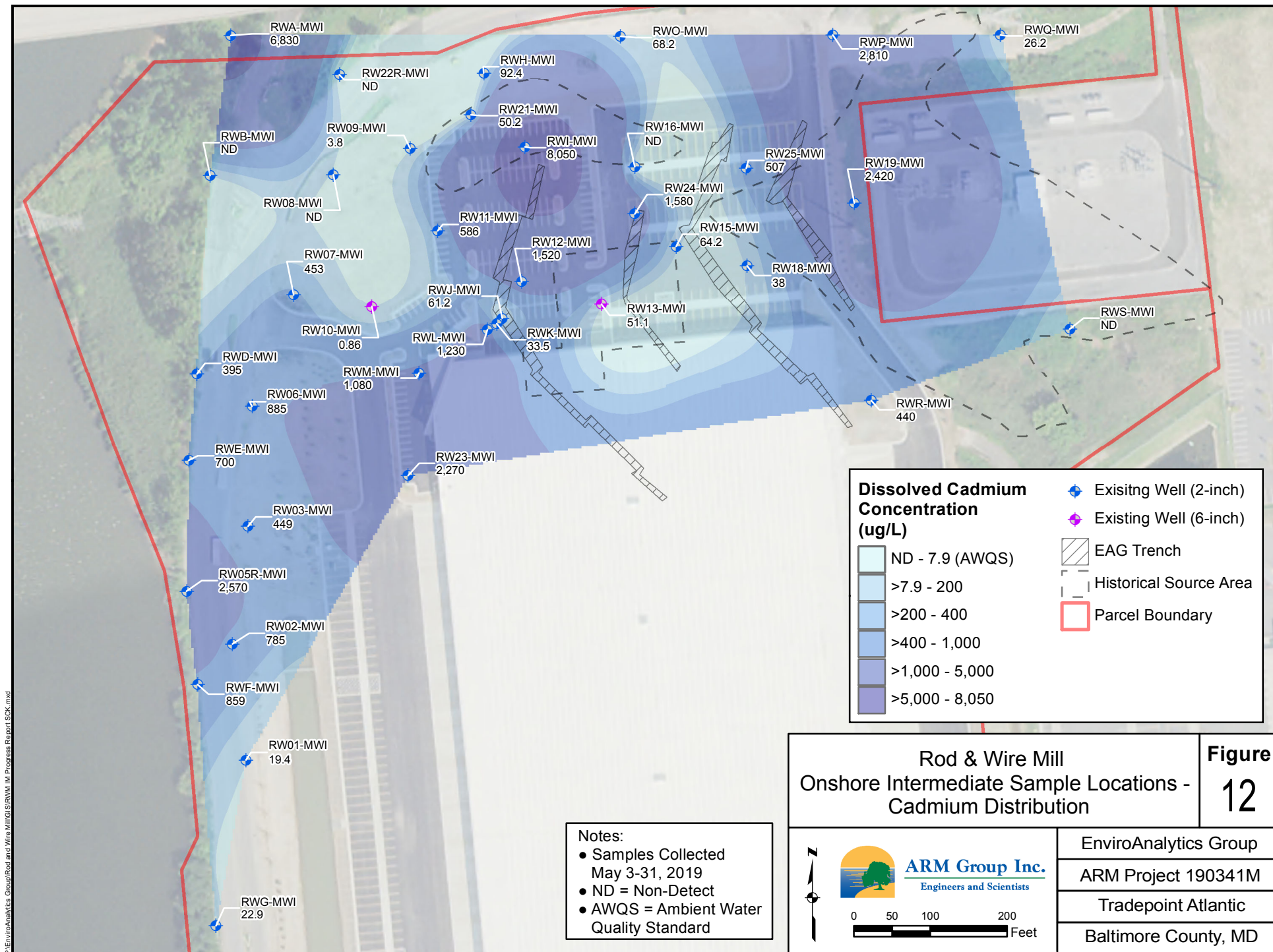








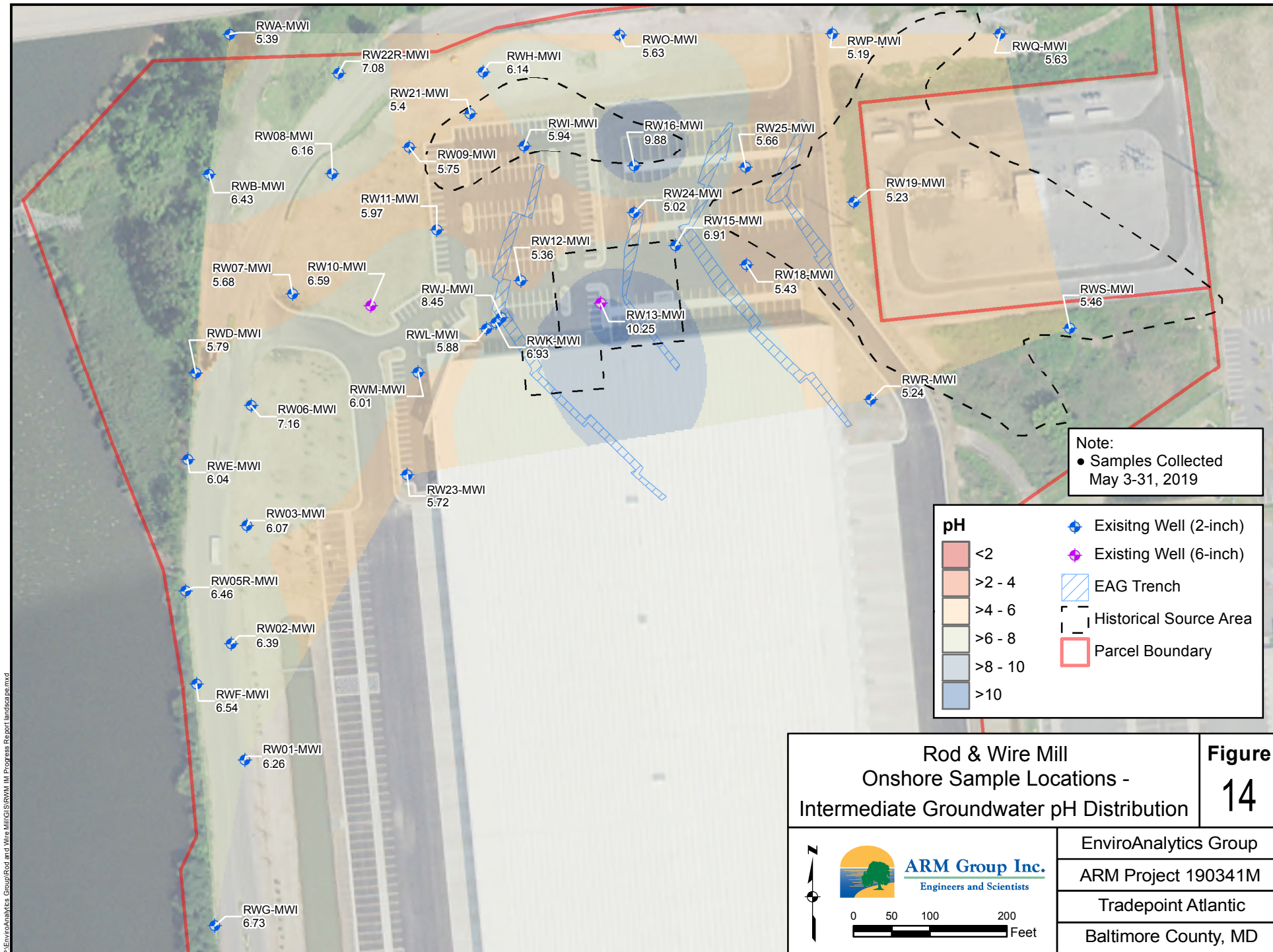



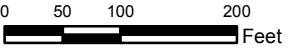


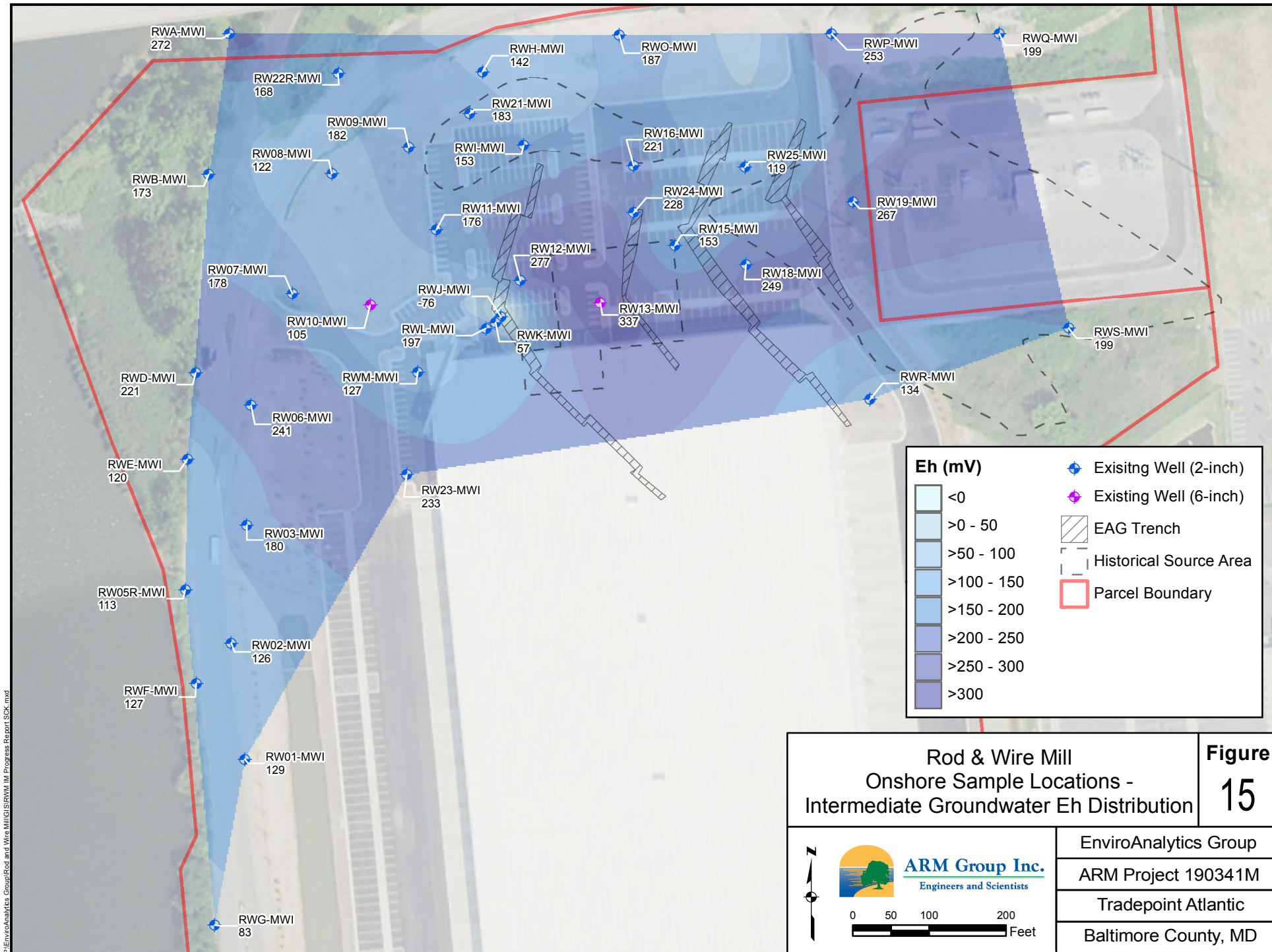








<b>Rod &amp; Wire Mill</b> <b>Onshore Sample Locations -</b> <b>Intermediate Groundwater pH Distribution</b>		<b>Figure</b> <b>14</b>
		
EnviroAnalytics Group ARM Project 190341M Tradepoint Atlantic Baltimore County, MD		
		



Rod & Wire Mill  
Onshore Sample Locations -  
Intermediate Groundwater Eh Distribution

**Figure**  
**15**



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0 50 100 200  
Feet

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ARM Project 190341M

Tradepoint Atlantic

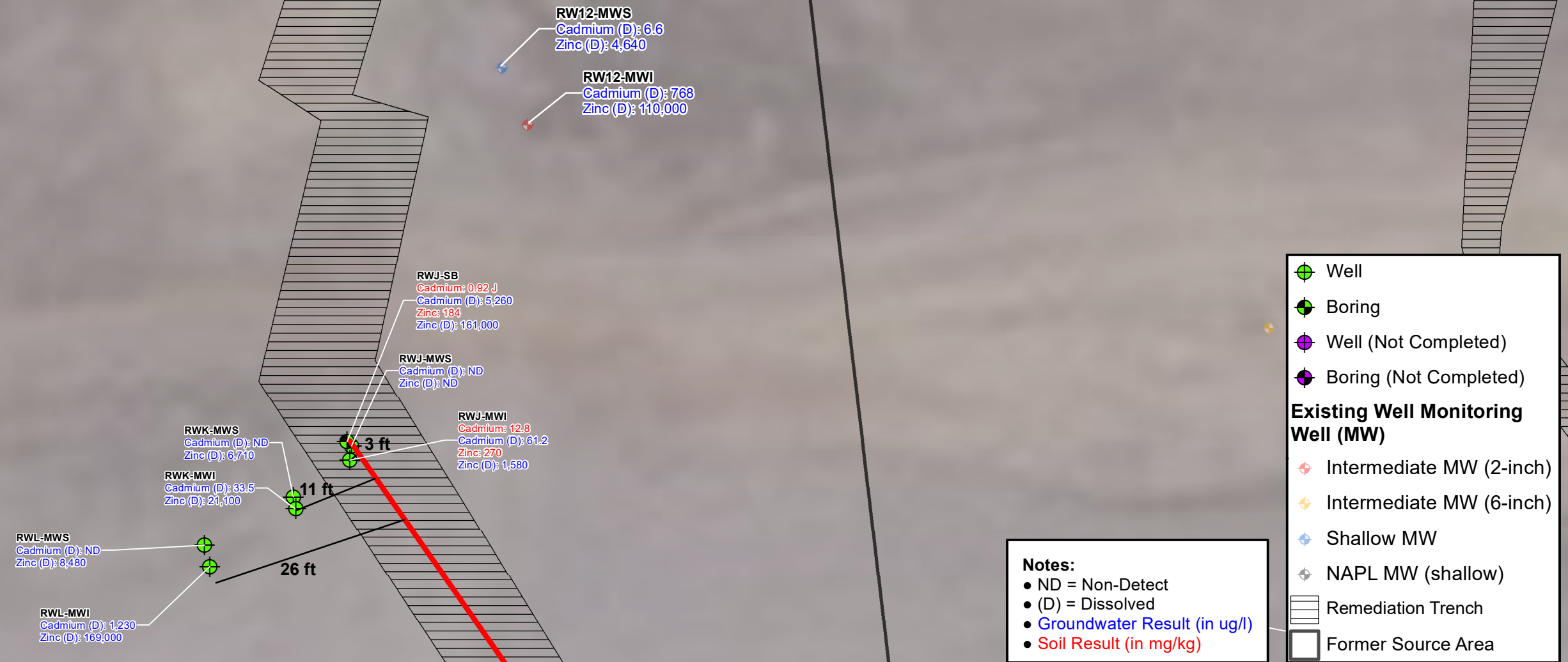
Baltimore County, MD











Rod & Wire Supplemental Investigation  
Onshore Sampling Dissolved Cadmium and  
Zinc Preliminary Groundwater Results

Figure  
18



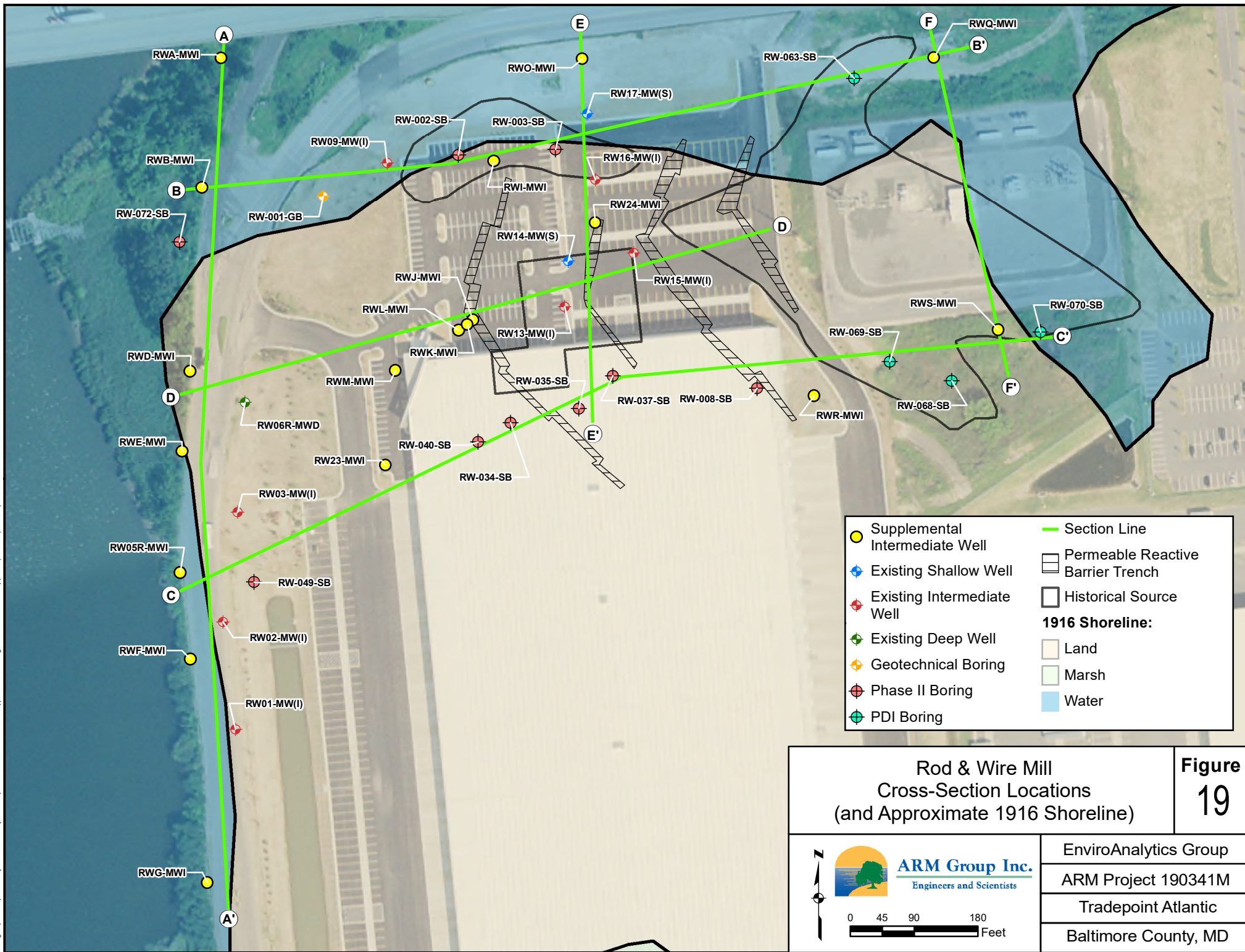
**ARM Group Inc.**  
Engineers and Scientists

0 5 10 20  
Feet

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ARM Project 190341M  
Tradepoint Atlantic  
Baltimore County, MD



\\namgo-up-id\CorpData\Projects\EnviroAnalytics\Group190341M\RWMM Onshore Supplemental Investigation\GIS\RWMM\_M Supp. WP. (Onshore) landscape.mxd



Rod & Wire Mill  
Cross-Section Locations  
(and Approximate 1916 Shoreline)

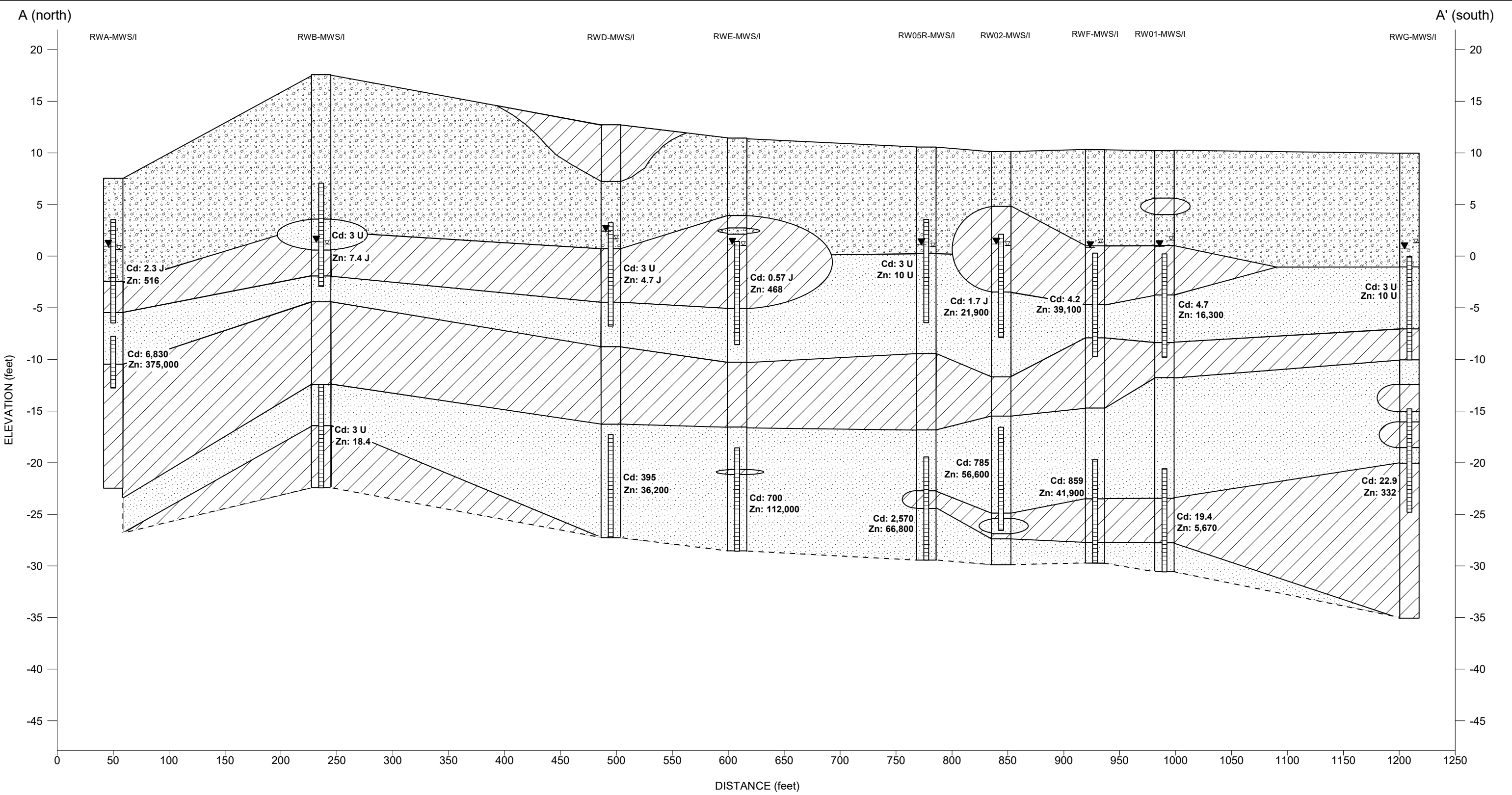
**Figure 19**


EnviroAnalytics Group


ARM Project 190341M


Tradepoint Atlantic


Baltimore County, MD




 Slag

 Sand


 Silt/Clay

 Shallow Well Groundwater Elevation

 Intermediate Well Groundwater Elevation

Notes:  
No geologic data below bottom of boreholes.  
All concentrations are dissolved fraction in micrograms per liter.

Tradepoint Atlantic  
Sparrows Point, MD  
ARM Project 190341M

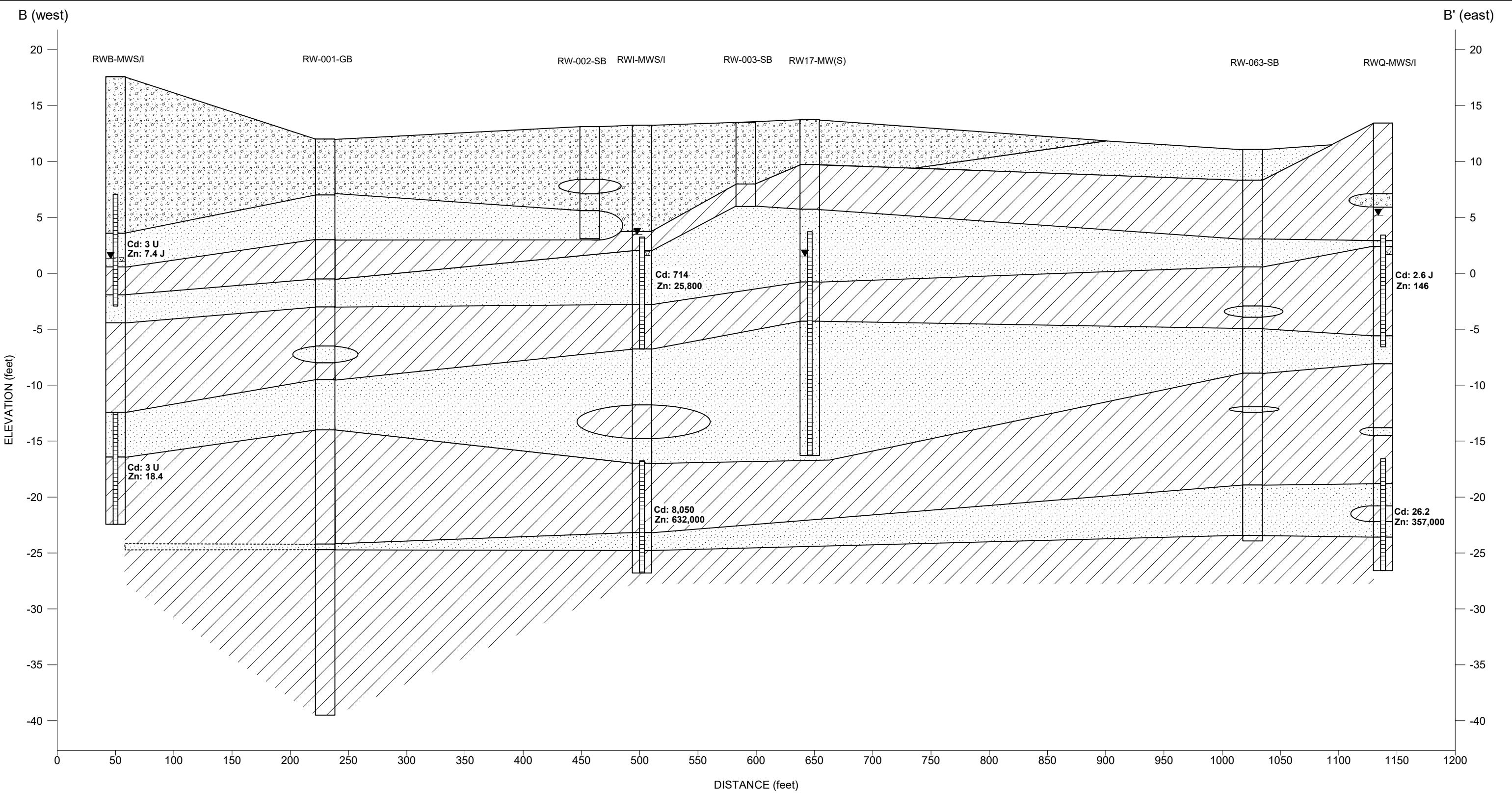


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**Figure 20**

Cross Section A-A'  
(Revision 1)





Slag

Sand

Silt/Clay

Shallow Well Groundwater Elevation

Intermediate Well Groundwater Elevation

**Notes:**

No geologic data below bottom of boreholes.

All concentrations are dissolved fraction in micrograms per liter.

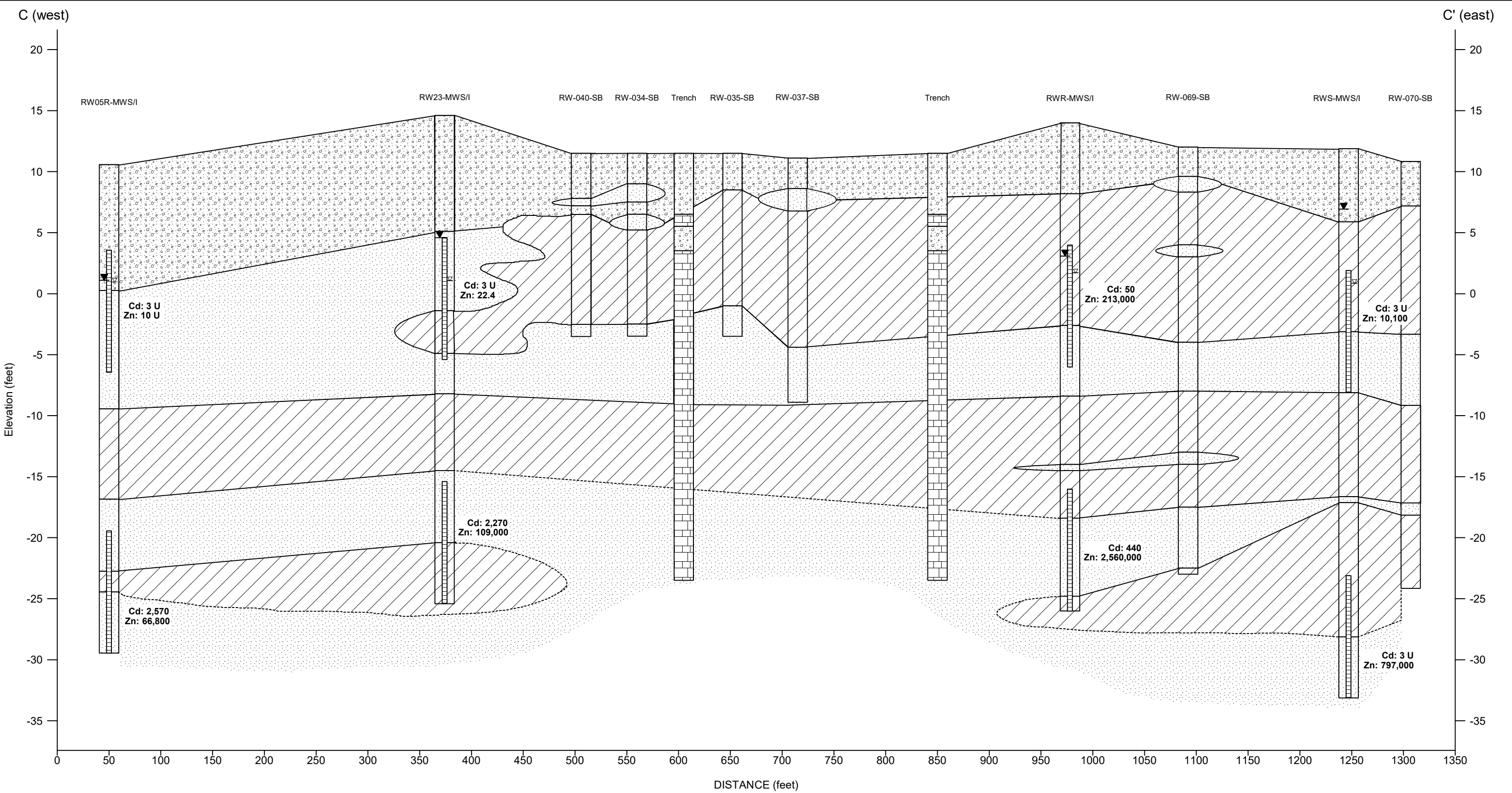
RW17-MWS is a NAPL well not sampled for Cd or Zn.

Tradepoint Atlantic  
Sparrows Point, MD  
ARM Project 190341M



**Figure 21**

Cross-Section B-B'  
(Revision 1)



**LEGEND**

- Slag
- Sand
- Silt/Clay
- Trench Alkaline Charge Material
- Shallow Well Groundwater Elevation
- Intermediate Well Groundwater Elevation

**Notes:**

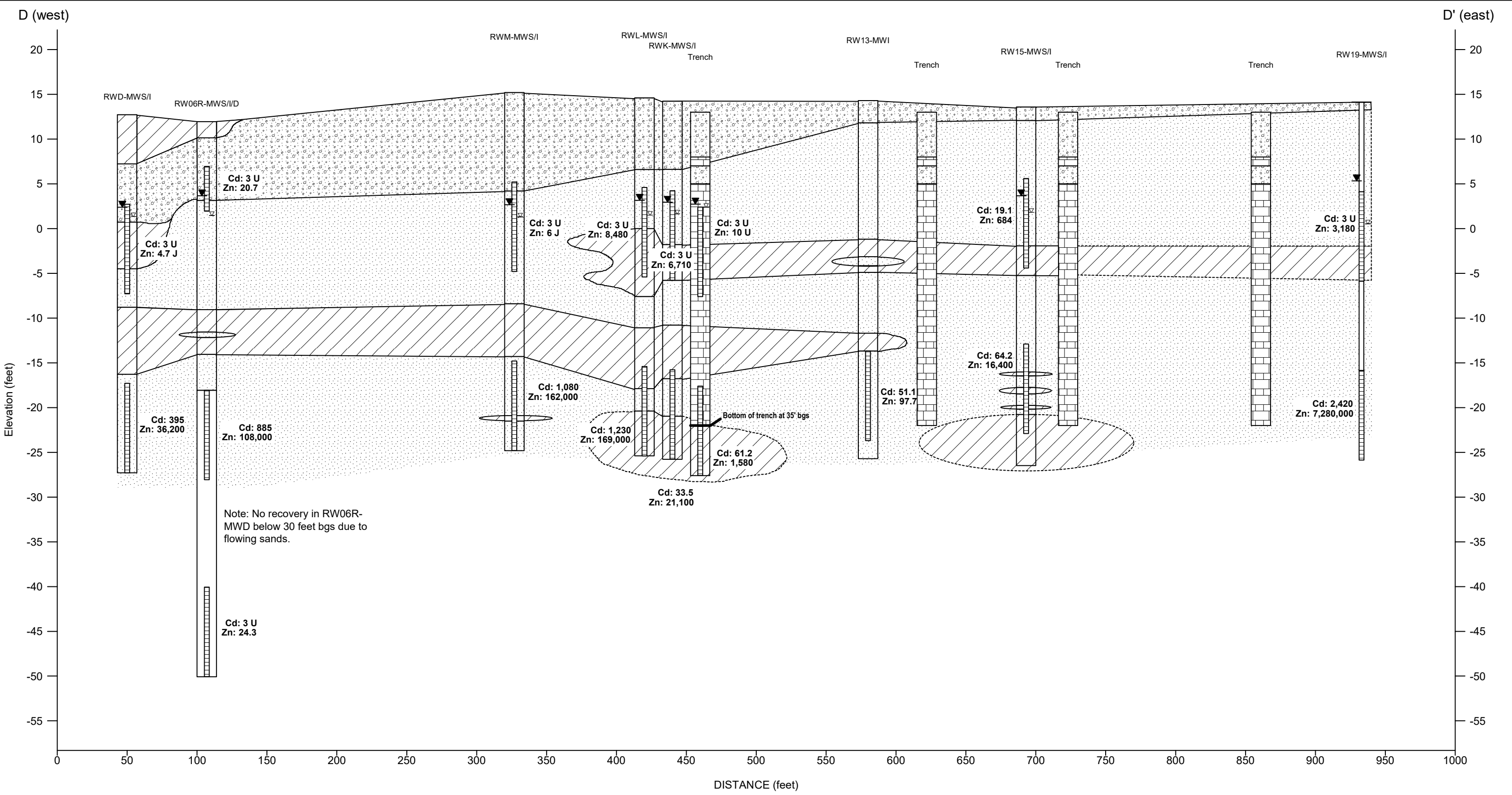
- No geologic data below bottom of boreholes.
- All concentrations are dissolved fraction in micrograms per liter.

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**Figure 22**

Cross-Section C-C'  
(Revision 1)



**LEGEND**

Slag

Sand

Silt/Clay

Trench Alkaline Charge Material

Shallow Well Groundwater Elevation

Intermediate Well Groundwater Elevation

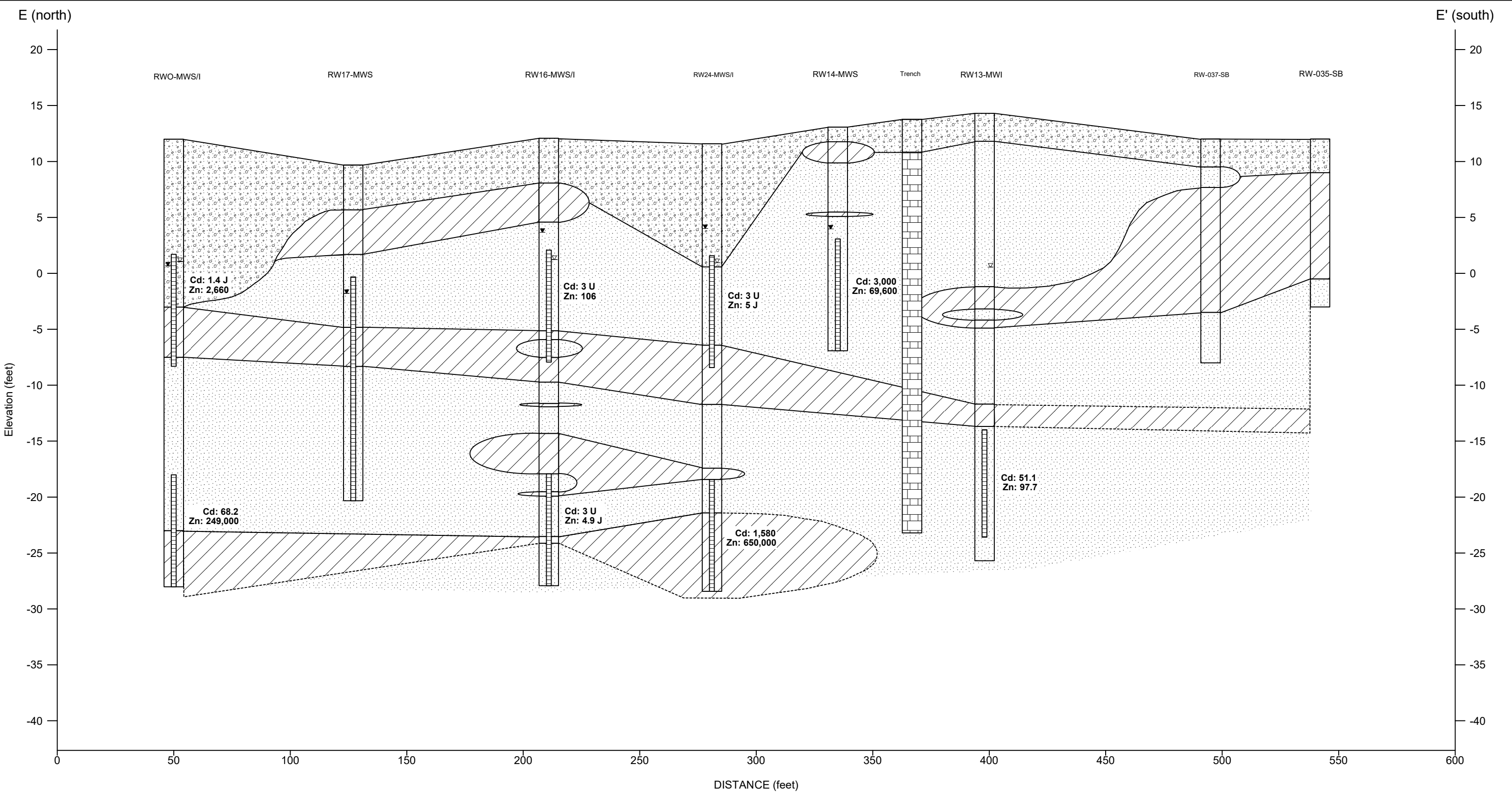
**Notes:**  
No geologic data below bottom of boreholes.  
All concentrations are dissolved fraction in micrograms per liter.  
Lithologies from RW19-MWI boring log not included because they were logged with inconsistent descriptive scheme.

Tradepoint Atlantic  
Sparrows Point, MD  
ARM Project 190341M

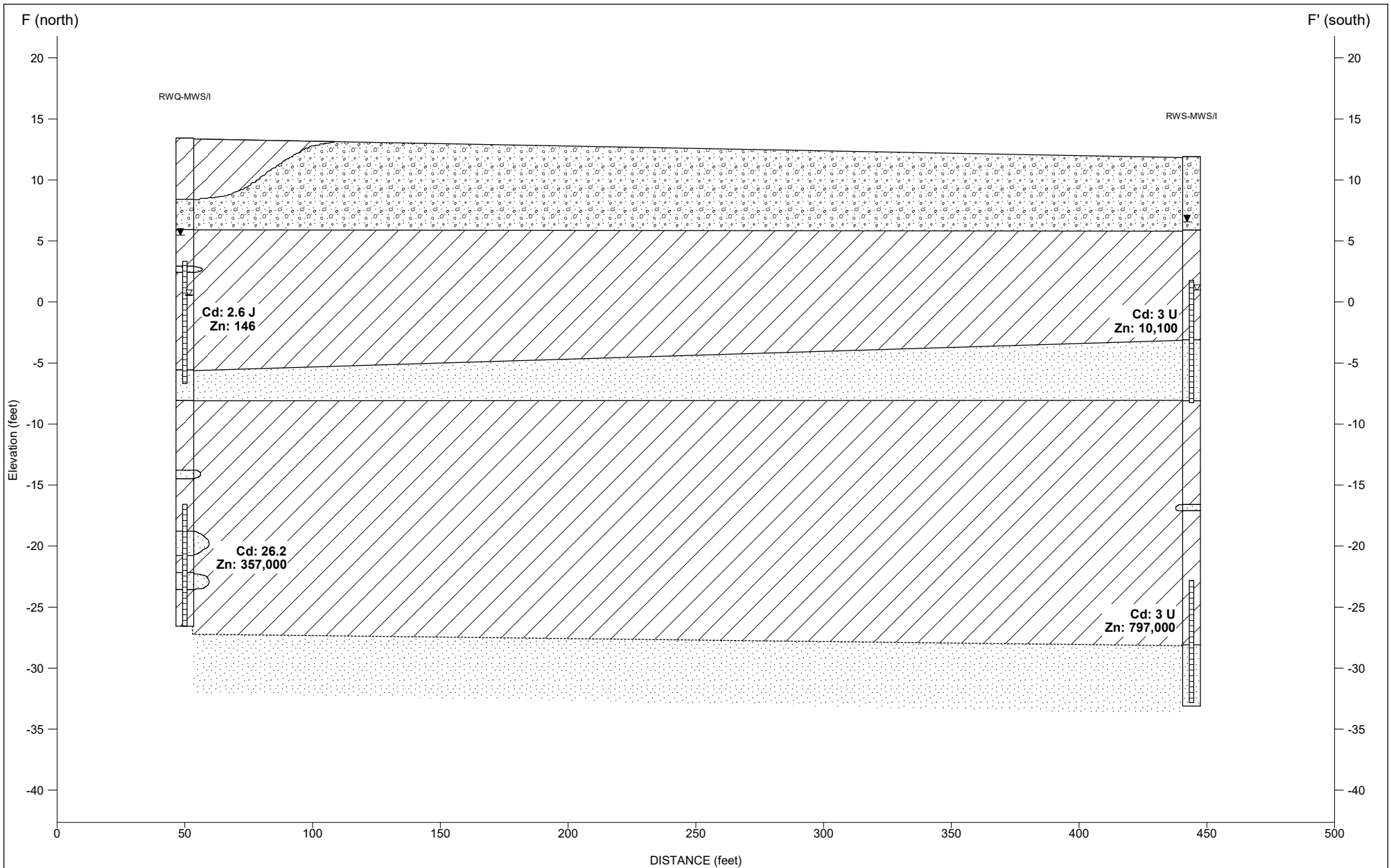
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**Figure 23**

Cross-Section D-D'



**Figure 24**  
Cross-Section E-E'



## LEGEND

- Slag
- Sand
- Silt/Clay
- Shallow Well Groundwater Elevation
- Intermediate Well Groundwater Elevation

### Notes:

No geologic data below bottom of boreholes.  
 All concentrations are dissolved fraction in micrograms per liter.

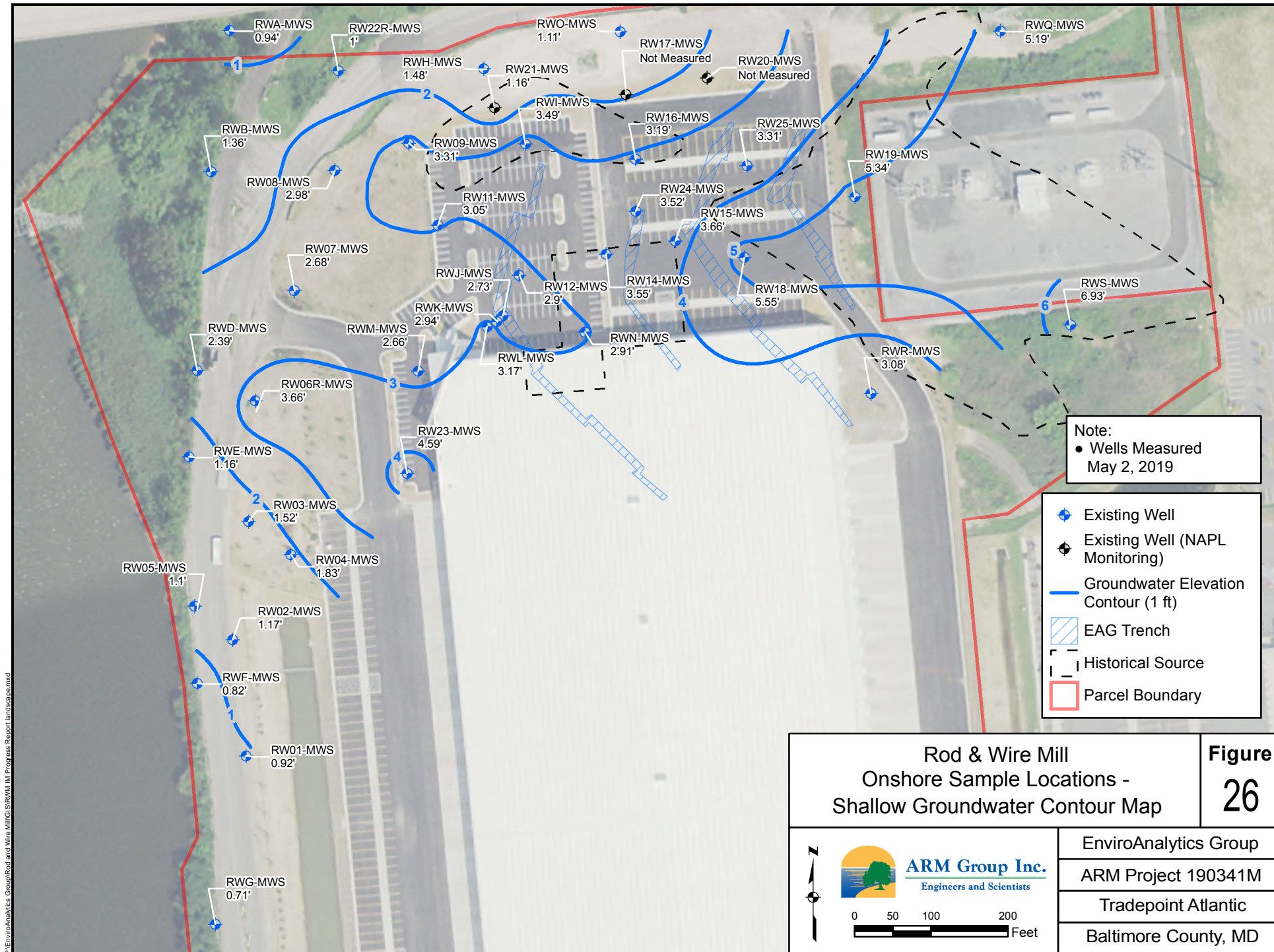
Tradepoint Atlantic  
 Sparrows Point, MD  
 ARM Project 190341M



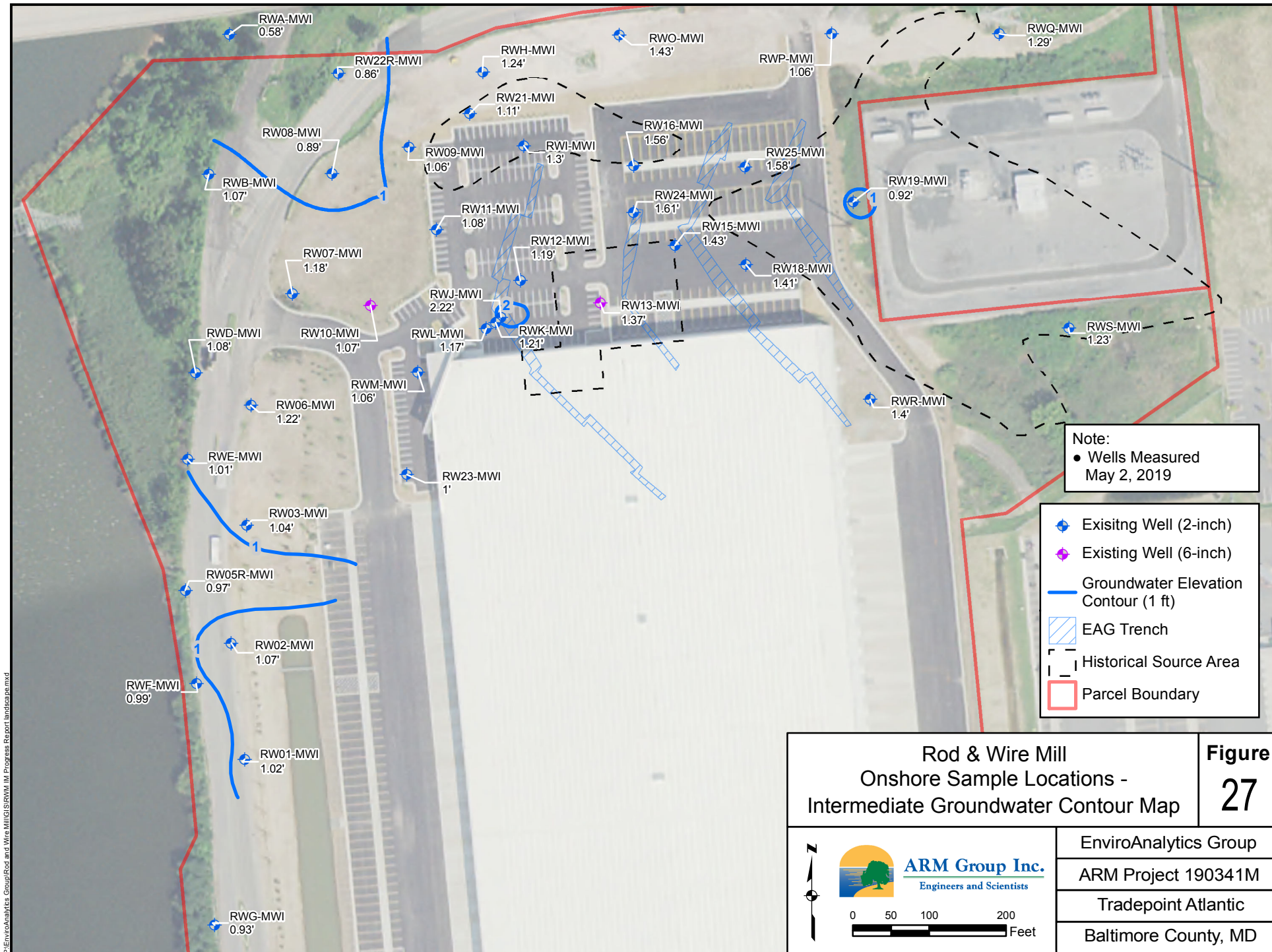
# Figure 25

Cross-Section F-F'



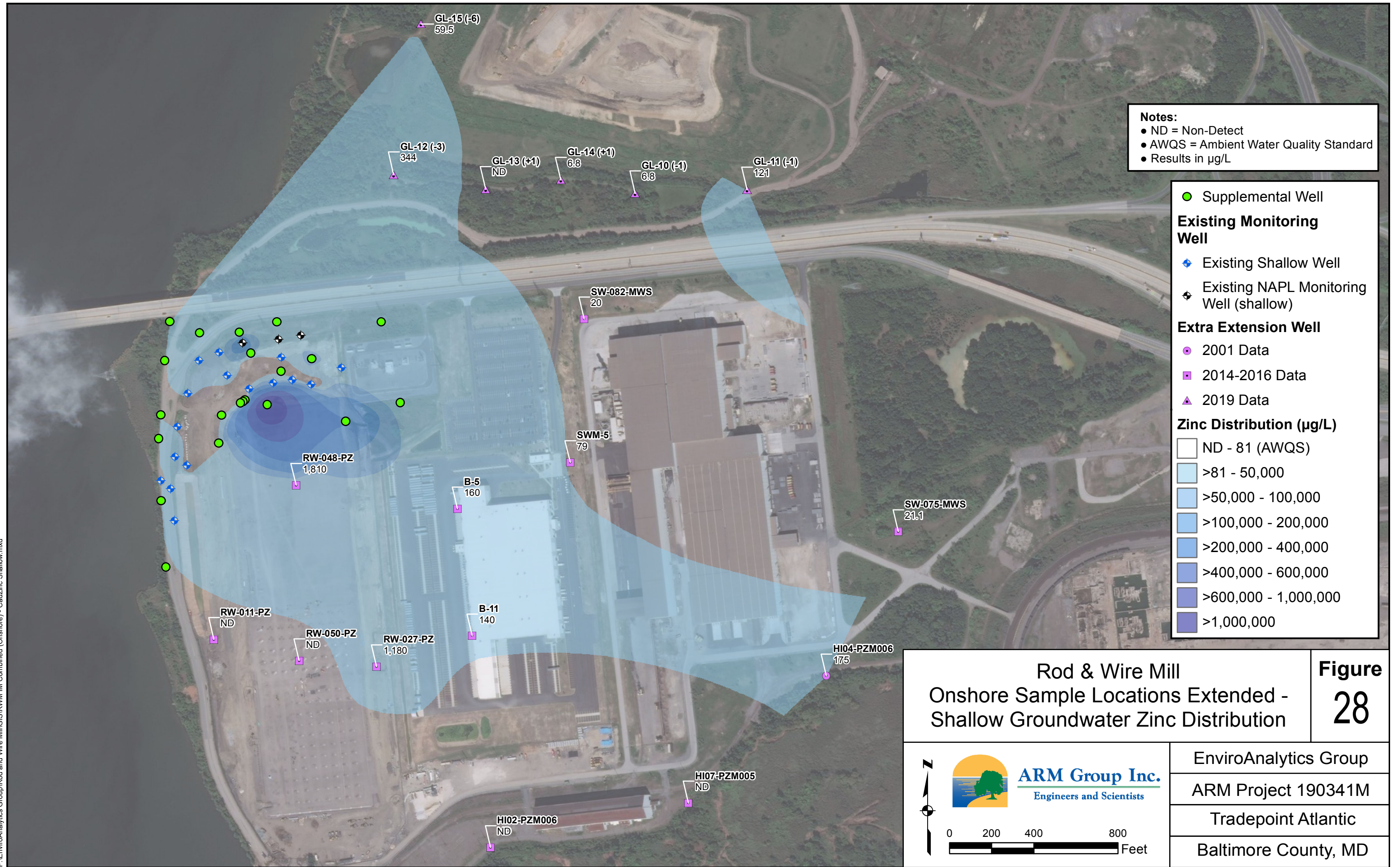




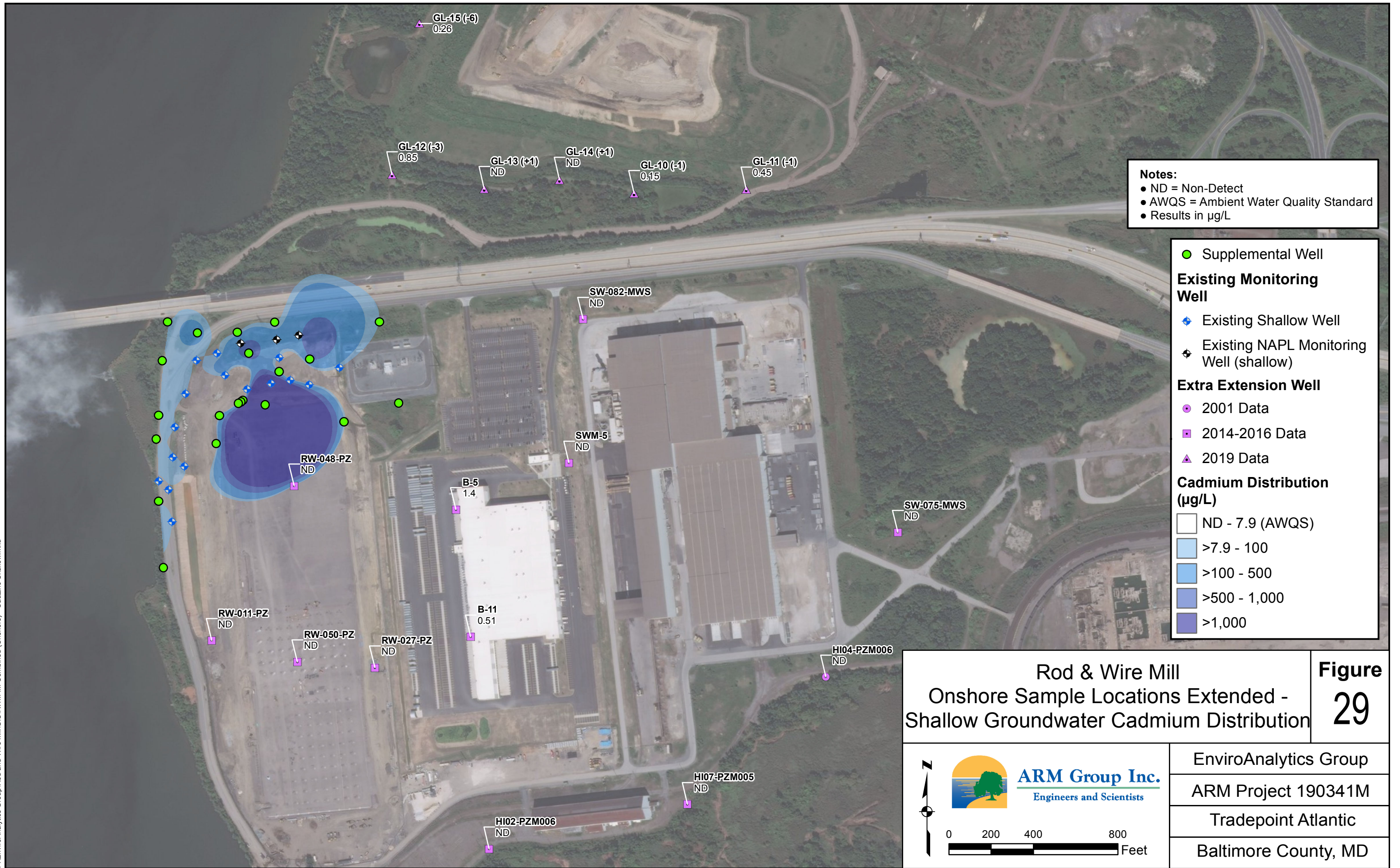




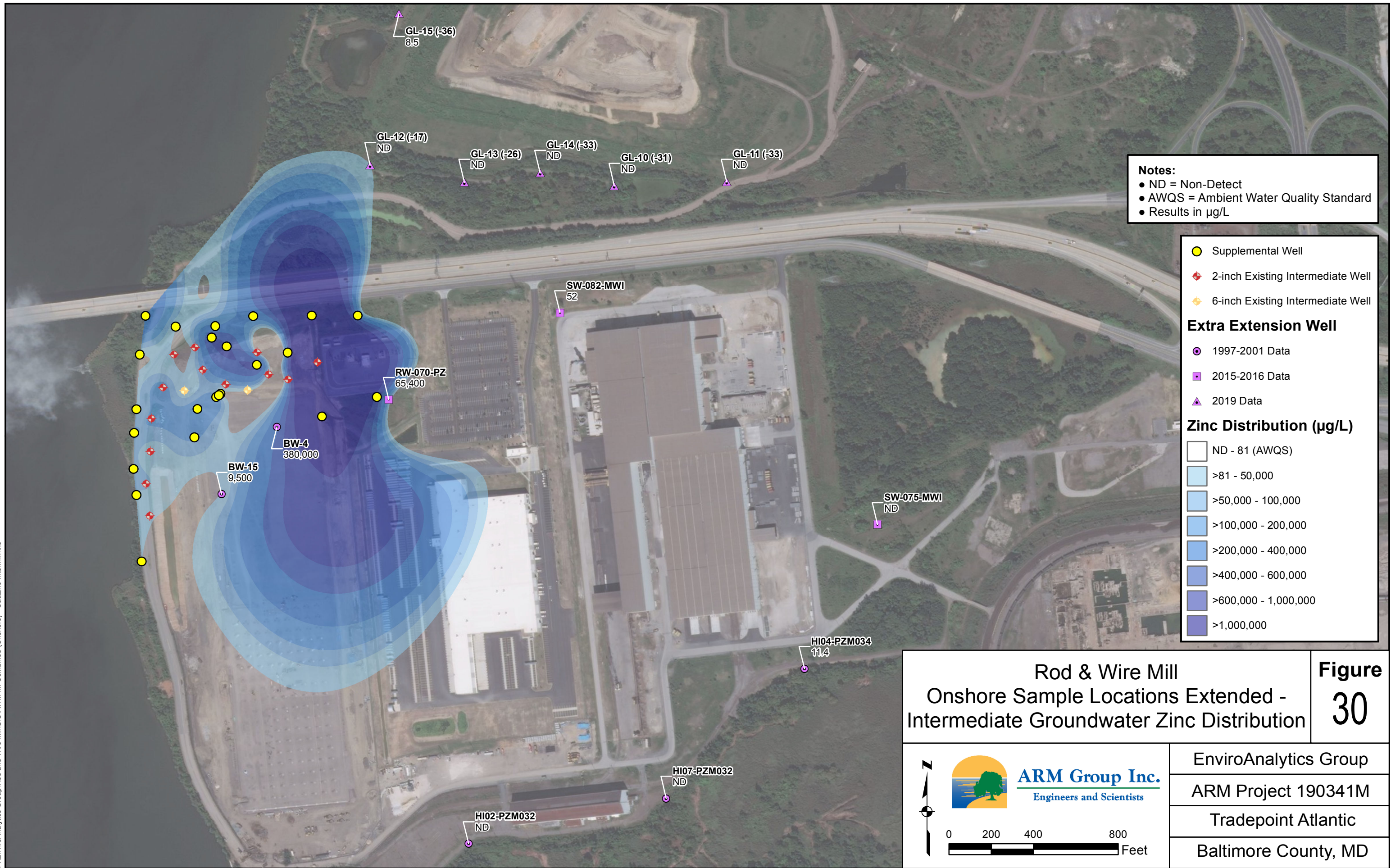
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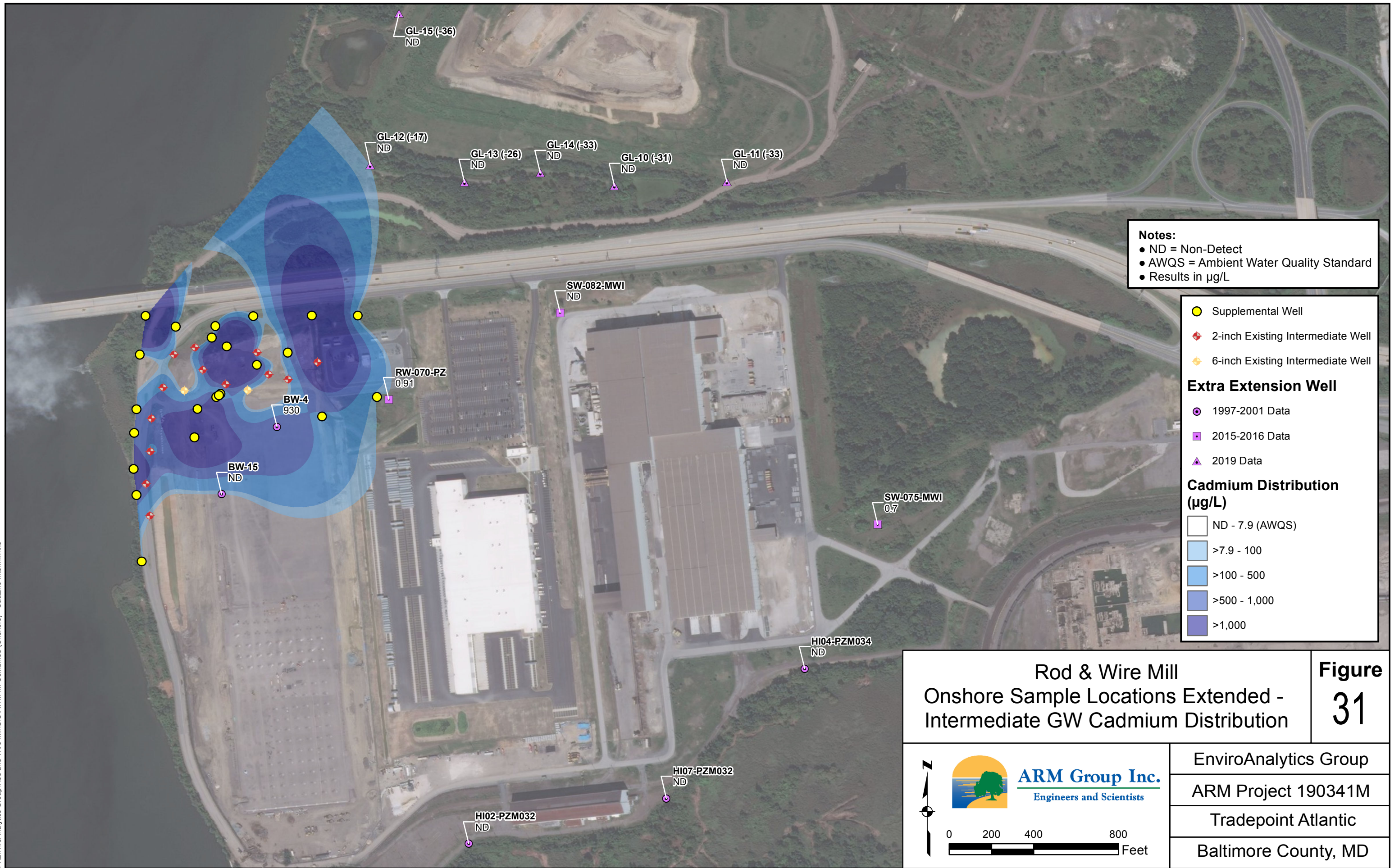














Rod & Wire Mill  
Onshore Sample Locations Extended -  
Intermediate GW Cadmium Distribution

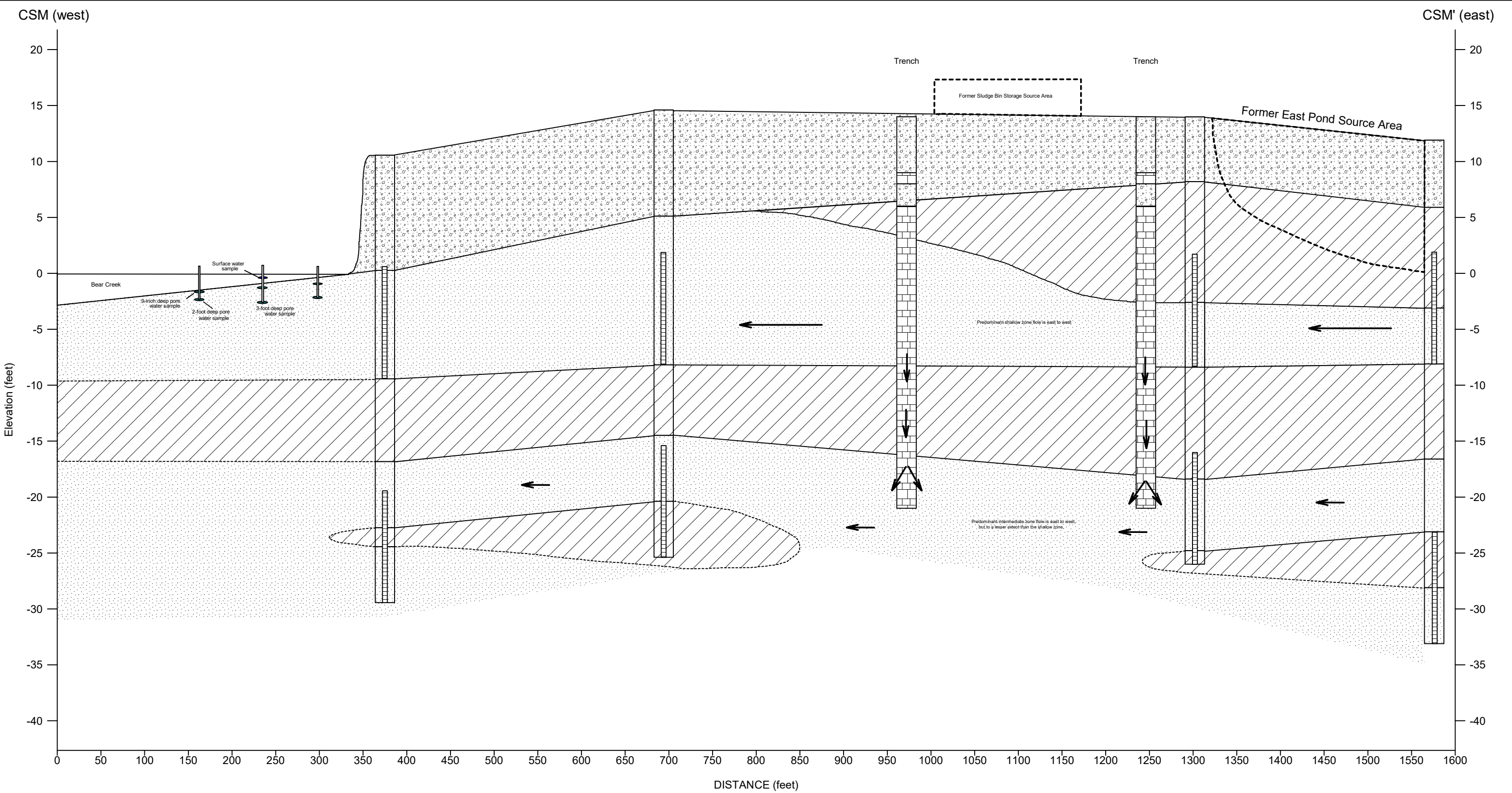
Figure  
31






**ARM Group Inc.**  
Engineers and Scientists

0 200 400 800 Feet

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ARM Project 190341M
Tradepoint Atlantic
Baltimore County, MD





<b>LEGEND</b>		<b>Figure 32</b>
 Slag	 Groundwater Flow Direction	
 Sand		<b>Conceptual Site Model (CSM) Cross-Section (Revision 1)</b>
 Silt/Clay		
 Trench Alkaline Charge Material		

Tradepoint Atlantic Sparrows Point, MD ARM Project 190341M
 <b>ARM Group Inc.</b> Engineers and Scientists



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## TABLES

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**Table 1**  
**Groundwater Well Elevations and Measurements**  
**Rod and Wire Mill Area**  
**Sparrows Point, Maryland**

Shallow Wells				Intermediate Wells			
Well Name	Depth to Water (ft)	TOC Elev	GW Elev	Well Name	Depth to Water (ft)	TOC Elev	GW Elev
RW01-MWS	8.79	9.71	0.92	RW01-MWI	8.76	9.78	1.02
RW02-MWS	8.84	10.01	1.17	RW02-MWI	8.79	9.86	1.07
RW03-MWS	9.16	10.68	1.52	RW03-MWI	9.77	10.81	1.04
RW04-MWS	7.35	9.18	1.83				
RW05-MWS	8.63	9.73	1.10	RW05R-MWI	11.98	12.95	0.97
RW06-MWS	7.66	11.32	3.66	RW06-MWI	10.22	11.44	1.22
RW07-MWS	10.29	12.97	2.68	RW07-MWI	11.63	12.81	1.18
RW08-MWS	9.4	12.38	2.98	RW08-MWI	11.38	12.27	0.89
RW09-MWS	9.59	12.90	3.31	RW09-MWI	11.62	12.68	1.06
				RW10-MWI	12.39	13.46	1.07
RW11-MWS	9.28	12.33	3.05	RW11-MWI	11.36	12.44	1.08
RW12-MWS	10.23	13.13	2.90	RW12-MWI	12.16	13.35	1.19
				RW13-MWI	12.3	13.67	1.37
RW14-MWS	9.1	12.65	3.55				
RW15-MWS	9.56	13.22	3.66	RW15-MWI	11.9	13.33	1.43
RW16-MWS	8.85	12.04	3.19	RW16-MWI	10.52	12.08	1.56
RW18-MWS	8.13	13.68	5.55	RW18-MWI	12.54	13.95	1.41
RW19-MWS	9.08	14.42	5.34	RW19-MWI	13.22	14.14	0.92
RW21-MWS	12.35	13.51	1.16	RW21-MWI	13.35	14.46	1.11
RW22R-MWS	15.56	16.56	1.00	RW22R-MWI	15.77	16.63	0.86
RW23-MWS	9.65	14.24	4.59	RW23-MWI	13.36	14.36	1.00
RW24-MWS	9.03	12.55	3.52	RW24-MWI	10.96	12.57	1.61
RW25-MWS	8.63	11.94	3.31	RW25-MWI	10.5	12.08	1.58
RWA-MWS	9.65	10.59	0.94	RWA-MWI	9.62	10.20	0.58
RWB-MWS	18.81	20.17	1.36	RWB-MWI	18.66	19.73	1.07
RWD-MWS	12.54	14.93	2.39	RWD-MWI	13.79	14.87	1.08
RWE-MWS	12.8	13.96	1.16	RWE-MWI	12.91	13.92	1.01
RWF-MWS	11.92	12.74	0.82	RWF-MWI	11.32	12.31	0.99
RWG-MWS	11.79	12.50	0.71	RWG-MWI	11.55	12.48	0.93
RWH-MWS	10.35	11.83	1.48	RWH-MWI	10.79	12.03	1.24
RWI-MWS	9.4	12.89	3.49	RWI-MWI	11.65	12.95	1.30
RWJ-MWS	11.08	13.81	2.73	RWJ-MWI	11.88	14.10	2.22
RWK-MWS	11.3	14.24	2.94	RWK-MWI	13.01	14.22	1.21
RWL-MWS	11.09	14.26	3.17	RWL-MWI	13.19	14.36	1.17
RWM-MWS	12.31	14.97	2.66	RWM-MWI	13.86	14.92	1.06
RWN-MWS	11.95	14.86	2.91				
RWO-MWS	10.48	11.59	1.11	RWO-MWI	10.24	11.67	1.43
				RWP-MWI	11.49	12.55	1.06
RWQ-MWS	10.74	15.93	5.19	RWQ-MWI	14.34	15.63	1.29
RWR-MWS	10.6	13.68	3.08	RWR-MWI	12.21	13.61	1.40
RWS-MWS	7.72	14.65	6.93	RWS-MWI	13.07	14.30	1.23
RW17-MWS	11.86	13.40	1.54				
RW20-MWS	10.47	12.33	1.86				

Date of Water Level Measurement: May 2, 2019

**Table 2**  
**Sampling Locations, Descriptions, and Notes**  
**Rod and Wire Mill Area**  
**Sparrows Point, Maryland**

Sample	Depth	Sampling Coordinates		Description/Notes	Picture
		Northing	Easting		
RW-001-PW	-	571330.6616	1455859.621	Could not sample this location due to hard bottom	
RW-002-PW	-	571324.1256	1455794.95	Could not sample this location due to hard bottom	
RW-003-PW	-	571316.5841	1455720.33	9 inch sample could not be collected because pore water and surface water specific conductance did not have a 30% difference; 3 foot sample could not be collected due to hard bottom	
RW-004-PW	-	571532.2652	1455832.48	9 inch sample could not be collected because pore water and surface water specific conductance did not have a 30% difference; 3 foot sample could not be collected due to low permeability of the substrate	
RW-005-PW	-	571517.3412	1455797.562	9 inch sample could not be collected due to low permeability of the substrate; 3 foot sample could not be collected due to hard bottom	
RW-006-PW-2	2 feet	571510.1736	1455722.905	9 inch sample could not be collected because pore water and surface water specific conductance did not have a 30% difference	
RW-007-PW-1		571694.0374	1455832.798		
RW-007-PW-3		571694.0374	1455832.798		
RW-008-PW-1		571693.7085	1455770.451		
RW-008-PW-3		571693.7085	1455770.451		
RW-009-PW-1		571677.7749	1455696.229		
RW-009-PW-2		571677.7749	1455696.229		
RW-010-PW	-	571974.8221	1455749.06	9 inch sample could not be collected because pore water and surface water specific conductance did not have a 30% difference; 3 foot sample could not be collected due to low permeability of the substrate	
RW-011-PW-1	9 inches	571938.6987	1455689.47	3 foot sample could not be collected due to hard bottom	
RW-012-PW-1	9 inches	571902.6699	1455623.146	3 foot sample could not be collected due to hard bottom	



**Table 2**  
**Sampling Locations, Descriptions, and Notes**  
**Rod and Wire Mill Area**  
**Sparrows Point, Maryland**

Sample	Depth	Sampling Coordinates		Description/Notes	Picture
		Northing	Easting		
RW-013-PW-1	9 inches	572194.3323	1455667.323	Screen filter is covered in black mud	Photo: 1
RW-013-PW-2	2 feet	572194.3323	1455667.323		
RW-014-PW-1	9 inches	572179.5537	1455592.378		
RW-014-PW-3	3 feet	572179.5537	1455592.378		
RW-015-PW-1	9 inches	572136.2905	1455536.502		
RW-015-PW-3	3 feet	572136.2905	1455536.502		
RW-016-PW-1	9 inches	572421.0041	1455796.468		
RW-016-PW-3	3 feet	572421.0041	1455796.468		
RW-017-PW-1	9 inches	572425.1565	1455750.869		
RW-017-PW-3	3 feet	572425.1565	1455750.869		
RW-018-PW-3	3 feet	572412.3149	1455665.391		
RW-019-PW	-	572742.5539	1455888.172	Could not sample this location due to low permeability of the substrate; screen filter is covered in black mud	
RW-020-PW-1		572732.8471	1455911.211		
RW-020-PW-3		572732.8471	1455911.211		
RW-021-PW-1		572633.5729	1455913.452		
RW-021-PW-3		572633.5729	1455913.452		
RW-022-PW	-	572912.0162	1456175.458	Could not sample this location due to hard bottom	
RW-023-PW	-	572944.7172	1456152.422	Could not sample this location due to low permeability of the substrate; screen filter is covered in black mud	Photo: 2
RW-024-PW	-	572965.1554	1456138.025	Could not sample this location due to low permeability of the substrate; screen filter is covered in black mud	
PW-D02-1	9 inches	571880.6144	1455595.503	3 foot sample could not be collected due to hard bottom	
PW-DE01-1	9 inches	571507.18	1455712.52	3 foot sample could not be collected due to hard bottom	

**Table 3**  
**RWM Supplemental Investigation**  
**Summary of Shallow Groundwater Results**

Parameter	Units	AWQS	PAL	RW22R-MWS	RW23-MWS	RW24-MWS	RW25-MWS	RWA-MWS	RWB-MWS	RWD-MWS	RWE-MWS	RWF-MWS
Date Sample Collected				5/15/2019	5/3/2019	5/8/2019	5/8/2019	5/15/2019	5/15/2019	5/14/2019	5/14/2019	5/16/2019
<b>Total Metals</b>												
Cadmium	ug/l	7.9	5	168	3 U	0.91 J	495	6.2	0.60 J	3 U	0.59 J	5.7
Zinc	ug/l	81	6,000	65,300	12.7	94	70,800	750	64.9	4.8 J	489	38,600
<b>Dissolved Metals</b>												
Cadmium Dissolved	ug/l	7.9	5	157	3 U	3 U	491	2.3 J	3 U	3 U	0.57 J	4.2
Zinc Dissolved	ug/l	81	6,000	58,100	22.4	5 J	70,500	516	7.4 J	4.7 J	468	39,100
<b>Other</b>												
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			326	20	10 U	110	10 U	10 U	10 U	10 U	204
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			48	50	268	50	42	120	104 J-	248 J-	6 J-
Dissolved Oxygen	mg/l			4.49	2.97	2.34	2.29	2.57	4.93	2.39	2.73	2.6
Eh	mV			174	239	-12	145	69	156	177	65	260
ORP	mV			-39.4	25.1	-225.3	-68.3	-142.5	-53.6	-36.7	-148.6	46.9
pH	su			6.70	6.27	12.16	6.08	8.24	9.20	6.53	7.77	5.35
Specific Conductance	mS/cm			2.471	0.633	2.652	1.339	2.748	1.344	0.659	1.654	2.119
Turbidity	NTU			1.1	429.9	12.7	28.1	1.16	12.1	15.6	8.14	12.2
Water Temperature	°C			16	15.3	16.3	16.1	18.2	20.6	15	15.1	15.4

**Detections in bold**

Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)

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Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)

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Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82

**Table 3**  
**RWM Supplemental Investigation**  
**Summary of Shallow Groundwater Results**

Parameter	Units	AWQS	PAL	RWG-MWS	RWH-MWS	RWI-MWS	RWJ-MWS	RWK-MWS	RWL-MWS	RWM-MWS	RWN-MWS
Date Sample Collected				5/13/2019	5/9/2019	5/9/2019	5/7/2019	5/7/2019	5/7/2019	5/3/2019	5/3/2019
Total Metals											
Cadmium	ug/l	7.9	5	3 U	30.6	743	3 U	3 U	3 U	3 U	13,000
Zinc	ug/l	81	6,000	4.7 J	3,880	27,500	42.7	9,130	6,280	10.5	1,020,000
Dissolved Metals											
Cadmium Dissolved	ug/l	7.9	5	3 U	20	714	3 U	3 U	3 U	3 U	13,000
Zinc Dissolved	ug/l	81	6,000	10 U	367	25,800	10 U	6,710	8,480	6 J	978,000
Other											
Acidity (CaCO3 pH8.3)	mg/l			10 U	10 U	10 U	10 U	42	66	10 U	1,480
Alkalinity (CaCO3 pH4.5)	mg/l			120 J-	258	88	232	26	20	44	12
Dissolved Oxygen	mg/l			1.94	2.71	2.56	1.66	2.02	2.38	2.36	2.71
Eh	mV			-96	-86	127	-106	88	149	206	191
ORP	mV			-310.4	-300.1	-86.4	-318.7	-124.8	-61.5	-7.1	-21.9
pH	su			9.09	8.67	6.99	12.09	6.84	6.33	6.84	4.86
Specific Conductance	mS/cm			3.105	1.007	2.165	2.004	0.749	0.709	0.281	2.901
Turbidity	NTU			4.99	13.8	2.87	18.6	11.2	20.8	53	165.9
Water Temperature	°C			13.8	15.2	16.1	16.5	16.9	19.3	15.7	15.8

**Detections in bold**

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C<sub>T</sub> = -0.7357(T) + 224.82



**Table 3**  
**RWM Supplemental Investigation**  
**Summary of Shallow Groundwater Results**

Parameter	Units	AWQS	PAL	RWO-MWS	RWQ-MWS	RWR-MWS	RWS-MWS	RW01-MW(S)	RW02-MW(S)	RW03-MW(S)	RW04-MW(S)
Date Sample Collected				5/10/2019	5/17/2019	5/10/2019	5/17/2019	5/29/2019	5/29/2019	5/28/2019	5/22/2019
<b>Total Metals</b>											
Cadmium	ug/l	7.9	5	<b>10</b>	<b>2.9 J</b>	<b>51.8</b>	3 U	<b>4.8</b>	<b>2 J</b>	<b>18.9</b>	3 U
Zinc	ug/l	81	6,000	<b>3,200</b>	<b>148</b>	<b>214,000</b>	<b>9,740</b>	<b>16,100</b>	<b>22,400</b>	<b>20,100</b>	<b>132</b>
<b>Dissolved Metals</b>											
Cadmium Dissolved	ug/l	7.9	5	<b>1.4 J</b>	<b>2.6 J</b>	<b>50</b>	3 U	<b>4.7</b>	<b>1.7 J</b>	<b>17.9</b>	3 U
Zinc Dissolved	ug/l	81	6,000	<b>2,660</b>	<b>146</b>	<b>213,000</b>	<b>10,100</b>	<b>16,300</b>	<b>21,900</b>	<b>18,700</b>	10 U
<b>Other</b>											
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			10 U	10 U	<b>428</b>	10 U	<b>80</b>	<b>70</b>	<b>30</b>	10 U
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			<b>320</b>	<b>150</b>	<b>28</b>	<b>336</b>	<b>5 J</b>	<b>20</b>	<b>5 J</b>	<b>210</b>
Dissolved Oxygen	mg/l			<b>1.72</b>	<b>2.69</b>	<b>1.98</b>	<b>2.9</b>	<b>2.32</b>	<b>2.16</b>	<b>2.05</b>	<b>4</b>
Eh	mV			<b>132</b>	<b>231</b>	<b>233</b>	<b>171</b>	<b>292</b>	<b>182</b>	<b>323</b>	<b>203</b>
ORP	mV			<b>-80.8</b>	<b>17.5</b>	<b>20.1</b>	<b>-43.8</b>	<b>80.3</b>	<b>-25.5</b>	<b>109.9</b>	<b>-9.3</b>
pH	su			<b>6.86</b>	<b>6.12</b>	<b>4.85</b>	<b>6.31</b>	<b>5.2</b>	<b>6.12</b>	<b>5.22</b>	<b>6.93</b>
Specific Conductance	mS/cm			<b>1.426</b>	<b>0.623</b>	<b>1.916</b>	<b>1.216</b>	<b>1.268</b>	<b>0.999</b>	<b>0.875</b>	<b>0.749</b>
Turbidity	NTU			<b>4.17</b>	<b>5.97</b>	<b>58.5</b>	<b>13.7</b>	<b>6.99</b>	<b>9.44</b>	<b>3.81</b>	<b>6.75</b>
Water Temperature	°C			<b>15.9</b>	<b>15</b>	<b>15.6</b>	<b>14.1</b>	<b>18.3</b>	<b>23.8</b>	<b>16.2</b>	<b>17.6</b>

**Detections in bold**

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**Table 3**  
**RWM Supplemental Investigation**  
**Summary of Shallow Groundwater Results**

Parameter	Units	AWQS	PAL	RW05-MW(S)	RW06R-MW(S)	RW07-MW(S)	RW08-MW(S)	RW09-MW(S)	RW21-MW(S)	RW11-MW(S)	RW12-MW(S)
Date Sample Collected				5/23/2019	5/23/2019	5/24/2019	5/24/2019	5/28/2019	6/7/2019	5/22/2019	5/20/2019
<b>Total Metals</b>											
Cadmium	ug/l	7.9	5	3 U	3 U	3 B	1.2 B	13.2	486	1 J	4.4
Zinc	ug/l	81	6,000	10 J	33	151	12,500	15,300	279,000	38,600	5,870
<b>Dissolved Metals</b>											
Cadmium Dissolved	ug/l	7.9	5	3 U	3 U	2.9 J	0.86 J	12	483	1.1 B	2.1 J
Zinc Dissolved	ug/l	81	6,000	10 U	20.7	137	11,300	14,100	282,000	38,900	1,550
<b>Other</b>											
Acidity (CaCO3 pH8.3)	mg/l			10 U	10 U	10 U	20	10 U	478	220	10 U
Alkalinity (CaCO3 pH4.5)	mg/l			46	96	72	32	60	70	14	62
Dissolved Oxygen	mg/l			2.55	6.26	4.1	2.01	2.52	2	2.06	2.23
Eh	mV			189	264	331	250	221	179	231	235
ORP	mV			-20.9	50.8	117.6	37.9	9.5	-33.6	19	24
pH	su			9.35	8.68	6.89	5.81	6.14	5.97	5.75	6.44
Specific Conductance	mS/cm			1.503	0.833	0.994	0.928	1.276	2.259	1.737	1.264
Turbidity	NTU			4.61	12.8	9.81	3.64	16.2	15.3	2.33	4.27
Water Temperature	°C			20.2	16.4	15.9	17.1	17.9	16.9	17.3	18.3

**Detections in bold**

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**Table 3**  
**RWM Supplemental Investigation**  
**Summary of Shallow Groundwater Results**

Parameter	Units	AWQS	PAL	RW14-MW(S)	RW15-MW(S)	RW16-MW(S)	RW18-MW(S)	RW19-MW(S)
Date Sample Collected				5/20/2019	5/21/2019	5/22/2019	5/21/2019	5/29/2019
<b>Total Metals</b>								
Cadmium	ug/l	7.9	5	<b>3,000</b>	<b>20.6</b>	3 U	3 U	<b>0.69 J</b>
Zinc	ug/l	81	6,000	<b>73,600</b>	<b>766</b>	<b>5.5 J</b>	<b>25.6</b>	<b>3,150</b>
<b>Dissolved Metals</b>								
Cadmium Dissolved	ug/l	7.9	5	<b>3,000</b>	<b>19.1</b>	3 U	3 U	3 U
Zinc Dissolved	ug/l	81	6,000	<b>69,600</b>	<b>684</b>	<b>106</b>	<b>16.9</b>	<b>3,180</b>
<b>Other</b>								
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			<b>116</b>	10 U	10 U	10 U	<b>110</b>
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			<b>2 J</b>	<b>20</b>	<b>142</b>	<b>130</b>	<b>40</b>
Dissolved Oxygen	mg/l			<b>2.55</b>	<b>1.78</b>	<b>1.52</b>	<b>1.63</b>	<b>1.86</b>
Eh	mV			<b>377</b>	<b>66</b>	<b>-49</b>	<b>101</b>	<b>95</b>
ORP	mV			<b>165.4</b>	<b>-146.7</b>	<b>-260.3</b>	<b>-110.1</b>	<b>-114.7</b>
pH	su			<b>5.06</b>	<b>8.78</b>	<b>11.84</b>	<b>11.54</b>	<b>7.38</b>
Specific Conductance	mS/cm			<b>1.615</b>	<b>0.815</b>	<b>2.135</b>	<b>0.657</b>	<b>2.793</b>
Turbidity	NTU			<b>1.85</b>	<b>0.87</b>	<b>2.47</b>	<b>1.93</b>	<b>5.01</b>
Water Temperature	°C			<b>17.7</b>	<b>16.9</b>	<b>17.8</b>	<b>19</b>	<b>20.4</b>

**Detections in bold**

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C<sub>T</sub> = -0.7357(T) + 224.82



**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RW05R-MWI	RW21-MWI	RW22R-MWI	RW23-MWI	RW24-MWI	RW25-MWI	RWA-MWI
Date Sample Collected				5/13/2019	5/9/2019	5/14/2019	5/3/2019	5/8/2019	5/8/2019	5/15/2019
<b>Total Metals</b>										
Cadmium	µg/L	7.9	5	2,590	53.9	3 U	2,340	1,610	500	6,970
Zinc	µg/L	81	6,000	68,400	630,000	1,750	112,000	695,000	421,000	391,000
<b>Dissolved Metals</b>										
Cadmium Dissolved	µg/L	7.9	5	2,570	50.2	3 U	2,270	1,580	507	6,830
Zinc Dissolved	µg/L	81	6,000	66,800	624,000	1,030	109,000	650,000	413,000	375,000
<b>Other</b>										
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			280	1,980	412	322	1,180	702	832
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			100 J-	8 J	38 J-	38	10	20	20
Dissolved Oxygen	mg/l			2.39	2.53	2.23	3.01	2.44	3.03	2.59
Eh	mV			113	183	168	233	228	119	272
ORP	mV			-99.8	-29	-44.7	20.8	15.9	-94	61.1
pH	su			6.46	5.40	6.08	5.72	5.02	5.66	5.39
Specific Conductance	mS/cm			7.551	3.322	2.805	2.283	3.067	2.029	2.888
Turbidity	NTU			8.77	38.89	16.7	196.5	31.1	16.7	75.7
Water Temperature	°C			16.2	17.5	16.3	16.7	17.2	16.4	18.3

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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

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

J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82

**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RWB-MWI	RWD-MWI	RWE-MWI	RWF-MWI	RWG-MWI	RWH-MWI	RWI-MWI
Date Sample Collected				5/15/2019	5/14/2019	5/14/2019	5/16/2019	5/13/2019	5/9/2019	5/9/2019
<b>Total Metals</b>										
Cadmium	µg/L	7.9	5	3 U	402	722	906	23.9	103	8,950
Zinc	µg/L	81	6,000	17.6	37,700	121,000	40,700	357	234,000	652,000
<b>Dissolved Metals</b>										
Cadmium Dissolved	µg/L	7.9	5	3 U	395	700	859	22.9	92.4	8,050
Zinc Dissolved	µg/L	81	6,000	18.4	36,200	112,000	41,900	332	226,000	632,000
<b>Other</b>										
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			10 U	328	528	182	50	642	10 U
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			102	48 J-	52 J-	96 J-	70 J-	84	184
Dissolved Oxygen	mg/l			2.68	2.71	2.68	2.99	2.45	3.05	2.96
Eh	mV			173	221	120	127	83	142	153
ORP	mV			-38.9	8.1	-93.1	-85.5	-130.7	-70.5	-59.4
pH	su			6.43	5.79	6.09	6.54	6.73	6.14	5.94
Specific Conductance	mS/cm			1.696	3.046	4.699	10.708	10.408	2.675	3.985
Turbidity	NTU			34.6	32.1	17.8	11.2	11.7	16.7	10.57
Water Temperature	°C			16.9	15.8	16.2	16.6	15.4	16.1	16.8

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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

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

J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82

**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RWJ-MWI	RWJ-SB	RWK-MWI	RWL-MWI	RWM-MWI	RWO-MWI
Date Sample Collected				5/7/2019	5/1/2019	5/7/2019	5/8/2019	5/3/2019	5/10/2019
<b>Total Metals</b>									
Cadmium	µg/L	7.9	5	<b>61.4</b>	NS	<b>46.7</b>	<b>1,260</b>	<b>1,130</b>	<b>70.3</b>
Zinc	µg/L	81	6,000	<b>3,080</b>	NS	<b>21,300</b>	<b>163,000</b>	<b>165,000</b>	<b>243,000</b>
<b>Dissolved Metals</b>									
Cadmium Dissolved	µg/L	7.9	5	<b>61.2</b>	<b>5,260</b>	<b>33.5</b>	<b>1,230</b>	<b>1,080</b>	<b>68.2</b>
Zinc Dissolved	µg/L	81	6,000	<b>1,580</b>	<b>161,000</b>	<b>21,100</b>	<b>169,000</b>	<b>162,000</b>	<b>249,000</b>
<b>Other</b>									
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			<b>10</b>	<b>230</b>	<b>78</b>	<b>452</b>	<b>486</b>	<b>268</b>
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			<b>10</b>	<b>46</b>	<b>8 J</b>	<b>12</b>	<b>42</b>	<b>78</b>
Dissolved Oxygen	mg/l			<b>1.63</b>	NS	<b>1.63</b>	<b>2.64</b>	<b>2.55</b>	<b>2.01</b>
Eh	mV			<b>-76</b>	NS	<b>57</b>	<b>197</b>	<b>127</b>	<b>187</b>
ORP	mV			<b>-288</b>	NS	<b>-154.7</b>	<b>-15.3</b>	<b>-85.6</b>	<b>-25.5</b>
pH	su			<b>8.45</b>	NS	<b>6.93</b>	<b>5.88</b>	<b>6.01</b>	<b>5.63</b>
Specific Conductance	mS/cm			<b>2.486</b>	NS	<b>2.238</b>	<b>2.103</b>	<b>2.118</b>	<b>2.689</b>
Turbidity	NTU			<b>15.7</b>	NS	<b>13.8</b>	<b>28.1</b>	<b>275.3</b>	<b>10.6</b>
Water Temperature	°C			<b>17.4</b>	NS	<b>18.5</b>	<b>17.5</b>	<b>16.6</b>	<b>17.2</b>

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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

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

J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82



**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RWP-MWI	RWQ-MWI	RWR-MWI	RWS-MWI	RWU-SB	RW01-MW(I)
Date Sample Collected				5/17/2019	5/16/2019	5/10/2019	5/17/2019	4/30/2019	5/29/2019
<b>Total Metals</b>									
Cadmium	µg/L	7.9	5	<b>2,790</b>	<b>28.3</b>	<b>457</b>	3 U	NS	<b>24.4</b>
Zinc	µg/L	81	6,000	<b>2,970,000</b>	<b>339,000</b>	<b>2,660,000</b>	<b>843,000</b>	NS	<b>5,980</b>
<b>Dissolved Metals</b>									
Cadmium Dissolved	µg/L	7.9	5	<b>2,810</b>	<b>26.2</b>	<b>440</b>	3 U	3 U	<b>19.4</b>
Zinc Dissolved	µg/L	81	6,000	<b>3,210,000</b>	<b>357,000</b>	<b>2,560,000</b>	<b>797,000</b>	<b>63.8</b>	<b>5,670</b>
<b>Other</b>									
Acidity (CaCO3 pH8.3)	mg/l			<b>3,440</b>	<b>1,300</b>	<b>2,700</b>	<b>2,810</b>	10 U	<b>320</b>
Alkalinity (CaCO3 pH4.5)	mg/l			<b>40</b>	<b>54 J-</b>	<b>66</b>	<b>50</b>	<b>138</b>	<b>40</b>
Dissolved Oxygen	mg/l			<b>2.43</b>	<b>2.37</b>	<b>2.24</b>	<b>3.23</b>	NS	<b>2.26</b>
Eh	mV			<b>253</b>	<b>199</b>	<b>134</b>	<b>199</b>	NS	<b>129</b>
ORP	mV			<b>41.2</b>	<b>-13.7</b>	<b>-79.5</b>	<b>-15</b>	NS	<b>-82.8</b>
pH	su			<b>5.19</b>	<b>5.63</b>	<b>5.24</b>	<b>5.46</b>	NS	<b>6.26</b>
Specific Conductance	mS/cm			<b>5.331</b>	<b>2.88</b>	<b>5.052</b>	<b>5.486</b>	NS	<b>5.871</b>
Turbidity	NTU			<b>28.8</b>	<b>8.25</b>	<b>22.8</b>	<b>19.3</b>	NS	<b>7.91</b>
Water Temperature	°C			<b>17.5</b>	<b>16.1</b>	<b>15.3</b>	<b>15</b>	NS	<b>18.3</b>

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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

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

J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82

**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RW02-MW(I)	RW03-MW(I)	RW06-MW(I)	RW07-MW(I)	RW08-MW(I)	RW09-MW(I)
Date Sample Collected				5/29/2019	5/28/2019	5/23/2019	5/24/2019	5/24/2019	5/28/2019
<b>Total Metals</b>									
Cadmium	µg/L	7.9	5	803	536	903	445	3 U	4.7
Zinc	µg/L	81	6,000	58,700	14,200	109,000	132,000	44	68,400
<b>Dissolved Metals</b>									
Cadmium Dissolved	µg/L	7.9	5	785	449	885	453	3 U	3.8
Zinc Dissolved	µg/L	81	6,000	56,600	13,300	108,000	136,000	10 U	64,200
<b>Other</b>									
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			260	170	322	676	142	900
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			80	50	12	30	64	30
Dissolved Oxygen	mg/l			2.42	2.54	5.56	2.4	2.19	2.25
Eh	mV			126	180	241	178	122	182
ORP	mV			-86.1	-32.9	29.2	-34.4	-89.6	-29.8
pH	su			6.39	6.07	7.16	5.68	6.16	5.75
Specific Conductance	mS/cm			7.314	8.072	0.237	2.919	1.499	2.367
Turbidity	NTU			13.6	12.1	19.8	17.9	10.68	10.44
Water Temperature	°C			17.6	16.8	17.6	17.4	17.5	17.8

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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

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

J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82

**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RW10-MW(I)	RW11-MW(I)	RW12-MW(I)	RW13-MW(I)	RW15-MW(I)	RW16-MW(I)
Date Sample Collected				5/24/2019	5/22/2019	5/20/2019	5/21/2019	5/21/2019	5/22/2019
<b>Total Metals</b>									
Cadmium	µg/L	7.9	5	3 B	598	1,500	94.7	64.9	3 U
Zinc	µg/L	81	6,000	6,150	122,000	120,000	580	16,500	135
<b>Dissolved Metals</b>									
Cadmium Dissolved	µg/L	7.9	5	0.86 J	586	1,520	51.1	64.2	3 U
Zinc Dissolved	µg/L	81	6,000	5,560	121,000	111,000	97.7	16,400	4.9 J
<b>Other</b>									
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			98	462	274	10	23	10 U
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			78	24	20	5 J	30	36
Dissolved Oxygen	mg/l			1.86	2.59	2.84	6.57	1.98	2.52
Eh	mV			105	176	277	337	153	221
ORP	mV			-107.1	-36.6	66.2	124.3	-58.6	9.4
pH	su			6.59	5.97	5.36	10.25	6.91	9.88
Specific Conductance	mS/cm			1.403	2.439	1.495	1.506	0.402	1.019
Turbidity	NTU			45.3	6.05	0.91	0.98	4.19	6.58
Water Temperature	°C			17.4	17.2	18.5	16.9	17.3	17.9

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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

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

J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

Eh = ORP + C<sub>T</sub>

C<sub>T</sub> = -0.7357(T) + 224.82



**Table 4**  
**RWM Supplemental Investigation**  
**Summary of Intermediate and Deep Groundwater Results**

Parameter	Units	AWQS	PAL	RW18-MW(I)	RW19-MW(I)	RW06R-MW(D)
Date Sample Collected				5/21/2019	5/29/2019	5/23/2019
<b>Total Metals</b>						
Cadmium	µg/L	7.9	5	<b>38</b>	<b>2,440</b>	3 U
Zinc	µg/L	81	6,000	<b>276,000</b>	<b>7,270,000</b>	<b>45.3</b>
<b>Dissolved Metals</b>						
Cadmium Dissolved	µg/L	7.9	5	<b>38</b>	<b>2,420</b>	3 U
Zinc Dissolved	µg/L	81	6,000	<b>279,000</b>	<b>7,280,000</b>	<b>24.3</b>
<b>Other</b>						
Acidity (CaCO <sub>3</sub> pH8.3)	mg/l			<b>966</b>	<b>9,180</b>	<b>102</b>
Alkalinity (CaCO <sub>3</sub> pH4.5)	mg/l			<b>2.5 J</b>	<b>70</b>	<b>54</b>
Dissolved Oxygen	mg/l			<b>1.91</b>	<b>2.15</b>	<b>2.58</b>
Eh	mV			<b>249</b>	<b>267</b>	<b>106</b>
ORP	mV			<b>37.1</b>	<b>58.1</b>	<b>-104.9</b>
pH	su			<b>5.43</b>	<b>5.23</b>	<b>6.47</b>
Specific Conductance	mS/cm			<b>2.494</b>	<b>6.893</b>	<b>2.07</b>
Turbidity	NTU			<b>1.9</b>	<b>7.91</b>	<b>9.56</b>
Water Temperature	°C			<b>17.6</b>	<b>21.4</b>	<b>18.3</b>

**Detections in bold**

**Values in red indicate an exceedance of the Project Action Limit (PAL) and Ambient Water Quality Standard (AWQS)**

**Values in blue indicate an exceedance of the Ambient Water Quality Standard (AWQS)**

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J-: The positive result reported for this analyte is a quantitative estimate but may be biased low.

NS: Not sampled

$Eh = ORP + C_T$

$C_T = -0.7357(T) + 224.82$

**Table 5**  
**Rod and Wire Mill - Offshore Investigation**  
**Summary of Pore Water Results**

Parameter	Units	Surface Water Criteria	RW-001-PW	RW-002-PW	RW-003-PW	RW-004-PW	RW-005-PW	RW-006-PW-2	RW-007-PW-1
<b>Dissolved Metals</b>									
Cadmium	µg/L	7.9	NS (HB)	NS (HB)	NS (30)	NS (30)	NS (LP)	<b>10.9</b>	<b>0.72 J</b>
Zinc	µg/L	81	NS (HB)	NS (HB)	NS (30)	NS (30)	NS (LP)	<b>75,200</b>	<b>7,810</b>
Hardness	µg/L		NS (HB)	NS (HB)	NS (30)	NS (30)	NS (LP)	<b>1,600,000</b>	<b>1,110,000</b>

Parameter	Units	Surface Water Criteria	RW-007-PW-3	RW-008-PW-1	RW-008-PW-3	RW-009-PW-1	RW-009-PW-2	RW-010-PW	RW-011-PW-1
<b>Dissolved Metals</b>									
Cadmium	µg/L	7.9	<b>2.6 J</b>	3 U	<b>1.9 J</b>	3 U	3 U	NS (30)	3 U
Zinc	µg/L	81	<b>122,000</b>	<b>656</b>	<b>21,700</b>	<b>4.7 J</b>	<b>69.5</b>	NS (30)	<b>3.4 J</b>
Hardness	µg/L		<b>1,220,000</b>	<b>1,390,000</b>	<b>1,940,000</b>	<b>985,000</b>	<b>2,100,000</b>	NS (30)	<b>898,000</b>

Parameter	Units	Surface Water Criteria	RW-012-PW-1	RW-013-PW-1	RW-013-PW-2	RW-014-PW-1	RW-014-PW-3	RW-015-PW-1	RW-015-PW-3
<b>Dissolved Metals</b>									
Cadmium	µg/L	7.9	3 U	<b>0.38 J</b>	3 U	3 U	3 U	3 U	3 U
Zinc	µg/L	81	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Hardness	µg/L		<b>864,000</b>	<b>1,100,000</b>	<b>1,290,000</b>	<b>1,110,000</b>	<b>1,980,000</b>	<b>878,000</b>	<b>1,650,000</b>

**Detections in bold**

**Values in red indicate an exceedance of the Surface Water Criteria**

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

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

NS (HB): Not sampled due to hard bottom

NS (LP): Not sampled due to low porosity

NS (30): Not sampled due to <30% difference in specific conductance between pore water and surface water

**Table 5**  
**Rod and Wire Mill - Offshore Investigation**  
**Summary of Pore Water Results**

Parameter	Units	Surface Water Criteria	RW-016-PW-1	RW-016-PW-3	RW-017-PW-1	RW-017-PW-3	RW-018-PW-3	RW-019-PW	RW-020-PW-1
<b>Dissolved Metals</b>									
Cadmium	µg/L	7.9	3 U	3 U	3 U	3 U	3 U	NS (LP)	3 U
Zinc	µg/L	81	10 U	<b>9.1 J</b>	10 U	10 U	<b>3.6 J</b>	NS (LP)	10 U
Hardness	µg/L		<b>662,000</b>	<b>489,000</b>	<b>1,740,000</b>	<b>1,150,000</b>	<b>1,800,000</b>	NS (LP)	<b>1,120,000</b>

Parameter	Units	Surface Water Criteria	RW-020-PW-3	RW-021-PW-1	RW-021-PW-3	RW-022-PW	RW-023-PW	RW-024-PW	PW-D02-1
<b>Dissolved Metals</b>									
Cadmium	µg/L	7.9	<b>0.36 J</b>	3 U	<b>0.35 J</b>	NS (HB)	NS (LP)	NS (LP)	3 U
Zinc	µg/L	81	10 U	10 U	10 U	NS (HB)	NS (LP)	NS (LP)	<b>2.7 J</b>
Hardness	µg/L		<b>2,110,000</b>	<b>745,000</b>	<b>289,000</b>	NS (HB)	NS (LP)	NS (LP)	<b>892,000</b>

Parameter	Units	Surface Water Criteria	PW-DE01-1
<b>Dissolved Metals</b>			
Cadmium	µg/L	7.9	3 U
Zinc	µg/L	81	10 U
Hardness	µg/L		<b>920,000</b>

**Detections in bold**

**Values in red indicate an exceedance of the Surface Water Criteria**

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

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

NS (HB): Not sampled due to hard bottom

NS (LP): Not sampled due to low porosity

NS (30): Not sampled due to <30% difference in specific conductance between pore water and surface water



**Table 6**  
**Rod and Wire Mill - Offshore Investigation**  
**Summary of Surface Water Results**

Parameter	Units	Surface Water Criteria	RW-001-SW-2	RW-004-SW-2	RW-006-SW-1.5	RW-007-SW-1.5	RW-008-SW-1.5	RW-10-SW-1.5	RW-022-SW-1.5
<b>Metals</b>									
Zinc (Dissolved)	µg/L	81	<b>9.5 J</b>	<b>12.2</b>	<b>7.4 J</b>	<b>11.5</b>	<b>13.7</b>	<b>7.5 J</b>	<b>7.9 J</b>
Hardness (Total)	mg/L	---	<b>582</b>	<b>572</b>	<b>623</b>	<b>605</b>	<b>60</b>	<b>603</b>	<b>623</b>

**Detections in bold**

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

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## **APPENDIX A**

### **Boring and Well Construction Logs**

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# ARM Group Inc.

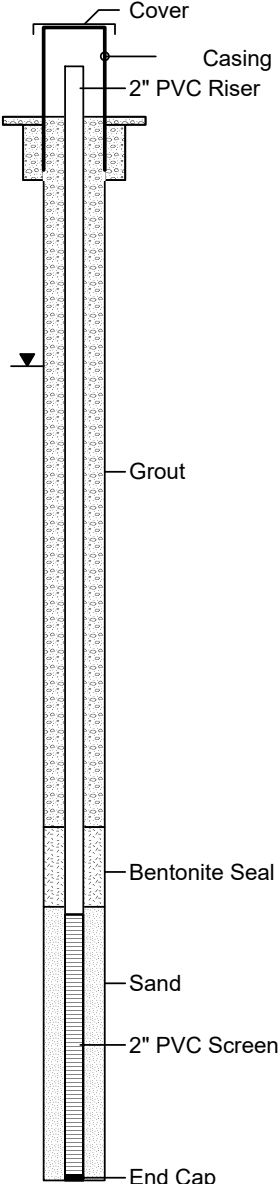
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
 Project Number : 190341M-2  
 Client : EnviroAnalytics Group  
 Site : Sparrow's Point  
 Borehole Location : Parcel A3  
 ARM Representative : L. Perrin  
 Checked by : M. Replogle, EIT  
 Drilling Company : GSI, Inc.  
 Driller : Ali Berenbrok-Niblett  
 Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571732.44  
 Easting (ft) : 1455877.00  
 Date/Time Started : 4/23/19 1118  
 Date/Time Completed : 4/23/19 1427  
 Surf. Elev. (ft AMSL) : 10.56'  
 TOC Elev. (ft AMSL) : 12.95'  
 Total Well Depth (ft) : 40' bgs  
 Depth to Water (ft) : 0 Hr: 11.64' TOC  
 Depth to Water (ft) : Static: 12.21' TOC  
 Bit/Auger Size (in.) : 3.50"

Well ID: RW05R-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	54	-	(0-7.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to dense, brown to dark brown, dry to very moist, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid            1.5x1.5' concrete pad            1" expandable-type cap            Casing Stickup (ags): 3.15'</p> <p>Riser: Sch 40 PVC            Riser Diameter: 1 in            Riser Stickup (ags): 2.83'            Riser Amount: 26.71'</p> <p>Grout: Portland w/ 5% Bentonite            Top: 0' bgs            Bottom: 26.71' bgs</p> <p>Wet at 10.3' bgs</p> <p>Bentonite Seal: 1-3' sleeve            Top: 26.71' bgs            Bottom: 29.71' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand            Top: 29.71' bgs            Bottom: 39.71' bgs</p> <p>Screen: Sch 40 PVC            Screen Diameter: 1 in            Slot Size: 0.010"            Top: 29.71' bgs            Bottom: 39.71' bgs            Total Screen: 10'</p> <p>Collapsed Material            Top: 39.71' bgs            Bottom: 40.00' bgs</p>
5	78	-	(7.5-9.4') GRAVELLY SILT with SAND, very firm, black, moist, non-plastic, non-cohesive	ML	
10	94	0.0	(9.4-10.3') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to dense, brown to dark brown, dry to very moist, non-plastic, non-cohesive	SW/GW	
15	100	0.0	(10.3-13.5') CLAYEY SAND, medium dense, pale brown, wet, non-plastic, non-cohesive	SC	
20	80	0.1	(13.5-13.9') SANDY CLAY, very firm, reddish yellow, moist, low plasticity, cohesive	CL	
25	62	0.1	(13.9-15') SAND with CLAY, medium dense, reddish yellow and pale brown, wet, non-plastic, non-cohesive	SW/CL	
30	84	0.1	(15-20') SAND, very fine to medium, medium dense, reddish yellow then brownish gray at 17.5' bgs, wet, non-plastic, non-cohesive	SW	
35	100	0.1	(20-21.4') SANDY CLAY, soft, gray, very moist, low plasticity, cohesive	CL	
40		0.1	(21.4-27.4') CLAY, firm to very firm, brown, moist, medium plasticity, cohesive	CL	
45		0.1	(27.4-33.3') SAND, medium to coarse, and GRAVEL, fine, loose to medium dense, very pale brown, wet, non-plastic, non-cohesive	SW/GP	
		0.1	(33.3-35') CLAY, hard, gray, dry to moist, low plasticity, cohesive	CL	
		0.1	(35-36.3') CLAYEY SAND, dense, gray, wet, non-plastic, non-cohesive	SC	
		0.2	(36.3-40') SAND with CLAY, medium dense, gray, wet, non-plastic, non-cohesive	SW-SC	
		0.3			
		0.4			

End of boring

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

Monitoring Well Development  
 Date: 05/01/2019  
 Purged Amount: 6.50 gallons  
 Well Volumes Removed: 5.37





# ARM Group Inc.

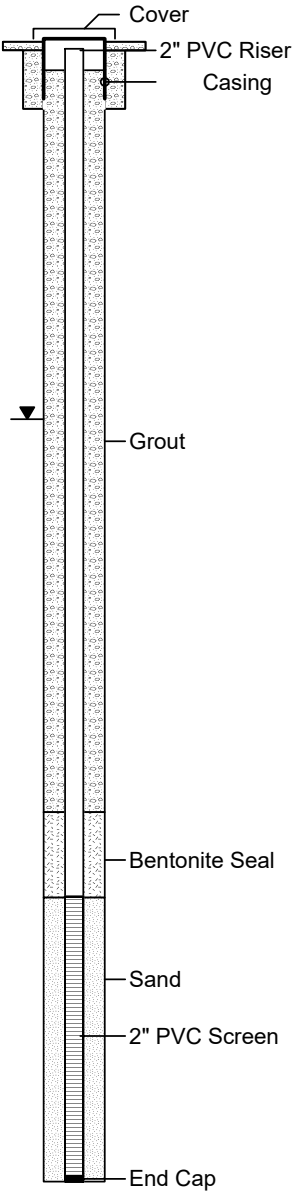
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
 Project Number : 190341M-2  
 Client : EnviroAnalytics Group  
 Site : Sparrow's Point  
 Borehole Location : Parcel A3  
 ARM Representative : L. Perrin  
 Checked by : M. Replogle, EIT  
 Drilling Company : GSI, Inc.  
 Driller : Kevin Pumphrey  
 Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572350.773  
 Easting (ft) : 1456246.875  
 Date/Time Started : 4/09/19 1255  
 Date/Time Completed : 4/09/19 1535  
 Surf. Elev. (ft AMSL) : 14.63'  
 TOC Elev. (ft AMSL) : 14.46'  
 Total Well Depth (ft) : 40.04' bgs  
 Depth to Water (ft) : 0 Hr: 12.83' TOC  
 Depth to Water (ft) : Static: 13.00' TOC  
 Bit/Auger Size (in.) : 3.50"

Well ID: RW21-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-2.5') SANDY CLAY with GRAVEL, hard, reddish brown, dry, low plasticity, cohesive	CL	 <p>6" Protective Steel Casing with Locking Flush Mount Lid          1.5x1.5' concrete pad          1" expandable-type cap          Casing Stickup (ags): 0.45'</p> <p>Riser: Sch 40 PVC          Riser Diameter: 1 in          Riser Stickup (bgs): 0.25'          Riser Amount: 26.79'</p> <p>Wet at 9.9' bgs</p> <p>Grout: Portland w/ 5% Bentonite          Top: 1' bgs          Bottom: 27.04' bgs</p> <p>Bentonite Seal: 1-3' sleeve          Top: 27.04' bgs          Bottom: 30.04' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand          Top: 30.04' bgs          Bottom: 40.04' bgs</p> <p>Screen: Sch 40 PVC          Screen Diameter: 1 in          Slot Size: 0.010"          Top: 30' bgs          Bottom: 40' bgs          Total Screen: 10'</p>
5	68	1.1 23.6 16.6	(2.5-9.9') Non-native SAND with some SLAG, SAND and GRAVEL-sized, dark brown with gray, dry, non-plastic, non-cohesive	SW/GW	
10	80	- 20.0 3.6 6.9 2.8	(9.9-13') SILT with SAND, very soft, yellowish red, wet, non-plastic, non-cohesive	ML	
15	58	0.0 0.0 0.0	(13-16.2') CLAYEY SAND, firm to very firm, yellowish red and light brown, wet, non-plastic, non-cohesive	SC	
20	100	0.2 0.0 0.0 0.0	(16.2-19.5') SANDY CLAY, very firm, yellowish red and light gray, very moist, low plasticity, cohesive	CL	
25	100	0.0 0.0 0.0	(19.5-20') CLAY with SAND, hard, grayish brown, very moist, low plasticity, cohesive	CL	
30	100	0.1 0.0 0.0	(20-28') CLAY, very firm, grayish brown, moist, medium plasticity, cohesive	CL	
35	74	0.0 0.6 4.2 0.0	(28-29') SAND, fine to medium, light brown and pale brown, wet, non-plastic, non-cohesive	SW	
40	100	0.5 0.0 0.0 0.0	(29-30.5') SANDY CLAY, very firm, very moist, light brown and light gray, low plasticity, cohesive	CL	
		0.0 0.0 0.0	(30.5-34.5') SAND, fine to medium, medium dense, light gray grading to grayish brown, wet, non-plastic, non-cohesive	SW	
		0.2 0.0 0.0	(34.5-35') SANDY CLAY, very firm, very moist, light gray, low plasticity, cohesive	CL	
		0.0	(35-40') CLAY with SAND grading to CLAY, very firm, light gray grading to brown, very moist to moist, low plasticity, cohesive	CL	
End of boring					

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

Monitoring Well Development  
 Date: 04/30/2019  
 Purged Amount: 4.50 gallons  
 Well Volumes Removed: 4.13



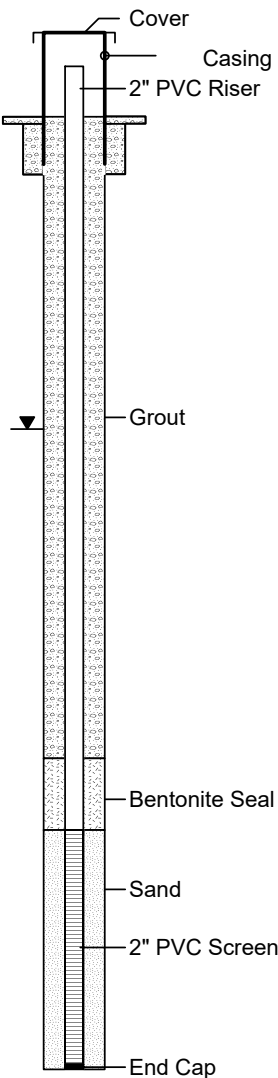
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572405.72  
Easting (ft) : 1456075.11  
Date/Time Started : 4/11/19 0840  
Date/Time Completed : 4/11/19 1127  
Surf. Elev. (ft AMSL) : 14.02'  
TOC Elev. (ft AMSL) : 16.63'  
Total Well Depth (ft) : 39.8' bgs  
Depth to Water (ft) : 0 Hr: 14.20' TOC  
Depth to Water (ft) : Static: 15.97' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RW22R-MWI**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	76	-	(0-1.5') SANDY SILT, very firm, brown to dark brown, dry, non-plastic, non-cohesive, light amount of ORGANICS	ML	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.15'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.92' Riser Amount: 26.8'</p> <p>Wet at 13.7' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 26.8' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 26.8' bgs Bottom: 29.8' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 29.8' bgs Bottom: 39.8' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30' bgs Bottom: 40' bgs Total Screen: 10'</p>
5	40	-	(1.5-12') Non-native SAND with SLAG, SAND and GRAVEL-sized, medium dense, dark brown with gray, dry, non-plastic, non-cohesive	SW/GW	
10	26	-	(12-15') SAND, fine to medium with trace coarse, yellowish red, wet, non-plastic, non-cohesive	SW	
15	100	-	(15-17.5') CLAYEY SAND, medium dense, light brown, wet, non-plastic, non-cohesive	SC	
20	100	-	(17.5-22.5') SANDY CLAY grading to CLAY, very firm to hard, light gray and pale brown to grayish brown, moist, low plasticity, cohesive	CL	
25	100	-	(22.5-25') CLAYEY SAND, loose to medium dense, light gray grading to light brown, wet, non-plastic, non-cohesive	SC	
30	100	-	(25-26.1') CLAY, very firm, brown and grayish brown, dry, low plasticity, cohesive	CL	
35	100	-	(26.1-27') SAND, fine to medium, pale brown and brown, wet, non-plastic, non-cohesive	SW	
40	100	-	(27-30') SANDY CLAY grading to CLAY with trace SAND, firm to very firm, light gray, very moist to moist, low plasticity, cohesive	SC	
45	100	-	(30-30.5') SAND, fine to medium, medium dense, light gray, wet, non-plastic, non-cohesive	CL	
50	100	-	(30.5-32') CLAYEY SAND, medium dense, light gray, wet, non-plastic, non-cohesive	SC	
		-	(32-35') SANDY CLAY, firm. light gray, very moist, low plasticity, cohesive	CL	
		-	(35-36.5') CLAYEY SAND, medium dense, light gray, moist to wet, non-plastic, non-cohesive		
		-	(36.5-40') CLAY, hard, brown to dark brown, dry, low plasticity, cohesive		
		-	End of Boring		

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

Monitoring Well Development  
Date: 04/18/2019  
Purged Amount: 3.50 gallons  
Well Volumes Removed: 3.37



# ARM Group Inc.

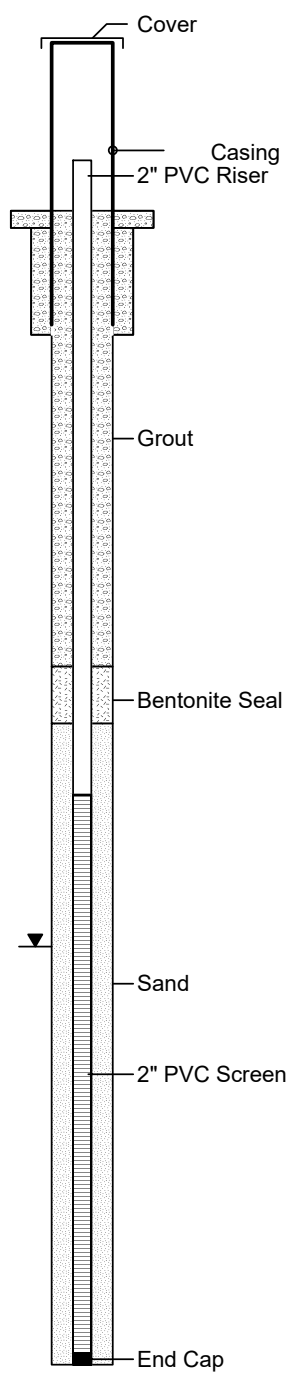
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
 Project Number : 190341M-2  
 Client : EnviroAnalytics Group  
 Site : Sparrow's Point  
 Borehole Location : Parcel A3  
 ARM Representative : L. Perrin  
 Checked by : M. Replogle, EIT  
 Drilling Company : GSI, Inc.  
 Driller : Kevin Pumphrey  
 Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572408.26  
 Easting (ft) : 1456073.27  
 Date/Time Started : 4/10/19 1421  
 Date/Time Completed : 4/10/19 1515  
 Surf. Elev. (ft AMSL) : 14.02'  
 TOC Elev. (ft AMSL) : 16.56'  
 Total Well Depth (ft) : 20.25' bgs  
 Depth to Water (ft) : 0 Hr: 15.58' TOC  
 Depth to Water (ft) : Static: 15.61' TOC  
 Bit/Auger Size (in.) : 3.50"

Well ID: RW22R-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-1.5') SANDY SILT with GRAVEL, hard, reddish brown, dry, non-plastic, non-cohesive	ML	 <p>4" Protective Steel Casing with Locking Lid          1.5x1.5' concrete pad          1" expandable-type cap          Casing Stickup (ags): 2.98'</p> <p>Riser: Sch 40 PVC          Riser Diameter: 1 in          Riser Stickup (ags): 2.70'          Riser Amount: 10.25'</p> <p>Grout: Portland w/ 5% Bentonite          Top: 0' bgs          Bottom: 8' bgs</p> <p>Bentonite Seal: Granular          Top: 8' bgs          Bottom: 9' bgs</p> <p>Wet at 13.6' bgs</p> <p>Filter Pack: #2 Sand          Top: 9' bgs          Bottom: 10.25' bgs</p> <p>2-5' prepack with #2 Sand:          Top: 10.25' bgs          Bottom: 20.25' bgs</p> <p>Screen: Sch 40 PVC          Screen Diameter: 1 in          Slot Size: 0.010"          Top: 10' bgs          Bottom: 20' bgs          Total Screen: 10'</p>
0.4	74	0.0	(1.5-4') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense, gray and dark brown, dry, non-plastic, non-cohesive	SW/GW	
5	-	0.0	(4-13.6') Non-native SAND with BRICK and SLAG, SAND and GRAVEL-sized, loose to medium dense, dark brown, gray, and yellow, moist to dry, non-plastic, non-cohesive	SW/GW	
5	50	0.0			
10	-	0.0			
10	56	0.0			
15	-	0.0	(13.6-15') SAND, very fine to medium, medium dense, yellowish red, wet, non-plastic, non-cohesive	SW	
15	-	0.0	(15-17.2') CLAYEY SAND grading to SAND, medium dense, reddish yellow, light brown, and pale brown, wet, non-plastic, non-cohesive	SC/SW	
20	84	0.0	(17.2-19.6') CLAY with SAND to SANDY CLAY, soft to firm, light gray and reddish yellow, very moist to moist, low plasticity, cohesive	CL	
20	-	0.0	(19.6-20') CLAY, hard, brown, dry, low plasticity, cohesive	CL	
			End of boring		

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

Monitoring Well Development  
 Date: 04/17/2019  
 Purged Amount: 2.75 gallons  
 Well Volumes Removed: 9.48





# ARM Group Inc.

Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
 Project Number : 190341M-2  
 Client : EnviroAnalytics Group  
 Site : Sparrow's Point  
 Borehole Location : Parcel A3  
 ARM Representative : L. Perrin  
 Checked by : M. Replogel, EIT  
 Drilling Company : GSI, Inc.  
 Driller : Kevin Pumphrey  
 Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571880.80  
 Easting (ft) : 1456165.13  
 Date/Time Started : 4/3/19 1215  
 Date/Time Completed : 4/3/19 1500  
 Surf. Elev. (ft AMSL) : 14.60'  
 TOC Elev. (ft AMSL) : 14.36'  
 Total Well Depth (ft) : 40.04' bgs  
 Depth to Water (ft) : 0 Hr: 13.14' TOC  
 Depth to Water (ft) : Static: 14.00' TOC  
 Bit/Auger Size (in.) : 3.50"

Well ID: RW23-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	78	-	(0-9.5') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown, dry, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	24	-				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.3' Riser Amount: 26.74'
10	72	-	(9.5-16') CLAYEY SAND, medium dense, reddish yellow and light brown then gray from 14.5-16' bgs, very moist then wet at 14' bgs, non-plastic, non-cohesive	SC		Wet at 14' bgs
15	92	-	(16-19.5') CLAY with SAND to CLAY, soft, dark gray, moist, low plasticity, cohesive	CL	Grout	Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 27.04' bgs
20	100	-	(19.5-22.8') SAND, fine to medium, with SILT, medium dense, gray, wet, non-plastic, non-cohesive	SW-SM		
25	100	-	(22.8-24') SANDY CLAY, firm, gray, very moist, low plasticity, cohesive	CL		Bentonite Seal: 1-3' sleeve Top: 27.04' bgs Bottom: 30.04' bgs
30	52	-	(24-25') CLAY, very firm, grayish brown, moist, low plasticity, cohesive	CL	Bentonite Seal	
35	100	-	(25-29.1') CLAY, soft to firm, grayish brown, very moist, low plasticity, cohesive	CL		Filter Pack: 2-5' prepack with #2 Sand Top: 30.04' bgs Bottom: 40.04' bgs
40	100	-	(29.1-34.7') SAND, fine to very coarse with GRAVEL, fine, medium dense, brownish yellow, wet, non-plastic, non-cohesive	SW/GP	Sand	
		-	(34.7-35') GRAVEL, fine, with trace SAND, medium dense to loose, brownish yellow, wet, non-plastic, non-cohesive	GP	2" PVC Screen	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30' bgs Bottom: 40' bgs Total Screen: 10'
		0.1	(35-40') CLAY with trace SAND, very firm, light brown to grayish brown, moist, low plasticity, cohesive	CL	End Cap	
			End of boring			

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

Monitoring Well Development  
 Date: 04/16/2019  
 Purged Amount: 9.25 gallons  
 Well Volumes Removed: 8.89



**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571883.60  
Easting (ft) : 1456164.80  
Date/Time Started : 4/4/19 0815  
Date/Time Completed : 4/4/19 0915  
Surf. Elev. (ft AMSL) : 14.50'  
TOC Elev. (ft AMSL) : 14.24'  
Total Well Depth (ft) : 20' bgs  
Depth to Water (ft) : 0 Hr: 13.00' TOC  
Depth to Water (ft) : Static: 9.74' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RW23-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		-	(0-7.7') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, brown to dark brown, dry, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
80		0.0				
5		-			Grout	Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.3' Riser Amount: 9.70'
56		0.0	(7.7-8) CLAYEY SAND, dense, reddish yellow, moist, non-plastic, non-cohesive	SC		Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs
10		0.0	(8-10.2') SAND, fine to coarse, reddish yellow, very moist, non-plastic, non-cohesive	SW	Bentonite Seal	Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs
100		0.0	(10.2-11.5') SANDY CLAY, firm, reddish yellow with gray, moist, low plasticity, cohesive	CL		Wet at 11.5' bgs
15		0.0	(11.5-14') SAND with CLAY, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW-SC	Sand	Filter Pack: #2 sand Top: 9' bgs Bottom: 10' bgs
100		0.0	(14-15.2') CLAYEY SAND, medium dense, gray, wet, non-plastic, non-cohesive	SC	2" PVC Screen	2-5' prepack sand with #2 Sand: Top: 10' bgs Bottom: 20' bgs
20		0.0	(15.2-20') CLAY, soft, gray, very moist, low plasticity, cohesive	CL	End Cap	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10' bgs Bottom: 20' bgs Total Screen: 10'
			End of boring			

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

Monitoring Well Development  
Date: 04/16/2019  
Purged Amount: 3.00 gallons  
Well Volumes Removed: 7.32



**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572223.81  
Easting (ft) : 1456460.41  
Date/Time Started : 4/12/19 0850  
Date/Time Completed : 4/12/19 1045  
Surf. Elev. (ft AMSL) : 12.74'  
TOC Elev. (ft AMSL) : 12.57'  
Total Well Depth (ft) : 39.94' bgs  
Depth to Water (ft) : 0 Hr: 10.84' TOC  
Depth to Water (ft) : Static: 11.04' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RW24-MWI**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	78	-	(0-11') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to dense, dark brown and gray, dry then wet at 9.5.bgs, non-plastic, non-cohesive, few cobbles	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	54	-				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.23' Riser Amount: 26.71'
10	50	-	(11-14.5') SAND with CLAY, medium dense, reddish yellow to pale brown, wet, non-plastic, non-cohesive	SW-SC		Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.94' bgs
15	100	-	(14.5-18') CLAYEY SAND, very fine to medium, yellowish red, wet, non-plastic, non-cohesive	SC	Grout	Wet at 9.5' bgs
20	100	-	(18-23.3') CLAY, hard, reddish brown, moist, low plasticity, cohesive	CL		Bentonite Seal: 1-3' sleeve Top: 26.94' bgs Bottom: 29.94' bgs
25	76	-	(23.3-29') SAND, very fine to coarse grading to fine GRAVEL with SAND, medium dense, reddish yellow grading to pale brown, wet, non-plastic, non-cohesive	SW/GP	Bentonite Sleeve	Filter Pack: 2-5' prepack with #2 Sand Top: 29.94' bgs Bottom: 39.94' bgs
30	80	-	(29-30') SANDY CLAY, very firm, reddish yellow, very moist, low plasticity, cohesive	CL		Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010"
35	100	-	(30-33') SAND, fine to medium with some coarse, medium dense, yellowish red, wet, non-plastic, cohesive	SW	Sand	Top: 29.94' bgs Bottom: 39.94' bgs Total Screen: 10'
40	100	-	(33-40') CLAY, very firm to hard, grayish brown, dry to moist, low plasticity, cohesive	CL	2" PVC Screen	
End of boring					End Cap	

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

Monitoring Well Development  
Date: 04/18/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 4.35





**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572226.49  
Easting (ft) : 1456460.20  
Date/Time Started : 4/12/19 1055  
Date/Time Completed : 4/12/19 1146  
Surf. Elev. (ft AMSL) : 12.78'  
TOC Elev. (ft AMSL) : 12.55'  
Total Well Depth (ft) : 20.14' bgs  
Depth to Water (ft) : 0 Hr: 8.50' TOC  
Depth to Water (ft) : Static: 8.78' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RW24-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0			(0-0.5') ASPHALT	NA	Cover	<p>6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.21' Riser Amount: 9.93'</p> <p>Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs Wet at 9.5' bgs</p> <p>Filter Pack: #2 sand Top: 9' bgs Bottom: 10.14' bgs</p> <p>2-5' prepack with #2 Sand: Top: 10.14' bgs Bottom: 20.14' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.14' bgs Bottom: 20.14' bgs Total Screen: 10'</p>
5	82	5.1	(0.5-10') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to dense, dark brown with gray, dry then wet at 9.5' bgs, non-plastic, non-cohesive	SW/GW	2" PVC Riser Casing	
10	60	0.4			Grout	
15	84	0.1	(10-13.5') SAND with CLAY, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW-SC	Bentonite Seal	
20	84	0.2	(13.5-18') CLAYEY SAND, medium dense to dense, reddish yellow, wet, non-plastic, non-cohesive	SC	Sand	
		0.1			2" PVC Screen	
		0.0	(18-20') CLAY, hard, reddish yellow, moist, low plasticity, cohesive	CL	End Cap	
		0.0				
		0.0				
		0.0				
			End of boring			

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

Monitoring Well Development  
Date: 04/18/2019  
Purged Amount: 3.00 gallons  
Well Volumes Removed: 6.67



**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572283.56  
Easting (ft) : 1456605.08  
Date/Time Started : 4/15/19 0845  
Date/Time Completed : 4/15/19 1030  
Surf. Elev. (ft AMSL) : 12.28'  
TOC Elev. (ft AMSL) : 12.08'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 10.28' TOC  
Depth to Water (ft) : Static: 10.62' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RW25-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-0.5') ASPHALT	NA	Cover	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
0.1	92	0.1	(0.5-7') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown and gray, dry, non-plastic, non-cohesive	SW/GW	2" PVC Riser Casing	
0.2	-	-				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.20' Riser Amount: 26.71'
2.7	-	-				
5	-	-				Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.94' bgs
40	-	-	(7-7.5') CLAY, soft, light brown, very moist, low plasticity, cohesive	CL		
0.0	-	-	(7.5-9.5') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown and gray, moist, non-plastic, non-cohesive	SW/GW		Wet at 12.3' bgs
10	-	-		CL		
54	0.0	0.0	(9.5-10.5') CLAY, soft to firm, brown, moist, low plasticity, cohesive	SW		Bentonite Seal: 1-3' sleeve Top: 26.91' bgs Bottom: 29.91' bgs
15	0.0	0.0	(10.5-14.5') SAND, fine to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SC		
100	0.0	0.0	(14.5-17') CLAYEY SAND, medium dense to dense, reddish yellow and gray, wet, non-plastic, non-cohesive	CL		Filter Pack: 2-5' prepack with #2 Sand Top: 29.91' bgs Bottom: 39.91' bgs
20	0.0	0.0	(17-20.5') CLAY, very firm, gray, moist, low plasticity, cohesive	SC		
100	0.0	0.0	(20.5-21') CLAYEY SAND, loose to medium dense, gray, wet, non-plastic, non-cohesive	CL		Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.91' bgs Bottom: 39.91' bgs Total Screen: 10'
25	0.0	0.0	(21-27') CLAY with SAND, very firm, gray, moist, low plasticity, cohesive			
72	0.0	0.0	(27-29') CLAYEY SAND, medium dense, gray, wet, non-plastic, cohesive	SC		Bentonite Sleeve
30	0.0	0.0	(29-33.5') SAND, fine to coarse, reddish yellow, wet, non-plastic, non-cohesive	SW		
80	0.0	0.0				Sand
35	0.0	0.0	(33.5-40') CLAY, very firm, grayish brown, moist, low plasticity, cohesive	CL		
100	0.0	0.0				2" PVC Screen
40	0.0	0.0				
			End of boring		End Cap	

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

Monitoring Well Development  
Date: 04/18/2019  
Purged Amount: 7.50 gallons  
Well Volumes Removed: 6.41



**ARM Group Inc.**  
Engineers and Scientists

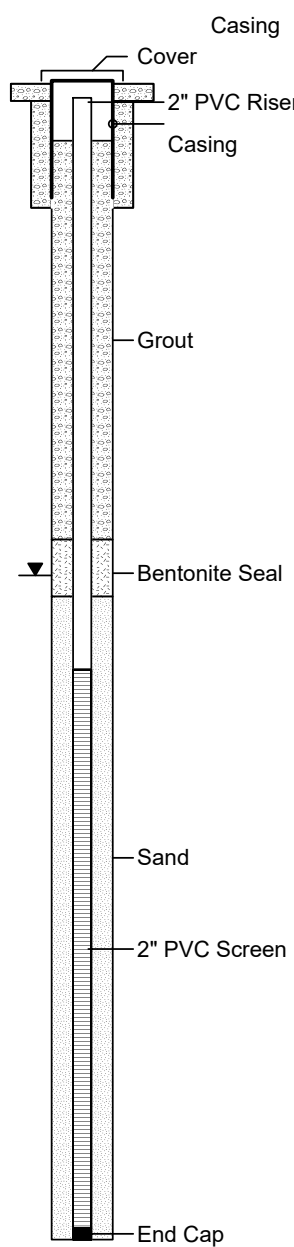
Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572286.204  
Easting (ft) : 1456604.855  
Date/Time Started : 4/12/19 1304  
Date/Time Completed : 4/12/19 1407  
Surf. Elev. (ft AMSL) : 12.16'  
TOC Elev. (ft AMSL) : 11.94'  
Total Well Depth (ft) : 20.28' bgs  
Depth to Water (ft) : 0 Hr: 8.37' TOC  
Depth to Water (ft) : Static: 8.38' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RW25-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-0.5') ASPHALT	NA	Cover	<p>6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.25' Riser Amount: 10.03'</p> <p>Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs</p> <p>Wet at 7.4' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs</p> <p>Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.28' bgs</p> <p>2-5' prepack with #2 Sand: Top: 10.28' bgs Bottom: 20.28' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.28' bgs Bottom: 20.28' bgs Total Screen: 10'</p>
0.0	72	0.0	(0.5-7.4') Non-native SAND with SILT and SLAG, SAND and GRAVEL-sized, dense, dark brown with gray, dry, non-plastic, non-cohesive	SW/GW	2" PVC Riser	
0.0		0.0			Casing	
3.6		0.0				
7.3		0.0		SC	Grout	
5	-	-				
1.7		0.0				
39.1	78	0.0	(7.4-11.2') CLAYEY SAND, medium dense, reddish yellow to yellowish red, wet, non-plastic, non-cohesive	SW-SC	Bentonite Seal	
0.0		0.0				
0.0		0.0				
0.0	80	0.0	(11.2-15') SAND with CLAY, medium dense, yellowish red, wet, non-plastic, non-cohesive	CL	Sand	
0.0		0.0				
0.0		0.0				
0.0	84	0.0	(15-18') SANDY CLAY, firm to very firm, reddish yellow, moist to very moist, low plasticity, cohesive	CL	2" PVC Screen	
0.0		0.0				
0.0		0.0				
0.0		0.0	(18-20') CLAY with trace SAND, gray, moist, medium plasticity, cohesive	CL	End Cap	
20			End of boring			



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

Monitoring Well Development  
Date: 04/18/2019  
Purged Amount: 6.00 gallons  
Well Volumes Removed: 13.64





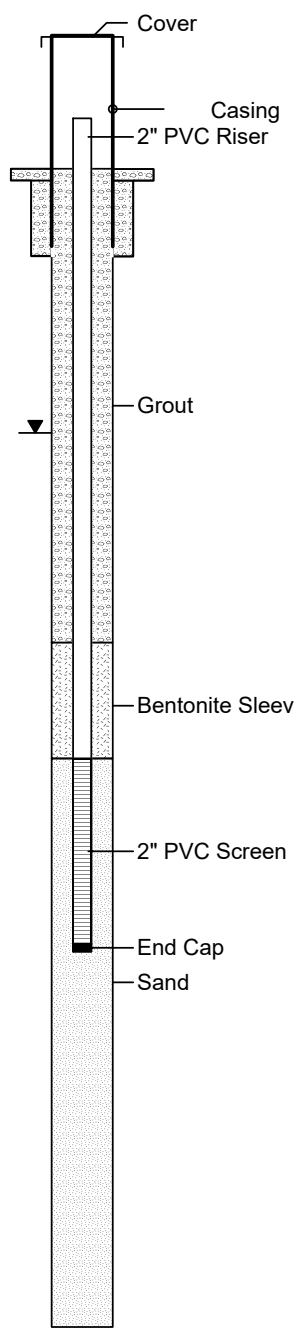
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572453.19  
Easting (ft) : 1455934.71  
Date/Time Started : 4/10/19 0945  
Date/Time Completed : 4/10/19 1215  
Surf. Elev. (ft AMSL) : 7.52'  
TOC Elev. (ft AMSL) : 10.20'  
Total Well Depth (ft) : 30' bgs  
Depth to Water (ft) : 0 Hr: 10.53' TOC  
Depth to Water (ft) : Static: 9.93' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWA-MWI**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-1') SANDY SILT, very firm, light brown, dry, non-plastic, non-cohesive	ML	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.09'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.86' Riser Amount: 13.28'</p> <p>Wet at 9' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 13.28' bgs</p> <p>Bentonite Seal: 1-3' Sleeve Top: 13.28' bgs Bottom: 15.28' bgs</p> <p>Filter Pack: 1-5' prepack with #2 Sand Top: 15.28' bgs Bottom: 28.28' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 15.28' bgs Bottom: 20.28' bgs Total Screen: 5'</p>
30	-	-	(1-10') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense, dark brown with gray, dry then wet at 9' bgs, non-plastic, non-cohesive, trace BRICK	SW/GW	
5	0.4	-			
26	-	-			
10	2.4	-	(10-13') CLAY with SAND, firm to hard, light gray and black, moist to dry, low plasticity, cohesive, trace small sand layers	CL	
80	0.0	0.0	(13-18') SAND grading to CLAYEY SAND, very fine to medium, medium dense, pale brown to light brown, wet, non-plastic, non-cohesive	SW/SC	<p>End of boring</p>
15	0.0	0.0			
92	0.0	0.0	(18-30') CLAY, soft to firm grading to hard, light gray to light reddish brown, then dark gray 27-30' bgs, very moist to dry, low plasticity, cohesive	CL	
20	0.0	0.0			
100	0.0	0.0			
25	0.0	0.0			
100	0.0	0.0			
30	0.0	0.0			

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

Monitoring Well Development  
Date: 04/17/2019  
Purged Amount: 2.00 gallons  
Well Volumes Removed: 3.92



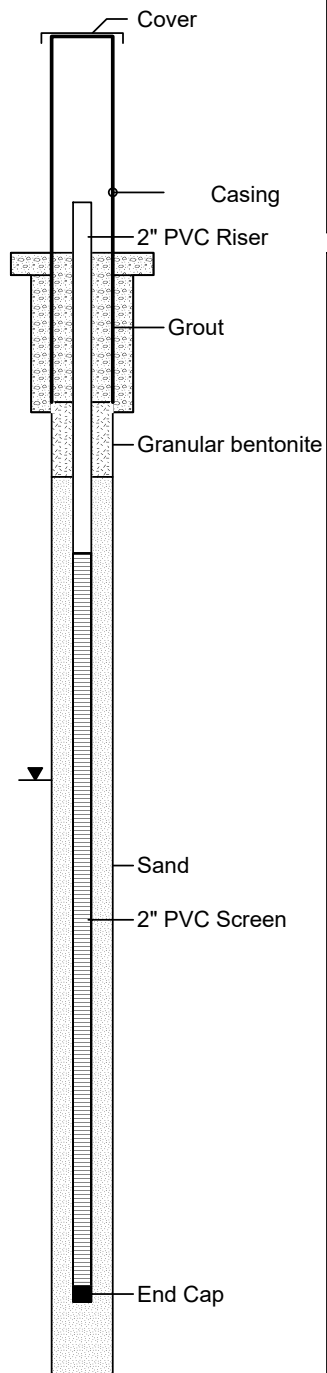
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572455.75  
Easting (ft) : 1455935.89  
Date/Time Started : 4/10/19 1305  
Date/Time Completed : 4/10/19 1415  
Surf. Elev. (ft AMSL) : 7.74'  
TOC Elev. (ft AMSL) : 10.59'  
Total Well Depth (ft) : 20' bgs  
Depth to Water (ft) : 0 Hr: 9.64' TOC  
Depth to Water (ft) : Static: 9.75' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWA-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-2') SANDY SILT, very firm, light brown, moist to dry, non-plastic, non-cohesive	ML	 <p>4" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.18'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.88' Riser Amount: 4.02'</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 2' bgs</p> <p>Bentonite Seal: Granular Top: 2' bgs Bottom: 3' bgs Wet at 9' bgs</p> <p>Filter Pack: #2 Sand Top: 14.02' bgs and 3' bgs Bottom: 15' bgs and 4.02' bgs</p> <p>2-5' prepack with #2 Sand: Top: 4.02' bgs Bottom: 14.02' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 4.02' bgs Bottom: 14.02' bgs Total Screen: 10'</p>
0.4	-	-			
66	0.0	-	(2-2.5) SANDY CLAY, very firm, reddish yellow, moist, low plasticity, cohesive	CL	
0.0	-	-	(2.5-8.3') SAND, fine to medium, yellowish red and brown, moist, non-plastic, non-cohesive		
0.8	-	-			
5	-	-		SW	
40	-	-			
1.4	-	-	(8.3-10.5') Non-native SAND with SLAG, SAND and GRAVEL-sized, medium dense, dark brown, very moist then wet at 9' bgs, non-plastic, non-cohesive	SW/GW	
2.3	-	-			
10	-	-	(10.5-12') CLAY with trace SAND, soft, greenish gray and black, very moist, low plasticity, cohesive	CL	
1.7	-	-			
70	0.0	-	(12-12.5') SAND, fine to medium, medium dense, light gray, wet, non-plastic, non-cohesive	SW	
0.0	-	-	(12.5-13.8') CLAY with SAND, firm to soft, light gray and gray, moist to very moist, low plasticity, cohesive	CL	
0.0	-	-	(13.8-15') CLAYEY SAND, dense, reddish yellow with gray, wet, non-plastic, non-cohesive	SC	
15	-	-	End of boring		

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

Monitoring Well Development  
Date: 04/17/2019  
Purged Amount: 2.25 gallons  
Well Volumes Removed: 7.76



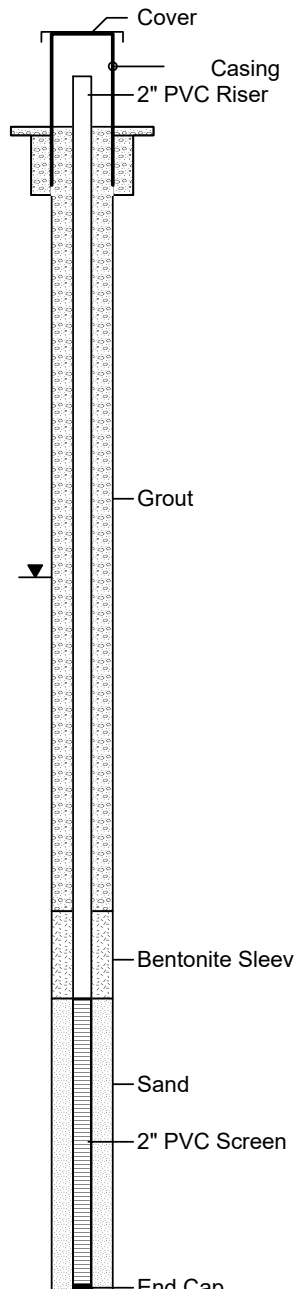
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572273.71  
Easting (ft) : 1455907.08  
Date/Time Started : 4/15/19 1112  
Date/Time Completed : 4/15/19 1441  
Surf. Elev. (ft AMSL) : 17.57'  
TOC Elev. (ft AMSL) : 19.73'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 18.02' TOC  
Depth to Water (ft) : Static: 18.14' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWB-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	72	-	(0-14') Non-native SAND with SILT and SLAG/BRICK, SAND and GRAVEL-sized, dense, dark brown with some red, gray, and yellow, dry to moist then wet at 13' bgs, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 2.95'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.48' Riser Amount: 26.87'</p> <p>Wet at 13' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 26.87' bgs</p> <p>Bentonite Seal: 1-3' Sleeve Top: 26.87' bgs Bottom: 29.87' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 29.87' bgs Bottom: 39.87' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.87' bgs Bottom: 39.87' bgs Total Screen: 10'</p>
5	90	0.1			
10	96	0.1			
15	84	0.1	(14-14.6') CLAYEY SAND, medium dense, brown grading to grayish brown, wet, non-plastic, non-cohesive	SC	
20	90	0.1	(14.6-15.4') SAND with CLAY, very fine to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW-SC	
25	96	0.1	(15.4-17') SANDY CLAY grading to CLAY, firm to hard, reddish yellow and light gray, moist to dry, low plasticity, cohesive	SC	
30	94	0.1	(17-19.5') CLAYEY SAND, medium dense, reddish yellow, wet, non-plastic, non-cohesive	CL	
35	100	0.1	(19.5-22') CLAYEY SAND, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SC	
40		0.1	(22-30') CLAY, hard, reddish yellow and light gray, moist, low plasticity, cohesive	ML	
		0.1	(30-32.3') SANDY SILT, very firm, grayish brown, moist to very moist, non-plastic, non-cohesive	SW	
		0.1	(32.3-34.1') SAND, fine to medium, medium dense, light brown, wet, non-plastic, non-cohesive	CL	<p>End of Boring</p>
		0.1	(34.1-34.5') CLAY, firm to hard, grayish brown, moist, low plasticity, cohesive		
		0.1			
		0.1			

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

Monitoring Well Development  
Date: 04/19/2019  
Purged Amount: 4.00 gallons  
Well Volumes Removed: 4.12





**ARM Group Inc.**  
Engineers and Scientists

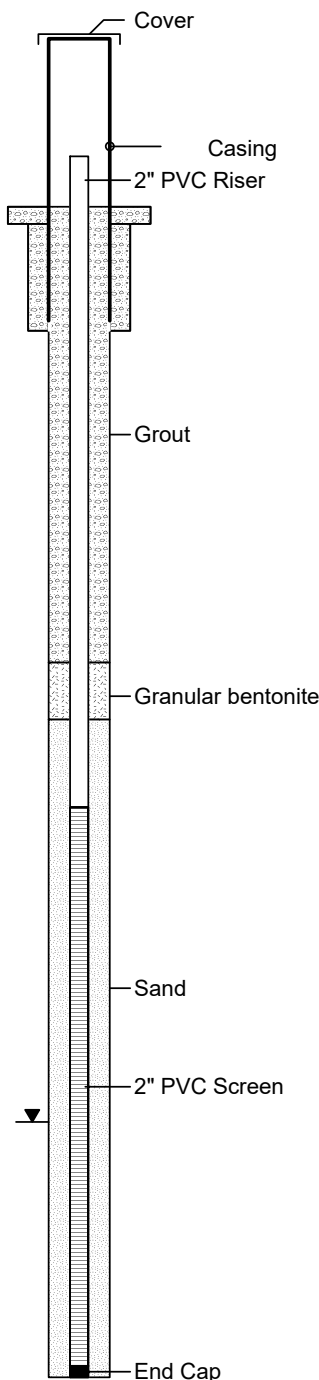
Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572277.12  
Easting (ft) : 1455907.95  
Date/Time Started : 4/15/19 1445  
Date/Time Completed : 4/16/19 0937  
Surf. Elev. (ft AMSL) : 17.66'  
TOC Elev. (ft AMSL) : 20.17'  
Total Well Depth (ft) : 20.54' bgs  
Depth to Water (ft) : 0 Hr: 22.90' TOC  
Depth to Water (ft) : Static: 18.76' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWB-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0		-	(0-17.5') Non-native SAND, BRICK and SLAG, SAND and GRAVEL-sized, dense, dark brown with red and yellow, dry to moist then wet at 14.5' bgs, non-plastic, non-cohesive	SW/GW	4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 2.9'  Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.76' Riser Amount: 10.54'  Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 8' bgs  Wet at 14.5' bgs  Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs  Filter Pack: #2 Sand Top: 9' bgs and 20.54' bgs Bottom: 10.54' bgs and 23.30' bgs  2-5' prepack with #2 Sand: Top: 10.54' bgs Bottom: 20.54' bgs  Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.54' bgs Bottom: 20.54' bgs Total Screen: 10'
44	1.9				
	3.1				
5	0.5				
	0.6				
	0.8				
82	-				
	2.6				
	2.1				
10	-				
	-				
	-				
46	-				
	84.3				
	0.1				
15	-				
	79.5				
	0.5				
74	0.1				
	0.2				
20			(17.5-20') CLAYEY SAND, medium dense, light grayish brown, wet, non-plastic, non-cohesive	SC	
			End of Boring		



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

Monitoring Well Development  
Date: 04/19/2019  
Purged Amount: 1.25 gallons  
Well Volumes Removed: 6.94



# ARM Group Inc.

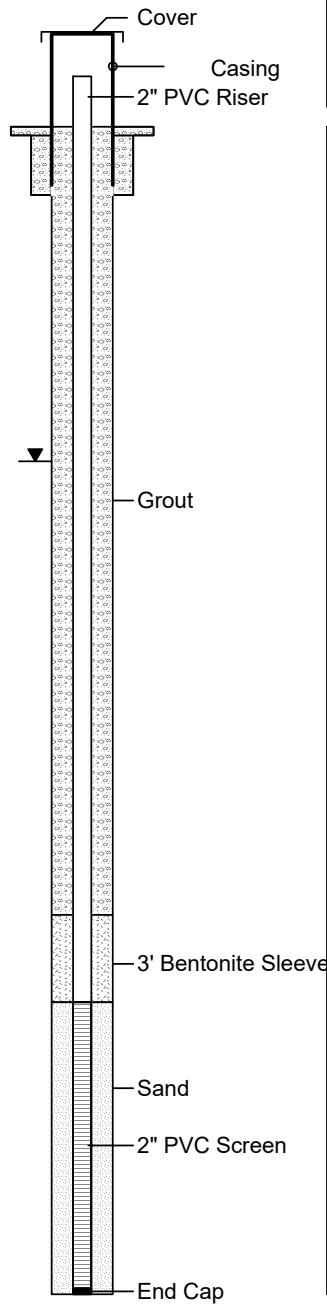
Engineers and Scientists

Well ID: RWD-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572013.83  
Easting (ft) : 1455886.20  
Date/Time Started : 4/22/19 0930  
Date/Time Completed : 4/22/19 1100  
Surf. Elev. (ft AMSL) : 12.72'  
TOC Elev. (ft AMSL) : 14.87'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 13.57' TOC  
Depth to Water (ft) : Static: 14.16' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-5.5') SILT with SAND to SANDY SILT, soft to very firm, dark grayish brown to dark brown, dry to moist, non-plastic to low plasticity, non-cohesive to cohesive, light amount of coal tar-like substance with strong odor from 1.1-2.2' bgs	ML	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 2.98'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.55' Riser Amount: 27'</p> <p>Wet at 17.2' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 27' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 27' bgs Bottom: 30' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 30' bgs Bottom: 40' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30' bgs Bottom: 40' bgs Total Screen: 10'</p>
5	-	-	(5.5-12') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense, dark brown, dry, non-plastic, non-cohesive	SW/GW	
10	-	-	(12-17.2') CLAY grading to SANDY CLAY, soft to firm, light brown grading to dark brown then light brownish gray, moist, low plasticity, cohesive	CL	
15	-	-	(17.2-21.5') SAND with CLAY, medium dense, light brownish gray grading to reddish yellow, wet, non-plastic, non-cohesive	SW-SC	
20	-	-	(21.5-29') SANDY CLAY grading to CLAY, soft to firm, grayish brown grading to reddish brown, moist, low plasticity,	CL	
25	-	-	(29-31.8') SAND, very fine to coarse, with GRAVEL, fine, and CLAY, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW/GP	
30	-	-	(31.8-37.3') CLAYEY SAND, dense, light gray, very moist, non-plastic, non-cohesive	SC	
35	-	-	(37.3-40') SAND with CLAY, pale brown to reddish yellow, medium dense, wet, non-plastic, non-cohesive	SW-SC	
40	-	-	End of Boring		

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

Monitoring Well Development  
Date: 05/01/2019  
Purged Amount: 9.00 gallons  
Well Volumes Removed: 7.89



**ARM Group Inc.**  
Engineers and Scientists

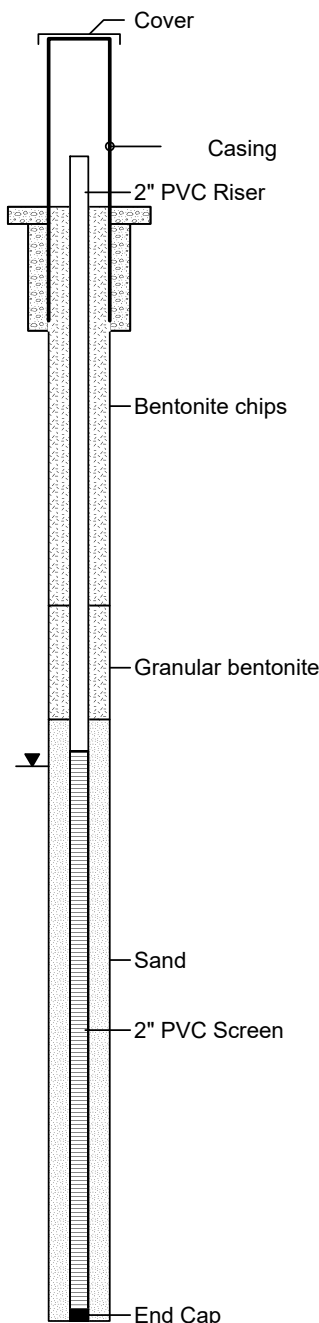
Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572013.83  
Easting (ft) : 1455886.20  
Date/Time Started : 4/22/19 1101  
Date/Time Completed : 4/22/19 1240  
Surf. Elev. (ft AMSL) : 12.72'  
TOC Elev. (ft AMSL) : 14.87'  
Total Well Depth (ft) : 19.55' bgs  
Depth to Water (ft) : 0 Hr: 12.34' TOC  
Depth to Water (ft) : Static: 12.52' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWD-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0		-	(0-9') SLAG, SAND and GRAVEL-sized, and non-native SAND, loose to medium dense, dark brown, dry then wet at 8.7' bgs, non-plastic, non-cohesive	SW/GW	4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.08'  Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.6' Riser Amount: 9.55'  Bentonite: 3/8" chips Top: 0' bgs Bottom: 7' bgs  Wet at 8.7' bgs  Bentonite Seal: Granular Top: 7' bgs Bottom: 9' bgs  Filter Pack: #2 sand Top: 9' bgs Bottom: 9.55' bgs  2-5' prepack with #2 Sand: Top: 9.55' bgs Bottom: 19.55' bgs  Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 9.55' bgs Bottom: 19.55' bgs Total Screen: 10'
54	8.3	1.9			
		2.4			
5	-	-			
26	-	-		SW-SC	
		2.2	(9-10') SAND with CLAY, loose, wet, reddish yellow, non-plastic, non-cohesive		
10	-	-	(10-18.9') NO RECOVERY		
		-			
0	-	-		NA	
		-			
15	-	-			
		-			
22	-	-		CL	
		7.1	(18.9-20') SANDY CLAY, soft, light brown, very moist to wet, low plasticity, cohesive		
20			End of Boring		



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

Monitoring Well Development  
Date: 05/01/2019  
Purged Amount: 2.00 gallons  
Well Volumes Removed: 5.13





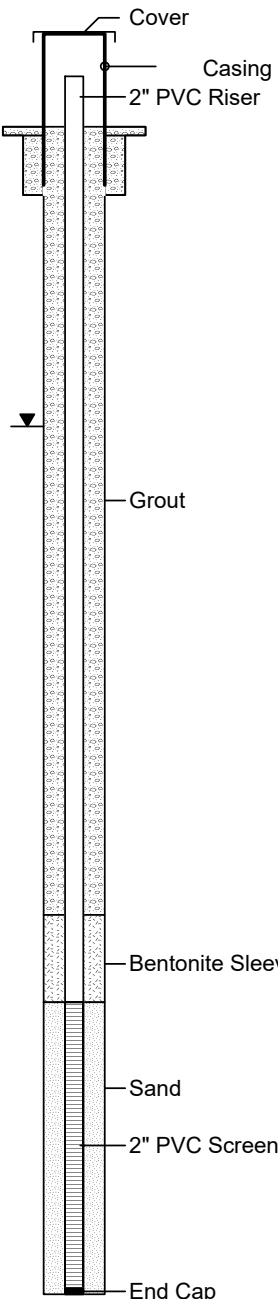
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571901.50  
Easting (ft) : 1455879.82  
Date/Time Started : 4/22/19 1435  
Date/Time Completed : 4/23/19 1106  
Surf. Elev. (ft AMSL) : 11.43'  
TOC Elev. (ft AMSL) : 13.92'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 12.35' TOC  
Depth to Water (ft) : Static: 12.97' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWE-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-7.5') SLAG, SAND and GRAVEL-sized, with non-native SAND, dense, brown to dark brown with some gray, dry to moist, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 2.98'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.56' Riser Amount: 27'</p> <p>Wet at 16.5' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 27' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 27' bgs Bottom: 30' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 30' bgs Bottom: 40' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30' bgs Bottom: 40' bgs Total Screen: 10'</p>
5	60	10.5	(7.5-8.7') SILT with GRAVEL and SAND, soft, black, very moist, low plasticity, cohesive	ML	
		397.5	(8.7-9.3') SLAG, SAND and GRAVEL-sized, with non-native SAND, dense, brown to dark brown with some gray, dry to moist, non-plastic, non-cohesive	SW/GW	
		47.1	(9.3-10.5') SILT with GRAVEL and SAND, soft, black, very moist, low plasticity, cohesive, strong sweet odor from 7.5-8.7' bgs and 9.3-10' bgs	ML	
10	76	0.4	(10.5-16.5') CLAY, very firm to hard, reddish yellow and light grayish brown, dry to moist, low plasticity, cohesive	CL	
		2.2	(16.5-21.7') SAND, very fine to medium, medium dense to dense, reddish yellow then grayish brown at 19' bgs, wet, non-plastic, non-cohesive	SW	
		14.3	(21.7-28') CLAY, very firm to hard, dark brown, dry to moist, low plasticity, cohesive	CL	
15	70	58.7	(28-30.9') SAND, medium to very coarse, with GRAVEL, fine, loose to medium dense, reddish yellow to pale brown, wet, non-plastic, non-cohesive	SW/GP	
		0.5	(30.9-32.1') GRAVEL, fine, loose to medium dense, very pale brown, wet, non-plastic, non-cohesive	GP	
		0.1	(32.1-32.6') SILT, very firm, light gray, dry, low plasticity, cohesive	ML	
20	76	0.0	(32.6-35') SAND, fine to medium, light gray, wet, non-plastic, non-cohesive	SW	<p>End of Boring</p>
		0.0	(35-40') NO RECOVERY; heaving sands encountered in boring	-	
25	100	0.0			
30	90	0.0			
35	100	0.6			
40	0	-			

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

Monitoring Well Development  
Date: 05/01/2019  
Purged Amount: 6.00 gallons  
Well Volumes Removed: 5.08



# ARM Group Inc.

Engineers and Scientists

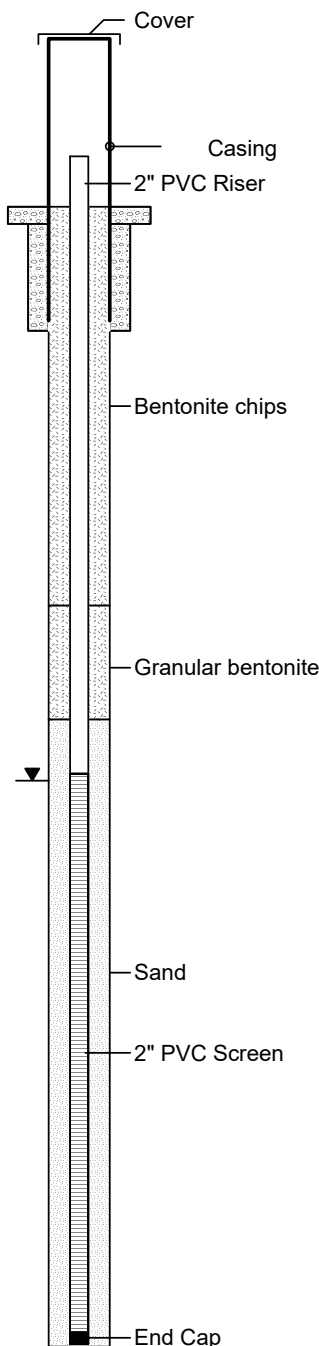
Project Name : RWM Onshore Supp. Inv.  
 Project Number : 190341M-2  
 Client : EnviroAnalytics Group  
 Site : Sparrow's Point  
 Borehole Location : Parcel A3  
 ARM Representative : L. Perrin  
 Checked by : M. Replogle, EIT  
 Drilling Company : GSI, Inc.  
 Driller : Kevin Pumphrey  
 Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571905.45  
 Easting (ft) : 1455879.94  
 Date/Time Started : 4/22/19 1322  
 Date/Time Completed : 4/22/19 1430  
 Surf. Elev. (ft AMSL) : 11.57'  
 TOC Elev. (ft AMSL) : 13.96'  
 Total Well Depth (ft) : 20' bgs  
 Depth to Water (ft) : 0 Hr: 12.73' TOC  
 Depth to Water (ft) : Static: 12.77' TOC  
 Bit/Auger Size (in.) : 3.50"

Well ID: RWE-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0		-	(0-7.5') SLAG, SAND and GRAVEL-sized, and non-native SAND, medium dense to dense, dark brown, dry then very moist 7.2-7.5' bgs, non-plastic, non-cohesive	SW/GW	4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.07'
56	2.4				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.54' Riser Amount: 9.95'
5		-			Bentonite chips Bentonite: 3/8" chips Top: 0' bgs Bottom: 7' bgs
56	1.0		(7.5-9.5') CLAY with SAND and GRAVEL, firm, brown to black, moist, low plasticity, cohesive	CL	Wet at 16' bgs
10		-			Bentonite Seal: Granular Top: 7' bgs Bottom: 9' bgs
56	1.7		(9.5-11.1') SLAG, SAND and GRAVEL-sized, and non-native SAND, medium dense to dense, dark brown, dry, non-plastic, non-cohesive	SW/GW	Filter Pack: #2 Sand Top: 9' bgs Bottom: 9.95' bgs
10		-			2-5' prepack with #2 Sand: Top: 9.95' bgs Bottom: 19.95' bgs
56	3.1		(11.1-16') CLAY with trace SAND grading to CLAY, very firm to hard, dry to moist, gray then light brownish gray and reddish yellow from 11.9-16' bgs, low plasticity, cohesive	CL	
15		-			
56	0.3				
15		-			
56	0.0				
15		-			
56	0.0				
15		-			
56	0.1		(16-20') SAND, very fine to medium, medium dense, very pale brown then reddish yellow at 17.2' bgs, then dark brown 17.8-20' bgs, wet, non-plastic, non-cohesive	SW	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 9.95' bgs Bottom: 19.95' bgs Total Screen: 10'
20		-			
20		-	End of Boring		



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

Monitoring Well Development  
 Date: 04/30/2019  
 Purged Amount: 4.25 gallons  
 Well Volumes Removed: 10.90



# ARM Group Inc.

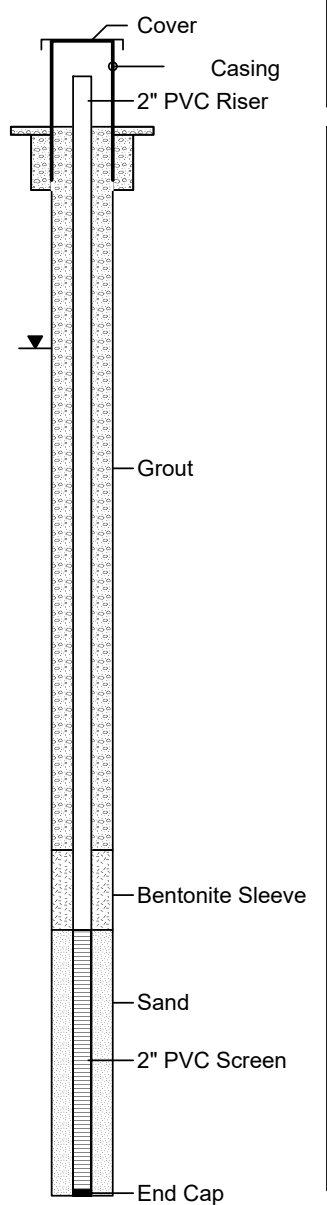
Engineers and Scientists

Well ID: RWF-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Don Marchese  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571606.11  
Easting (ft) : 1455890.87  
Date/Time Started : 4/24/19 0810  
Date/Time Completed : 4/24/19 1500  
Surf. Elev. (ft AMSL) : 10.30'  
TOC Elev. (ft AMSL) : 12.31'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 11.06' TOC  
Depth to Water (ft) : Static: 11.03' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-5') Non-native SAND with SLAG and BRICK, SAND and GRAVEL-sized, medium dense, brown with trace yellow, dry, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.13'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.35' Riser Amount: 27.2'</p> <p>Wet at 15' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 27.2' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 27.2' bgs Bottom: 30.2' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 30.2' bgs Bottom: 40.2' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30.2' bgs Bottom: 40.2' bgs Total Screen: 10'</p>
5	60	1.6	(5-9.3') SILT with GRAVEL, fine, and SAND, very firm grading to soft, dark brown and gray, moist to very moist, non-plastic, non-cohesive	ML	
10	100	0.1	(9.3-15') CLAY, hard, light brownish gray and reddish yellow, dry, low plasticity, cohesive	CL	
15	100	0.0	(15-18.2') SAND with CLAY, medium dense, reddish yellow then grayish brown at 16.5' bgs, wet, non-plastic, non-cohesive	SW-SC	
20	100	0.0	(18.2-19') SANDY CLAY, very firm, gray, moist, low plasticity, cohesive	CL	
25	100	0.0	(19-25') CLAY, very firm, gray, moist, low plasticity, cohesive, small SAND layer at depth	CL	
30	78	0.0	(25-26') GRAVEL, fine, with some SAND, medium to very coarse, medium dense, very pale brown, wet, non-plastic, non-cohesive	GP	
35	100	0.1	(26-28.7') SAND, fine to very coarse, with some GRAVEL, fine, very pale brown, wet, non-plastic, non-cohesive	SW	
40	100	0.1	(28.7-30') GRAVEL, fine, with some SAND, medium to very coarse, medium dense, very pale brown, wet, non-plastic, non-cohesive	GP	
45	100	0.1	(30-33.8') SAND, fine to very coarse, with some GRAVEL, fine, very pale brown, wet, non-plastic, non-cohesive	SW	
		0.1	(33.8-38') CLAY, dark brown, moist, low plasticity, cohesive	CL	
		0.0	(38-40') SAND with CLAY, dark gray, wet, non-plastic, non-cohesive	SW-SC	
			End of Boring		

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

Monitoring Well Development  
Date: 04/26/2019  
Purged Amount: 5.25 gallons  
Well Volumes Removed: 4.17





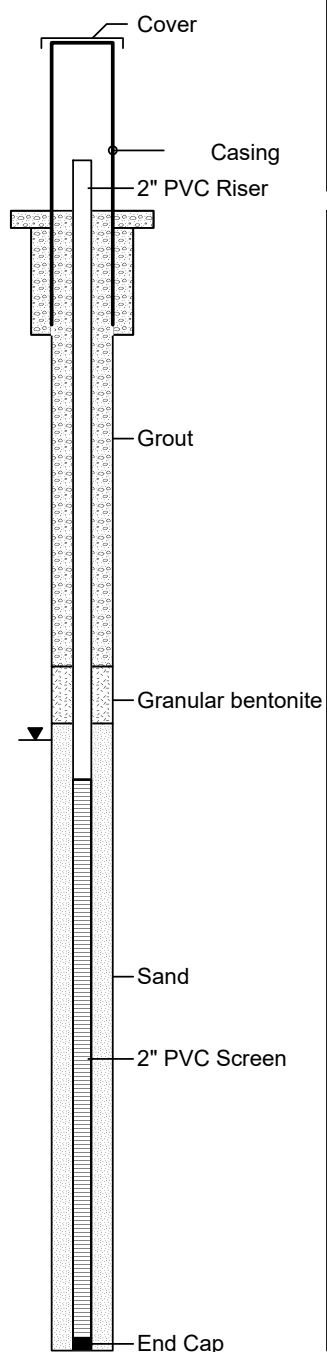
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Ali Berenbrok-Niblett  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571610.23  
Easting (ft) : 1455890.58  
Date/Time Started : 4/23/19 1435  
Date/Time Completed : 4/24/19 1515  
Surf. Elev. (ft AMSL) : 10.24'  
TOC Elev. (ft AMSL) : 12.74'  
Total Well Depth (ft) : 20' bgs  
Depth to Water (ft) : 0 Hr: 11.98' TOC  
Depth to Water (ft) : Static: 11.99' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWF-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0		-	(0-5.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to loose, brown to dark brown, dry, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.15'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.77' Riser Amount: 9.98'</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 8' bgs</p> <p>Wet at 7.4' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs</p> <p>Filter Pack: #2 Sand Top: 9' bgs Bottom: 9.98' bgs</p> <p>2-5' prepack with #2 Sand: Top: 9.98' bgs Bottom: 19.98' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 9.98' bgs Bottom: 19.98' bgs Total Screen: 10'</p>
60	0.4				
5		-	(5.5-7.4') SILT with SAND and GRAVEL, hard, dark gray and brown, dry, non-plastic, non-cohesive	ML	
84	0.1		(7.4-8.5') CLAYEY SAND, medium dense, black, wet, non-plastic, non-cohesive	SC	
	0.1		(8.5-9.3') SANDY CLAY, soft, black and gray, very moist, low plasticity, cohesive	CL	
10	0.1		(9.3-15') CLAY, hard, brownish gray and gray, dry, low plasticity, cohesive	CL	
	0.0				
	0.0				
100	0.1				
	0.2				
15	0.6		(15-18') SAND, very fine to medium, medium dense, pale brown then dark brownish gray at 16.4' bgs, wet, non-plastic, non-cohesive	SW	
	0.8				
100	0.2		(18-19.2') CLAYEY SAND, dense, gray, wet, non-plastic, non-cohesive	SC	
	0.2		(19.2-20') CLAY with some SAND, very firm, gray, moist, low plasticity, cohesive	CL	
20			End of Boring		

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

Monitoring Well Development  
Date: 04/26/2019  
Purged Amount: 3.75 gallons  
Well Volumes Removed: 8.72



# ARM Group Inc.

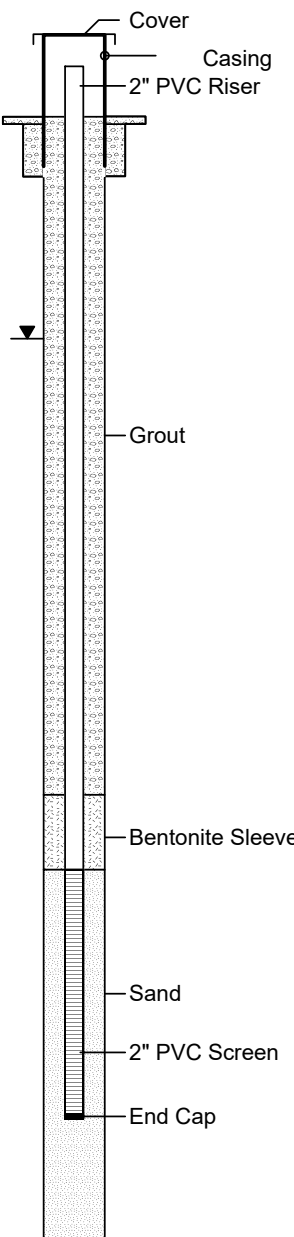
Engineers and Scientists

Well ID: RWG-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571293.18  
Easting (ft) : 1455914.97  
Date/Time Started : 4/25/19 0820  
Date/Time Completed : 4/25/19 1100  
Surf. Elev. (ft AMSL) : 9.96  
TOC Elev. (ft AMSL) : 12.48  
Total Well Depth (ft) : 45' bgs  
Depth to Water (ft) : 0 Hr: 11.42' TOC  
Depth to Water (ft) : Static: 11.60' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-7') Non-native SAND with SLAG, SAND and GRAVEL-sized, loose, brown with gray, dry, non-plastic, non-cohesive, trace BRICK and ORGANICS	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.10'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.79' Riser Amount: 21.75'</p> <p>Wet at 9.2' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 21.75' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 21.75' bgs Bottom: 24.75' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 24.75' bgs Bottom: 34.75' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 24.75' bgs Bottom: 34.75' bgs Total Screen: 10'</p> <p>Filter Pack: #2 Sand Top: 34.75' bgs Bottom: 45' bgs</p>
5	50	1.8	(7-8') SAND, fine to medium, medium dense, light brown, wet, non-plastic, non-cohesive	SW	
10	16	0.2	(8-11') Non-native SAND with SLAG, SAND and GRAVEL-sized, loose, brown with gray, wet, non-plastic, non-cohesive	SW/GW	
15	36	0.0	(11-17') SAND, very fine to medium with trace GRAVEL, fine, at 16.5' bgs, reddish yellow to pale brown then yellowish red from 16.5-17' bgs, wet, non-plastic, non-cohesive	SW	
20	88	0.0	(17-20') SANDY CLAY grading to CLAY, firm to soft, brown, moist, medium plasticity, cohesive	CL	
25	90	0.0	(20-22.4') SAND, very fine to medium, fine, reddish yellow to pale brown, wet, non-plastic, non-cohesive	SW	
30	82	0.0	(22.4-25') CLAY, very firm, gray, moist, low plasticity, cohesive	CL	
35	100	0.0	(25-26') SAND, very fine to medium, light brown, wet, non-plastic, non-cohesive	SW	
40	100	0.0	(26-28.5') CLAY, firm to soft, brown, moist, medium plasticity, cohesive	CL	
45	100	0.0	(28.5-30') SAND with some GRAVEL, fine, medium dense, very pale brown, wet, non-plastic, non-cohesive	SW	
			(30-45') CLAY, very firm to hard, grayish brown (30-35' bgs), brownish gray (35-40' bgs), brown (40-45' bgs), moist to dry, low plasticity, cohesive	CL	
			End of Boring		

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

Monitoring Well Development  
Date: 04/30/2019  
Purged Amount: 6.50 gallons  
Well Volumes Removed: 6.25



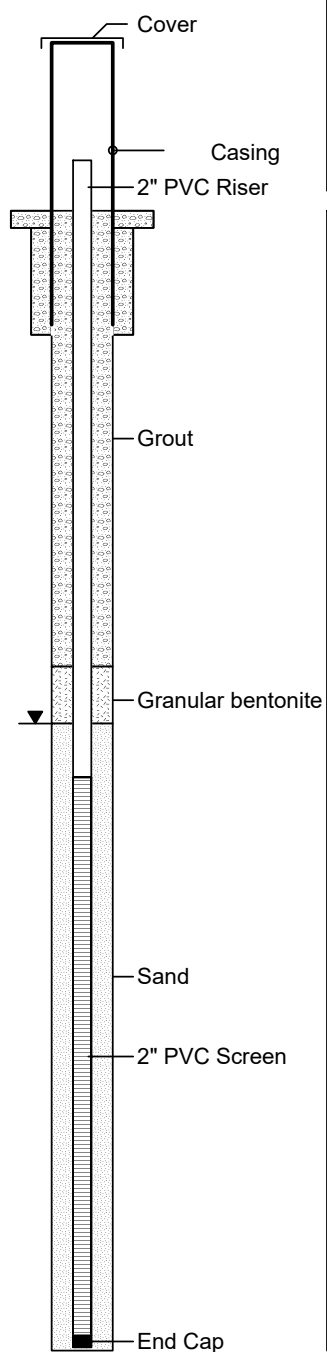
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Don Marchese  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571296.07  
Easting (ft) : 1455914.82  
Date/Time Started : 4/24/19 1306  
Date/Time Completed : 4/24/19 1400  
Surf. Elev. (ft AMSL) : 10.07'  
TOC Elev. (ft AMSL) : 12.50'  
Total Well Depth (ft) : 20' bgs  
Depth to Water (ft) : 0 Hr: 12.49' TOC  
Depth to Water (ft) : Static: 11.70' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWG-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-6.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense, brown with gray, dry, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.0'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.78' Riser Amount: 9.94'</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 8' bgs</p> <p>Wet at 9.3' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs</p> <p>Filter Pack: #2 Sand Top: 9' bgs Bottom: 9.94' bgs</p> <p>2-5' prepack with #2 Sand: Top: 9.94' bgs Bottom: 19.94' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 9.94' bgs Bottom: 19.94' bgs Total Screen: 10'</p>
50	1.8	1.7			
5	-	-	(6.5-9') SILT with GRAVEL and SAND, firm, brown with gray, moist, non-plastic, non-cohesive	ML	
34	-	0.1			
10	-	0.7	(9-10.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense, brown with gray, wet, non-plastic, non-cohesive	SW/GW	
78	0.0	0.0	(10.5-13') SANDY CLAY grading to CLAY, soft to very firm, gray, very moist to moist, low plasticity, cohesive	CL	
15	-	0.0	(13-17.1') SAND with CLAY, medium dense, reddish yellow to pale brown, wet, non-plastic, non-cohesive	SW-SC	
86	0.3	0.3	(17.1-20') CLAY, soft grading to very firm, grayish brown grading to brown, moist, low plasticity, cohesive	CL	
20	0.2		End of Boring		

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

Monitoring Well Development  
Date: 04/30/2019  
Purged Amount: 4.50 gallons  
Well Volumes Removed: 10.23





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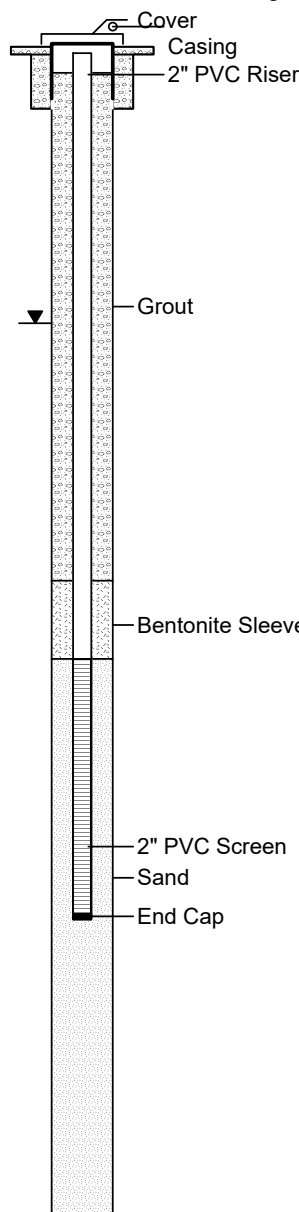
Well ID: RWH-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572408.04  
Easting (ft) : 1456263.43  
Date/Time Started : 4/9/19 0815  
Date/Time Completed : 4/9/19 1155  
Surf. Elev. (ft AMSL) : 12.40'  
TOC Elev. (ft AMSL) : 12.03'  
Total Well Depth (ft) : 45' bgs  
Depth to Water (ft) : 0 Hr: 10.19' TOC  
Depth to Water (ft) : Static: 10.38' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		1.1	(0-1.7') GRAVELLY CLAY with SAND, hard, reddish yellow and reddish brown, dry, low plasticity, cohesive, glass present	CL	Cover	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0.45'
	90	2.4		SW/GW	Casing	
		1.6	(1.7-4') Non-native SAND with GRAVEL, very dark brown, dry, non-plastic, non-cohesive	SW	2" PVC Riser	
5		0.1				
		-	(4-5.5') SAND, fine to medium with trace coarse and trace GRAVEL, fine, medium dense, reddish yellow, dry, non-plastic, non-cohesive	SW/GW		Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.38' Riser Amount: 20.53'
	74	3.2				Wet at 12.5' bgs
		3.6				Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 20.53' bgs
		1.6				
10		4.3	(5.5-12.5') Non-native SAND with some GRAVEL, medium dense, dark brown, dry, non-plastic, non-cohesive	GW/SW	Grout	
		-				
	56	0.0	(12.5-13.9') GRAVEL with SAND, medium dense, dark brown, wet, non-plastic, non-cohesive	CL		Bentonite Seal: 1-3' sleeve Top: 20.53' bgs Bottom: 23.53' bgs
		0.0				
15		0.0	(13.9-17') CLAY with SAND, firm, dark brown grading to pale brown, moist, low plasticity, cohesive	SC		
		0.1				
	92	0.1	(17-18') CLAYEY SAND, dense, reddish yellow with gray, wet, non-plastic, non-cohesive	SW		
		0.2				
20		0.8				
		-	(18-22') SAND, fine to medium, medium dense, pale brown and reddish yellow, wet, non-plastic, non-cohesive	CL	Bentonite Sleeve	
	80	0.2				
		0.1	(22-26') CLAY, very firm, grayish brown, moist, medium plasticity, cohesive	SW		
		0.0				
25		0.0	(26-28.5') SAND, fine to medium, medium dense, pale brown and reddish yellow, wet, non-plastic, non-cohesive	CL		Filter Pack: 2-5' prepack with #2 Sand Top: 23.53' bgs Bottom: 33.53' bgs
	100	0.2				
		5.2	(28.5-30.5') SANDY CLAY, firm to very firm, brown, dry to moist, low plasticity, cohesive	SW	2" PVC Screen	
30		2.4			Sand	
		3.7	(30.5-33') SAND, fine to medium, medium dense, gray, wet, non-plastic, non-cohesive		End Cap	
	100	0.1	(33-45') CLAY with trace SAND at top, very firm, gray grading to grayish brown, moist, low plasticity to medium plasticity, cohesive	CL		Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 23.53' bgs Bottom: 33.53' bgs Total Screen: 10'
		0.0				Filter Pack: #2 Sand Top: 33.53' bgs Bottom: 45' bgs
		-				
35		-				
	100	-				
		10.7				
40		0.3				
		0.0				
		0.1				
	100	0.1				
		0.0				
		0.0				
45		0.1				
			End of Boring			



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

Monitoring Well Development  
Date: 04/26/2019  
Purged Amount: 8.00 gallons  
Well Volumes Removed: 8.60



**ARM Group Inc.**  
Engineers and Scientists

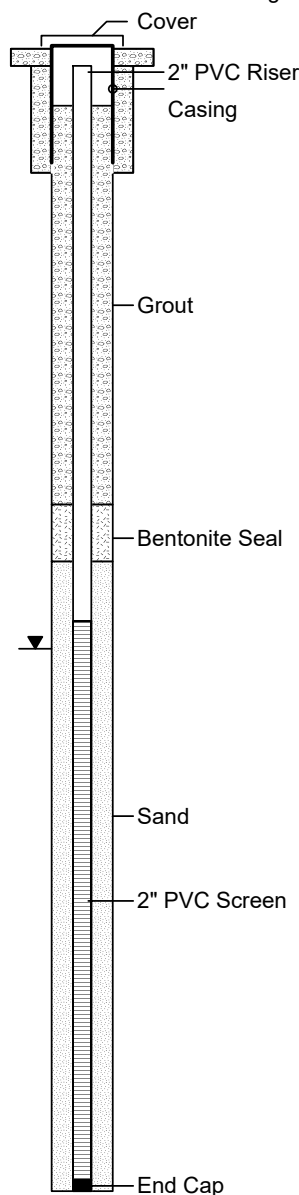
Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : M. Replogle, EIT  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572410.75  
Easting (ft) : 1456262.36  
Date/Time Started : 4/8/19 1350  
Date/Time Completed : 4/8/19 1600  
Surf. Elev. (ft AMSL) : 12.29'  
TOC Elev. (ft AMSL) : 11.83'  
Total Well Depth (ft) : 20.05' bgs  
Depth to Water (ft) : 0 Hr: 9.69' TOC  
Depth to Water (ft) : Static: 10.23' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWH-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		-	(0-8.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, dense, brown, gray, and dark brown, then dark brown 7.5-8.5' bgs, dry then moist 7.5-8.5' bgs, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0.45'
11.3	74	42.4				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.46' Riser Amount: 10.05'
1.8		465.3			Grout	Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs
5		-				Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs
9.4	50	-	(8.5-9.2') GRAVELLY CLAY, stiff, light brown, moist, low plasticity, cohesive	CL	Bentonite Seal	Wet at 17.5' bgs
7.7		-	(9.2-14.1') SLAG, SAND and GRAVEL-sized, dark brown and reddish yellow, moist, non-plastic, non-cohesive	SW/GW		Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.05' bgs
10		-				2-5' prepack with #2 Sand: Top: 10.05' bgs Bottom: 20.05' bgs
1.2	56	1.5			Sand	
9.5		9.5	(14.1-14.8') CLAY with WOOD CHIPS, soft, greenish gray, moist, low plasticity, cohesive	CL	2" PVC Screen	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.05' bgs Bottom: 20.05' bgs Total Screen: 10'
6.4		6.4	(14.8-15') SANDY CLAY, firm, gray, moist, low plasticity, cohesive	CL		
9.9		9.9	(15-17') CLAY, firm, gray with some reddish yellow mottling, moist, low plasticity, cohesive	SC		
1.4	94	1.4	(17-17.5') CLAYEY SAND, very dense, reddish yellow to light gray, moist, non-plastic, non-cohesive	SP		
1.2		1.2	(17.5-20') SAND, medium dense, reddish yellow 17.5-18.8' bgs, light gray 18.8-20' bgs, wet, non-plastic, non-cohesive		End Cap	
2.3		2.3				
20			End of boring			



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

Monitoring Well Development  
Date: 04/26/2019  
Purged Amount: 3.25 gallons  
Well Volumes Removed: 8.33



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Engineers and Scientists

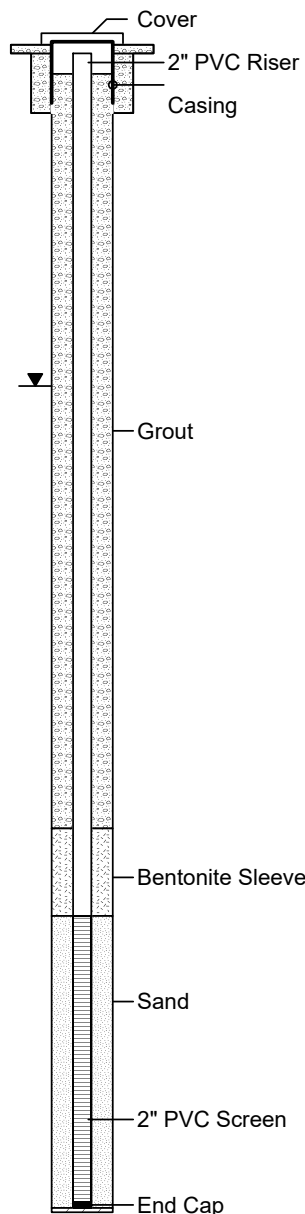
Well ID: RWI-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : M. Replogle, EIT  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572313.76  
Easting (ft) : 1456316.67  
Date/Time Started : 4/8/19 0930  
Date/Time Completed : 4/8/19 1140  
Surf. Elev. (ft AMSL) : 13.23'  
TOC Elev. (ft AMSL) : 12.95'  
Total Well Depth (ft) : 39.85' bgs  
Depth to Water (ft) : 0 Hr: 11.39' TOC  
Depth to Water (ft) : Static: 11.39' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-9.5') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown, dry, non-plastic, non-cohesive, trace red BRICK 8-9' bgs	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	80	0.7 1.4 4.0 1.2				
10	84	- 10.8 21.0 11.9	(9.5-11.2') CLAY, very soft, brown, wet, medium plasticity, cohesive	CL		Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.36' Riser Amount: 26.49'
15	100	0.1 0.1 0.0 0.2	(11.2-16') SAND, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SP	Grout	Wet at 9.5' bgs  Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.85' bgs
20	74	- 0.0 0.2 0.2	(16-20') CLAY, soft to stiff, gray, moist, medium plasticity, cohesive	CL		
25	100	0.4 -	(20-25') SAND, loose, gray, wet, non-plastic, non-cohesive, trace gray clay pockets	SW		Bentonite Seal: 1-3' sleeve Top: 26.85' bgs Bottom: 29.85' bgs
30	100	0.0 0.0 0.5 0.0	(25-28') CLAY, very stiff, very moist, light brown, medium plasticity, cohesive	CL	Bentonite Sleeve	Filter Pack: 2-5' prepack with #2 Sand Top: 29.85' bgs Bottom: 39.85' bgs
35	100	0.0 0.0 0.0 0.0	(28-30.2') SAND, fine to coarse, gray, reddish yellow, and pale brown, wet, non-plastic, non-cohesive	SW	Sand	
		0.0 0.0 0.0 0.0	(30.2-33') SILT, very stiff, gray, dry, non-plastic, non-cohesive, possible mica present	ML	2" PVC Screen	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.85' bgs Bottom: 39.85' bgs Total Screen: 10'
		0.0 0.0 0.0 0.0	(33-36.4') CLAY with some SAND, very stiff, gray, dry, low plasticity, cohesive	CL		
		0.0 0.0 0.0 0.0	(36.4-38') CLAYEY SAND, medium dense to loose, wet, non-plastic, non-cohesive	SC		
40	100	0.1	(38-40') CLAY, stiff, dark brown, low plasticity, cohesive, possible mica present	CL	End Cap	
			End of Boring			



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

Monitoring Well Development  
Date: 04/17/2019  
Purged Amount: 7.50 gallons  
Well Volumes Removed: 6.70





**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : M. Replogle, EIT  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572311.02  
Easting (ft) : 1456316.94  
Date/Time Started : 4/8/19 1145  
Date/Time Completed : 4/8/19 1340  
Surf. Elev. (ft AMSL) : 13.23'  
TOC Elev. (ft AMSL) : 12.89'  
Total Well Depth (ft) : 20' bgs  
Depth to Water (ft) : 0 Hr: 8.71' TOC  
Depth to Water (ft) : Static: 9.18' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWI-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		-	(0-10') Non-native SAND and SLAG, SAND and GRAVEL-sized, very dense, dark brown, dry then wet at 9.8' bgs, non-plastic, non-cohesive, trace brick 9-10' bgs, trace moisture 8-10' bgs	SW/GW		<p>6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.29' Riser Amount: 9.71'</p> <p>Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs Wet at 9.8' bgs</p> <p>Filter Pack: #2 Sand Top: 9' bgs Bottom: 10' bgs</p> <p>2-5' prepack with #2 Sand Top: 10' bgs Bottom: 20' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10' bgs Bottom: 20' bgs Total Screen: 10'</p>
4.8	80	3.4				
5		6.4				
52		0.7		NA		
10		2.7				
15		2.0				
10		-	(10-20') NO RECOVERY			
15		-				
20		-				
End of boring						

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

Monitoring Well Development  
Date: 04/17/2019  
Purged Amount: 5.50 gallons  
Well Volumes Removed: 13.10



# ARM Group Inc.

Engineers and Scientists

Well ID: RWJ-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572086.74  
Easting (ft) : 1456289.53  
Date/Time Started : 4/29/19 1240  
Date/Time Completed : 4/29/19 1440  
Surf. Elev. (ft AMSL) : 14.40'  
TOC Elev. (ft AMSL) : 14.10'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 12.58' TOC  
Depth to Water (ft) : Static: 13.11' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	90	1.8 5.5 3.9 6.4 21.1	(0-7.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, dense, dark brown with gray, dry to moist, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	76	93.9 1.1 4.7 8.4	(7.5-8') Limestone, SAND and GRAVEL-size, dense, white and very light gray, dry, non-plastic, non-cohesive	SW/GW		Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.3' Riser Amount: 26.33'
10	60	2.8 0.3 0.8	(8-12.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, dense, dark brown with gray, dry, non-plastic, non-cohesive	SW	Grout	Wet at 12.5' bgs Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.63' bgs
15	70	2.8 0.7 0.9	(12.5-17') SAND with trace Limestone GRAVEL, very fine to medium, medium dense, reddish yellow to yellowish red, wet, non-plastic, non-cohesive	CL		Bentonite Seal: 1-3' sleeve Top: 26.63' bgs Bottom: 29.63' bgs
20	68	0.6 0.7 0.4 0.8	(17-19.3') CLAY with some SAND, very firm, light grayish brown and reddish yellow, moist, low plasticity, cohesive	SW/GP		Filter Pack: 2-5' prepack with #2 Sand Top: 29.63' bgs Bottom: 39.63' bgs
25	100	1.5 1.8 2.4 3.8	(19.3-19.7') SAND with Limestone GRAVEL, coarse, medium dense, light reddish brown, wet, non-plastic, non-cohesive	CL	Bentonite Sleeve	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.63' bgs Bottom: 39.63' bgs Total Screen: 10
30	74	2.4 1.0 1.0 3.7	(20.4-24.6') SAND with trace Limestone GRAVEL, very fine to medium, reddish yellow grading to brownish gray, wet, non-plastic, non-cohesive	SW/GP	Sand	Collapsed Material: Top: 39.63' bgs Bottom: 40' bgs
35	100	0.6 0.8 0.9 1.2 1.4	(24.6-29.5') SANDY CLAY grading to CLAY, firm grading to very firm then hard, brownish gray to brown, moist grading to dry, low plasticity, cohesive	CL	2" PVC Screen	
40			(29.5-35') SAND, fine to medium with very coarse at depth, with some GRAVEL, fine, from medium dense to loose, grayish brown grading to reddish yellow, wet, non-plastic, non-cohesive		End Cap	
45			(35-40') CLAY, very firm, grayish brown, moist, low plasticity, cohesive			
50			End of Boring			

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

Monitoring Well Development  
Date: 05/01/2019  
Purged Amount: 8.50 gallons  
Well Volumes Removed: 8.02



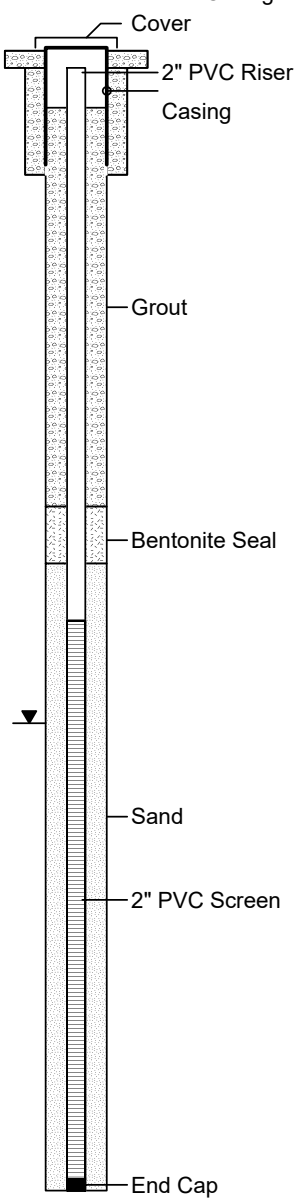
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572088.71  
Easting (ft) : 1456289.31  
Date/Time Started : 4/29/19 1042  
Date/Time Completed : 4/29/19 1158  
Surf. Elev. (ft AMSL) : 14.31'  
TOC Elev. (ft AMSL) : 13.81'  
Total Well Depth (ft) : 20.6' bgs  
Depth to Water (ft) : 0 Hr: 11.07' TOC  
Depth to Water (ft) : Static: 11.50' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWJ-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS	
0		-	(0-12') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to dense, brown to dark brown, dry, non-plastic, non-cohesive, some limestone gravel 8-9' bgs	SW/GW		6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'	
1.3						Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.49' Riser Amount: 10.11'	
1.4	70					Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs	
2.0						Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs	
27.4						Wet at 16' bgs	
5		0.7	(12-15.5') GRAVEL, coarse, medium dense, gray, moist, non-plastic, non-cohesive	GP		Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.6' bgs	
9.2						2-5' prepack with #2 Sand: Top: 10.6' bgs Bottom: 20.6' bgs	
100		2.6					
4.6			(15.5-17.5') SAND, fine to medium, and LIMESTONE GRAVEL, coarse, medium dense to loose, reddish yellow and white, wet ,non-plastic, non-cohesive	SW/GP		Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.6' bgs Bottom: 20.6' bgs Total Screen: 10'	
12.9							
10		-					
-		-	(17.5-19.1') CLAY with SAND, very firm, grayish brown, wet, non-plastic, non-cohesive	CL			
-	10	-					
1.9							
15		-	(19.1-20') SANDY SILT, soft, grayish brown, wet, non-plastic, non-cohesive	ML			
0.8							
80		1.2					
0.8							
1.1							
20			End of boring				

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

Monitoring Well Development  
Date: 05/01/2019  
Purged Amount: 2.00 gallons  
Well Volumes Removed: 5.88





**ARM Group Inc.**  
Engineers and Scientists

Client : EnviroAnalytics Group  
ARM Project No. : 190341M-2  
Project Description : RWM Onshore Supp. Inv.  
Site Location : Sparrows Point, MD  
ARM Representative : L. Perrin  
Checked by : M. Replogle E.I.T.  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Date : 05/01/2019  
Weather : 60s, Cloudy

Northing (US ft) : 572093.78  
Easting (US ft) : 1456289.53

**Boring ID: RWJ-SB**

(page 1 of 1)

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample ID/Interval	DESCRIPTION	USCS	REMARKS
0		-		(0-0.5') ASPHALT	NA	
	76	0.7		(0.5-10.4') Non-native SAND and SLAG, SAND and GRAVEL-sized, dense, dark brown with gray, dry, non-plastic, non-cohesive		
		0.1				
		1.5				
5		0.2				
		1.5			SW/GW	
		2.6				
	100	1.1				
		2.5				
10		0.4				
		-		(10.4-11.8') SLAG, coarse GRAVEL-sized, with some fine GRAVEL-sized and SAND-sized, loose, gray, dry, non-plastic, non-cohesive	GP	
	84	0.7				
		0.0		(11.8-24.5') LIMESTONE GRAVEL, coarse, with SANDY SILT, medium dense to dense, white and light reddish brown, dry then wet at 12.5' bgs, non-plastic, non-cohesive		
		0.0				
15		0.1				
		0.0	Composite			
		0.0				
	100	0.0			GP/ML	
		0.0				
20		0.1				
		-				
		-				
	36	-				
		0.0				
25		0.0		(24.5-25.7') SAND, fine to medium, with trace LIMESTONE GRAVEL, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW	
		0.0				
		0.0		(25.7-29.5') CLAY, very firm to hard, brown, moist, low plasticity, cohesive	CL	
	92	0.0				
		0.0				
		0.0				
30		0.0		(29.5-30') SAND, fine to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW	
				End of Boring		

Total Borehole Depth: 30' bgs.

Boring terminated at 30' bgs due to water and work plan.



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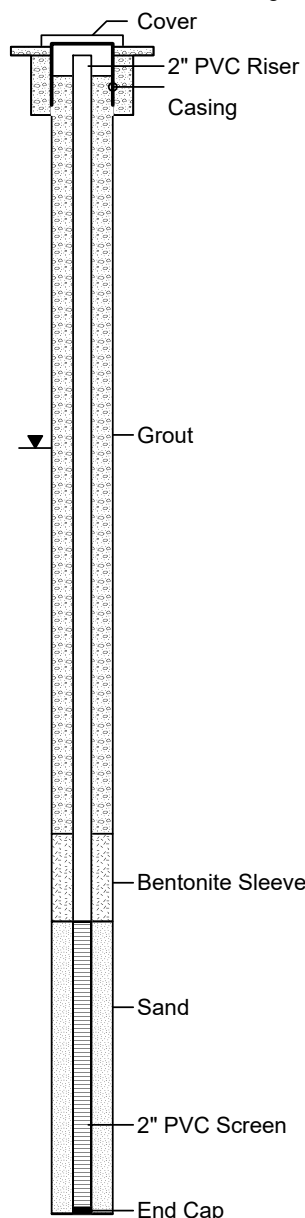
Well ID: RWK-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572080.79  
Easting (ft) : 1456279.77  
Date/Time Started : 4/2/19  
Date/Time Completed : 4/2/19  
Surf. Elev. (ft AMSL) : 14.54'  
TOC Elev. (ft AMSL) : 14.22'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 13.04' TOC  
Depth to Water (ft) : Static: 13.45' bgs  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-7.6') SLAG, SAND and GRAVEL-sized, with non-native SAND, dense, brown to dark brown, dry to moist, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	80	2.2 0.2 0.4 0.0	(7.6-10.5') SILTY SAND, dense, brown then reddish yellow with pale brown at 8.5' bgs, very moist, non-plastic, non-cohesive	SM		Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.3' Riser Amount: 26.67'
10	80	1.5 1.0 0.0	(10.5-16') SAND, fine to medium, dense, reddish yellow, wet, non-plastic, non-cohesive	SW		Wet at 11' bgs
15	80	0.0 0.0 0.2	(16-20') SANDY CLAY grading to CLAY, very firm to firm, gray, very moist to moist, low plasticity, cohesive	CL	Grout	Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.97' bgs
20	100	0.0 0.0 0.0	(20-25') SAND, fine to medium, with trace GRAVEL, fine to coarse, at depth, dense, reddish yellow grading to brownish gray, wet, non-plastic, non-cohesive	SW		Bentonite Seal: 1-3' sleeve Top: 26.97' bgs Bottom: 29.97' bgs
25	100	0.0 0.0 0.0	(25-31') CLAY, very firm, gray, moist, low plasticity, cohesive	CL	Bentonite Sleeve	Filter Pack: 2-5' prepack with #2 Sand Top: 29.97' bgs Bottom: 39.97' bgs
30	60	0.0 0.0 0.0	(31-32.5') SAND with trace GRAVEL, fine to coarse, brownish gray, wet, non-plastic, non-cohesive	SW	Sand	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.97' bgs Bottom: 39.97' bgs Total Screen: 10
35	100	0.0 0.0 0.0	(32.5-35.2') GRAVEL, fine, with SAND, medium dense, reddish yellow, wet, non-plastic, non-cohesive	GP/SW	2" PVC Screen	Collapsed Material: Top: 39.97' bgs Bottom: 40' bgs
40	100	0.0 0.0 0.0	(35.2-40') CLAY, very firm to firm, gray, moist, low plasticity, cohesive	CL	End Cap	
			End of Boring			



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

Monitoring Well Development  
Date: 04/16/2019  
Purged Amount: 6.50 gallons  
Well Volumes Removed: 6.19

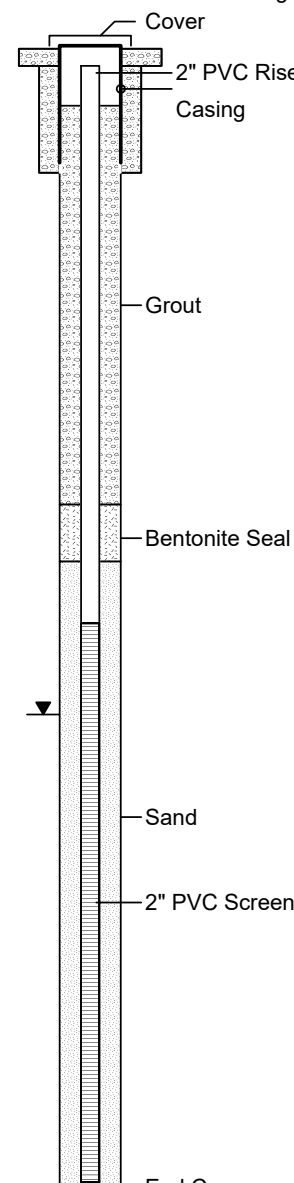


Northing (ft)	: 572082.89
Easting (ft)	: 1456279.78
Date/Time Started	: 4/01/19
Date/Time Completed	: 4/01/19
Surf. Elev. (ft AMSL)	: 14.50'
TOC Elev. (ft AMSL)	: 14.24'
Total Well Depth (ft)	: 20.08' bgs
Depth to Water (ft)	: 0 Hr: 10.84' TOC
Depth to Water (ft)	: Static: 11.38' TOC
Bit/Auger Size (in.)	: 3.50"

Well ID: RWK-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS		COMPLETION DETAILS
0	-	-	(0-7.5') Non-native SAND and SLAG GRAVEL, fine to coarse, medium dense to dense, gray and dark brown, dry to moist, then wet at 7.3' bgs, non-plastic, non-cohesive	SW/GW		6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
80	0.1	2.3				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.25' Riser Amount: 9.83'
5	-	0.3				Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs
76	3.2	0.0	(7.5-10.4') SILTY SAND, dense, reddish yellow and light brown, wet, non-plastic, non-cohesive	SM		Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs
10	0.0	0.0				Wet at 7.5' bgs
84	0.0	0.0	(10.4-16') SAND with trace SILT, medium dense to dense, very pale brown then reddish yellow with light brown, wet, non-plastic, non-cohesive	SW		Filter Pack: #2 sand Top: 9' bgs Bottom: 10.08' bgs
15	0.1	0.0				2-5' prepack with #2 Sand: Top: 10.08' bgs Bottom: 20.08' bgs
94	0.0	0.0	(16-20') CLAY, very firm, gray, moist, low plasticity, cohesive	CL		Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.08' bgs Bottom: 20.08' bgs Total Screen: 10'
20	0.0	0.0	End of boring			



Casing

Cover

2" PVC Riser

Casing

Grout

Bentonite Seal

Sand

2" PVC Screen

End Cap

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

Monitoring Well Development  
Date: 04/17/2019  
Purged Amount: 3.00 gallons  
Well Volumes Removed: 9.38





**ARM Group Inc.**  
Engineers and Scientists

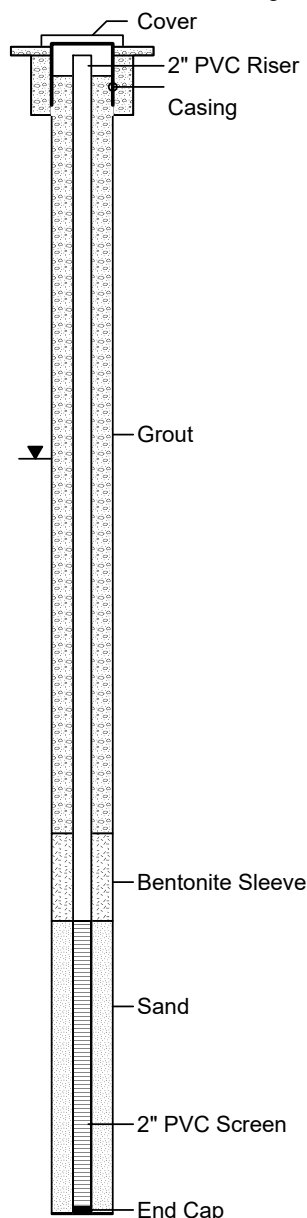
Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572073.09  
Easting (ft) : 1456266.84  
Date/Time Started : 4/2/19  
Date/Time Completed : 4/2/19  
Surf. Elev. (ft AMSL) : 14.60'  
TOC Elev. (ft AMSL) : 14.36'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 13.25' TOC  
Depth to Water (ft) : Static: 13.82' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWL-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		0.0	(0-8') SLAG, SAND and GRAVEL-sized, with non-native SAND, dense, dark brown, brown, and gray, dry to moist, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	100	0.1				
		0.8				
		0.2				
		0.1				
		-				
		0.5				
	72	0.0	(8-9.5') SILTY SAND, medium dense to dense, dark brown to light brown, very moist, non-plastic, non-cohesive	SM		Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.25' Riser Amount: 26.70'
10		0.0				
		0.0	(9.5-14.6') SAND, fine to medium with trace coarse, medium dense to dense, reddish yellow to yellowish red, wet, non-plastic, non-cohesive	SW		Wet at 9.5' bgs
	90	0.0				
		0.0				
		0.0				
15		0.0	(14.6-22.2') SANDY CLAY grading to CLAY, very firm to firm then hard, gray with reddish yellow to gray, dry to very moist, low plasticity, cohesive	CL	Grout	Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.95' bgs
	100	5.2				
		0.0				
20		0.0				
		-				
		0.0				
	86	0.0	(22.2-23.4') CLAYEY SAND, medium dense, gray, wet, non-plastic, non-cohesive	SC		Bentonite Seal: 1-3' sleeve Top: 26.95' bgs Bottom: 29.95' bgs
		0.0				
		0.0	(23.4-25.7') SAND, fine to medium, yellowish red, wet, non-plastic, non-cohesive	SW		Filter Pack: 2-5' prepack with #2 Sand Top: 29.95' bgs Bottom: 39.95' bgs
25		5.2				
		3.4	(25.7-32.5') CLAY, firm to hard, gray, dry to very moist, low plasticity, cohesive	CL	Bentonite Sleeve	
	90	2.2				
		0.2				
30		0.0				
		0.0				
	80	0.0	(32.5-35') GRAVEL, fine, with SAND, coarse to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	GP/SW	Sand	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.95' bgs Bottom: 39.95' bgs Total Screen: 10
		0.0				
35		0.0	(35-37') SANDY CLAY, very firm, gray, moist, low plasticity, cohesive	CL	2" PVC Screen	
		0.0				
	100	0.0	(37-40') CLAY, very firm, gray, moist, low plasticity, cohesive	CL	End Cap	Collapsed Material: Top: 39.95' bgs Bottom: 40' bgs
40		0.0	End of Boring			



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

Monitoring Well Development  
Date: 04/16/2019  
Purged Amount: 8.00 gallons  
Well Volumes Removed: 7.69



**ARM Group Inc.**  
Engineers and Scientists

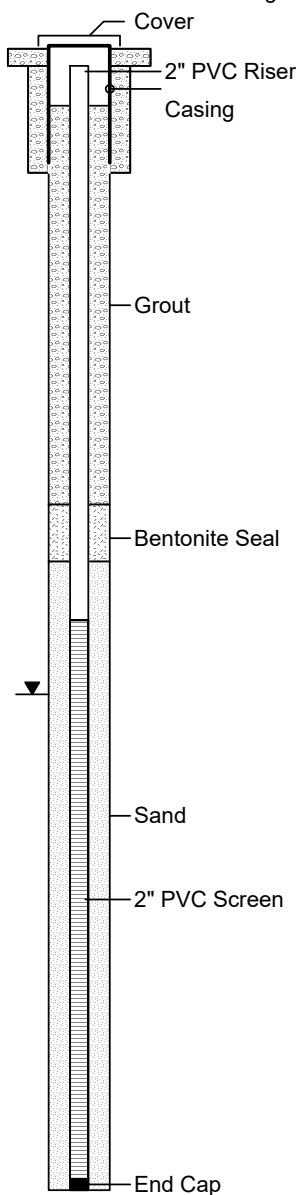
Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572075.55  
Easting (ft) : 1456266.81  
Date/Time Started : 4/02/19  
Date/Time Completed : 4/02/19  
Surf. Elev. (ft AMSL) : 14.55'  
TOC Elev. (ft AMSL) : 14.26'  
Total Well Depth (ft) : 20.03' bgs  
Depth to Water (ft) : 0 Hr: 14.75' TOC  
Depth to Water (ft) : Static: 11.03' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWL-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		1.0	(0-7.5') SLAG, SAND and GRAVEL-sized with non-native SAND, dense, dark brown and gray, dry to moist, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
90	0.1	0.0				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.30' Riser Amount: 9.73'
5	-	0.0			Grout	Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs
74	0.0	0.0	(7.5-9') SILTY SAND, dense, dark brown, very moist, non-plastic, non-cohesive	SM	Bentonite Seal	Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs
10	-	0.0	(9-14.5') SAND, fine to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW		Wet at 9' bgs
84	0.0	0.0			Sand	Filter Pack: #2 sand Top: 9' bgs Bottom: 10.03' bgs
15	0.0	0.0	(14.5-15') SANDY CLAY, very firm, gray, moist, low plasticity, cohesive	CL	2" PVC Screen	2-5' prepack with #2 Sand: Top: 10.03' bgs Bottom: 20.03' bgs
92	1.5	0.0	(15-20') CLAY, very firm, gray, moist, low plasticity, cohesive	CL	End Cap	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.03' bgs Bottom: 20.03' bgs Total Screen: 10'
20		0.0	End of boring			



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

Monitoring Well Development  
Date: 04/16/2019  
Purged Amount: 2.00 gallons  
Well Volumes Removed: 5.71



# ARM Group Inc.

Engineers and Scientists

Well ID: RWM-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572014.78  
Easting (ft) : 1456177.44  
Date/Time Started : 4/4/19 0920  
Date/Time Completed : 4/4/19 1205  
Surf. Elev. (ft AMSL) : 15.20'  
TOC Elev. (ft AMSL) : 14.92'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 13.73' TOC  
Depth to Water (ft) : Static: 13.62' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-11') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown with gray, dry to moist, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	88	0.0				Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.30' Riser Amount: 26.65'
10	6	0.0				
15	56	0.0	(11-15') CLAYEY SAND, medium dense, pale brown to reddish yellow, very moist then wet at 13.5' bgs, non-plastic, non-cohesive, some bits of clay	SC	Grout	Wet at 13.5' bgs  Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.95' bgs
20	100	0.0	(15-19.7') SAND, fine to medium, with CLAY, reddish yellow and pale brown, wet, non-plastic, non-cohesive	SW-SC		Bentonite Seal: 1-3' sleeve Top: 26.95' bgs Bottom: 29.95' bgs
25	100	0.0	(19.7-22.2') SAND, fine to medium with trace coarse, medium dense to dense, pale brown and reddish yellow, wet, non-plastic, non-cohesive	SW		
30	60	0.0	(22.2-23.6') CLAYEY SAND, dense, yellowish red, wet, non-plastic, non-cohesive, bits of clay	SC		Filter Pack: 2-5' prepack with #2 Sand Top: 29.95' bgs Bottom: 39.95' bgs
35	100	0.0	(23.6-29.5') CLAY, very firm, grayish brown, moist, medium plasticity, cohesive	CL	Bentonite Sleeve	
40	80	0.0	(29.5-30.5') CLAYEY SAND, medium dense, gray, wet, non-plastic, non-cohesive	SC	Sand	Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.95' bgs Bottom: 39.95' bgs Total Screen: 10
45	80	0.0	(30.5-36.1') GRAVEL, fine, with SAND, medium to coarse, medium dense, very pale brown, wet, non-plastic, non-cohesive	GP/SW	2" PVC Screen	Collapsed Material: Top: 39.95' bgs Bottom: 40' bgs
	80	0.0	(36.1-36.7') CLAY, very firm, gray, moist, low plasticity, cohesive	CL	End Cap	
	80	0.0	(36.7-38') CLAYEY SAND grading to SAND, fine to medium, medium dense, gray, wet, non-plastic, non-cohesive	SC/SW		
	80	0.0	(38-40') SAND, fine to medium, gray, wet, non-plastic, non-cohesive	SW		
			End of Boring			

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

Monitoring Well Development  
Date: 04/15/2019  
Purged Amount: 7.00 gallons  
Well Volumes Removed: 6.67





**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572017.30  
Easting (ft) : 1456177.36  
Date/Time Started : 4/4/19 1250  
Date/Time Completed : 4/4/19 1405  
Surf. Elev. (ft AMSL) : 15.21'  
TOC Elev. (ft AMSL) : 14.97'  
Total Well Depth (ft) : 20.07' bgs  
Depth to Water (ft) : 0 Hr: 11.71' TOC  
Depth to Water (ft) : Static: 12.22' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWM-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		-	(0-7.5') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown and dark grayish brown, dry, non-plastic, non-cohesive	SW/GW	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'
5	80	0.6			Grout	Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.35' Riser Amount: 9.72'
10	80	0.0	(7.5-12') SAND, fine to medium, dense, yellowish red, moist, non-plastic, non-cohesive	SW	Bentonite Seal	Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs  Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs
15	96	0.0	(12-13.9') CLAY with trace SAND, hard, reddish yellow with light gray, dry to moist, low plasticity, cohesive	CL	Sand	Wet at 15' bgs  Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.07' bgs
20	100	0.0	(13.9-18.5') CLAYEY SAND, dense, reddish yellow and light gray, moist to wet at 15' bgs, non-plastic, non-cohesive	SC	2" PVC Screen	2-5' prepack with #2 Sand: Top: 10.07' bgs Bottom: 20.07' bgs Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.07' bgs Bottom: 20.07' bgs Total Screen: 10'
20		0.0	(18.5-20') SAND with CLAY, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW-SC	End Cap	
			End of boring			

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

Monitoring Well Development  
Date: 04/15/2019  
Purged Amount: 16.50 gallons  
Well Volumes Removed: 55.00



**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572065.77  
Easting (ft) : 1456392.44  
Date/Time Started : 4/11/19  
Date/Time Completed : 4/11/19  
Surf. Elev. (ft AMSL) : 15.12'  
TOC Elev. (ft AMSL) : 14.86'  
Total Well Depth (ft) : 25.17' bgs  
Depth to Water (ft) : 0 Hr: 12.76' TOC  
Depth to Water (ft) : Static: 11.81' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWN-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-0.5') ASPHALT	NA	Cover	<p>6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.31' Riser Amount: 14.86'</p> <p>Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 13' bgs</p> <p>Bentonite Seal: Granular Top: 13' bgs Bottom: 14' bgs</p> <p>Wet at 6.5' bgs</p> <p>Filter Pack: #2 Sand Top: 14' bgs Bottom: 15.17' bgs</p> <p>2-5' prepack with #2 Sand: Top: 15.17' bgs Bottom: 25.17' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 15.17' bgs Bottom: 25.17' bgs Total Screen: 10'</p>
3.4	80	0.2	(0.5-7') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown with gray, dry then wet at 6.5' bgs, non-plastic, non-cohesive	SW/GW	2" PVC Riser Casing	
5	-	0.3				
6.6	66	0.1	(7-7.4') BRICK GRAVEL, loose, reddish yellow, very moist to wet, non-plastic, non-cohesive	GW		
10	-	0.0	(7.4-10') CLAYEY SAND grading to SAND, very fine to medium, light brown and reddish yellow, wet, non-plastic, non-cohesive	SC/SW		
10	-	5.7	(10-20.5') CLAY, very firm to hard, reddish yellow and light gray, dry, low plasticity, cohesive	CL	Grout	
15	-	0.4				
15	-	0.2			Bentonite Seal	
20	-	0.0				
20	-	0.0			Sand	
20	-	0.0			2" PVC Screen	
25	78	0.0	(20.5-25') SAND with CLAY, very fine to medium then very fine to coarse with trace GRAVEL 24-25' bgs, medium dense, pale brown to reddish yellow then brownish gray 24-25' bgs, wet, non-plastic, non-cohesive	SW-SC	End Cap	
			End of boring			

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

Monitoring Well Development  
Date: 04/17/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 9.62



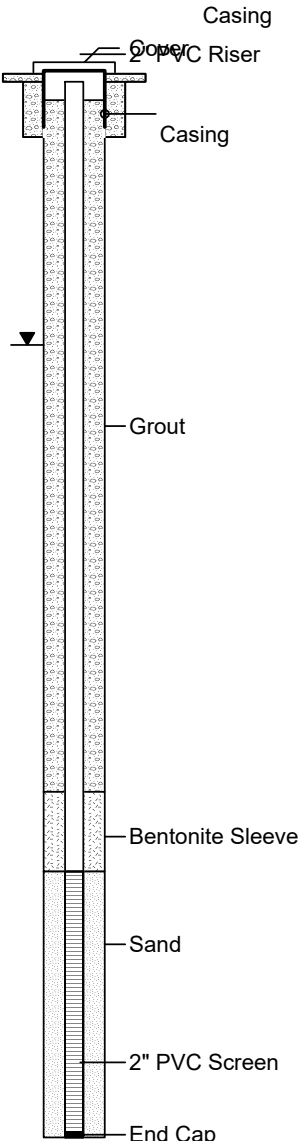
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572456.37  
Easting (ft) : 1456443.37  
Date/Time Started : 4/29/19 0855  
Date/Time Completed : 4/29/19 1030  
Surf. Elev. (ft AMSL) : 11.99'  
TOC Elev. (ft AMSL) : 11.67'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 9.13' TOC  
Depth to Water (ft) : Static: 9.90' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWO-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	-	-	(0-2.8') SAND with CLAY, dense, brownish yellow, dry, non-plastic, non-cohesive	SW-SC	 <p>6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0.45'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.35' Riser Amount: 26.65'</p> <p>Wet at 19.5' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 27' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 27' bgs Bottom: 30' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand: Top: 30' bgs Bottom: 40' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30' bgs Bottom: 40' bgs Total Screen: 10</p>
5	60	3.7	(2.8-4.8') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense, dark brown and brown, dry, non-plastic, non-cohesive	SW/GW	
10	18	8.9	(4.8-10') SANDY CLAY, with SLAG GRAVEL, firm, light brown, moist, low plasticity, cohesive	CL	
15	0	-	(10-19.5') NO RECOVERY		
20	8	43.3	(19.5-33') SAND, medium dense, grayish brown, wet, non-plastic, non-cohesive	SW	
25	4	139.9			
30	4	18.3			
35	6	9.1	(33-35') CLAYEY SAND, medium dense, grayish brown, wet, non-plastic, non-cohesive	SC	
40	27.0	-	(35-40') CLAY with SAND, soft to firm, grayish brown, moist, low plasticity, cohesive	CL	
45			End of Boring		

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

Monitoring Well Development  
Date: 05/08/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 4.13



**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572459.66  
Easting (ft) : 1456442.96  
Date/Time Started : 4/29/19 0815  
Date/Time Completed : 4/29/19 0850  
Surf. Elev. (ft AMSL) : 11.93'  
TOC Elev. (ft AMSL) : 11.59'  
Total Well Depth (ft) : 20.29' bgs  
Depth to Water (ft) : 0 Hr: 9.91' TOC  
Depth to Water (ft) : Static: 10.37' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWO-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0	-	-	(0-1.5') SAND with CLAY, loose to medium dense, brownish yellow, dry, non-plastic, non-cohesive	SW-SC	Cover 2" PVC Riser Casing	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0.45'
1.1	-	-	(1.5-15') Non-native SAND and SLAG, SAND and GRAVEL-sized, medium dense to dense, brown to dark brown, dry then wet at 12' bgs, non-plastic, non-cohesive, strong odor and heavy sheen 14.5-15' bgs	SW/GW	Bentonite Chips	Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.40' Riser Amount: 9.89'
78	0.8	-				Bentonite Seal: 3'8" chips Top: 1' bgs Bottom: 8' bgs
21.3	-	-				Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs
34.8	-	-				Wet at 12' bgs
5	-	-				Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.29' bgs
42	-	-				2-5' prepack with #2 Sand: Top: 10.29' bgs Bottom: 20.29' bgs
10	-	-				
60	28.2	-			Sand	
5.8	-	-			2" PVC Screen	
255.9	-	-				
15	5.8	-	(15-20') SAND, fine to medium with trace coarse, medium dense, grayish brown, wet, non-plastic, non-cohesive, trace sheen 15-17' bgs	SW		Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.29' bgs Bottom: 20.29' bgs Total Screen: 10'
6.9	-	-				
100	6.8	-				
2.3	-	-				
12.9	-	-				
20	-	-	End of boring		End Cap	

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

Monitoring Well Development  
Date: 05/08/2019  
Purged Amount: 3.00 gallons  
Well Volumes Removed: 7.50





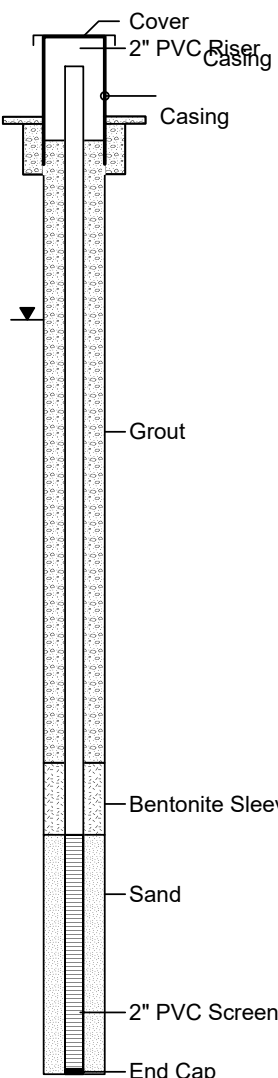
**ARM Group Inc.**  
Engineers and Scientists

Well ID: RWP-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572456.91  
Easting (ft) : 1456719.41  
Date/Time Started : 4/17/19 0910  
Date/Time Completed : 4/17/19 1115  
Surf. Elev. (ft AMSL) : 10.25'  
TOC Elev. (ft AMSL) : 12.55'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 11.33' TOC  
Depth to Water (ft) : Static: 11.24' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	40	-	(0-12.5') Non-native SAND and SLAG/BRICK, SAND and GRAVEL-sized, dense, very dark brown, dry then wet at 8.7' bgs, non-plastic, non-cohesive	SW/GW	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.15'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.54' Riser Amount: 27'</p> <p>Wet at 8.5' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 27' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 27' bgs Bottom: 30' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 30' bgs Bottom: 40' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 30' bgs Bottom: 40' bgs Total Screen: 10</p>
5	26	-	(12.5-13') SANDY SILT, firm, dark gray, very moist, low plasticity, cohesive	ML	
10	64	-	(13-18.5') SAND, fine to medium, brownish gray, wet, non-plastic, non-cohesive	SW	
15	64	-	(18.5-22.6') CLAY, firm, light brown, moist, low plasticity, cohesive	CL	
20	100	-	(22.6-23.6') SAND, very fine to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW	
25	94	-	(23.6-25') CLAY with trace SAND, firm, light gray and reddish yellow, moist, low plasticity, cohesive	SW/GP	
30	100	-	(25-27.5') SAND, very fine to coarse, with GRAVEL, fine, at depth, reddish yellow, wet, non-plastic, non-cohesive	CL	
35	100	-	(27.5-30') CLAY with trace SAND, soft to firm, light gray and reddish yellow, moist, low plasticity, cohesive	CL	
40	100	-	(30-35') SANDY CLAY grading to CLAY with trace SAND at depth, soft to very firm, gray and reddish yellow, very moist to moist, low plasticity, cohesive	SC	
45		-	(35-36') SANDY CLAY, very firm, yellowish red and grayish brown, moist, low plasticity, cohesive	CL	
50		-	(36-38.8') CLAYEY SAND, medium dense, yellowish red and light grayish brown, wet, non-plastic, non-cohesive		
		-	(38.8-40') SANDY CLAY, very firm, yellowish red and grayish brown, moist, low plasticity, cohesive		

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

Monitoring Well Development  
Date: 04/30/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 4.10



# ARM Group Inc.

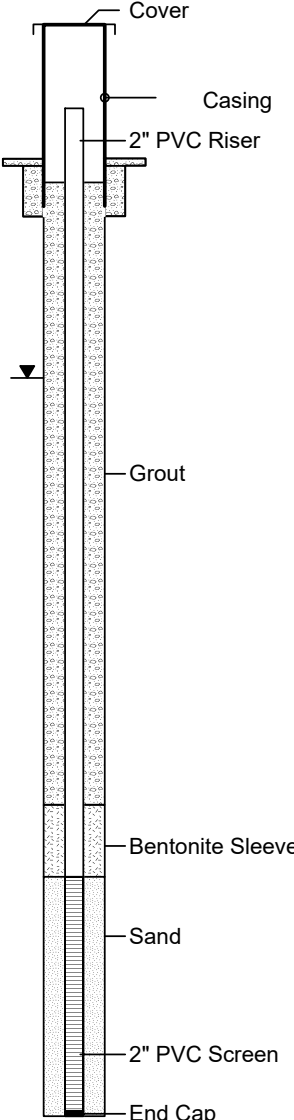
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
 Project Number : 190341M-2  
 Client : EnviroAnalytics Group  
 Site : Sparrow's Point  
 Borehole Location : Parcel A3  
 ARM Representative : L. Perrin  
 Checked by : M. Replogle, EIT  
 Drilling Company : GSI, Inc.  
 Driller : Kevin Pumphrey  
 Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572458.02  
 Easting (ft) : 1456935.48  
 Date/Time Started : 4/18/19 0810  
 Date/Time Completed : 4/18/19 1010  
 Surf. Elev. (ft AMSL) : 13.42'  
 TOC Elev. (ft AMSL) : 15.63'  
 Total Well Depth (ft) : 40' bgs  
 Depth to Water (ft) : 0 Hr: 14.90' TOC  
 Depth to Water (ft) : Static: 14.16' TOC  
 Bit/Auger Size (in.) : 3.50"

Well ID: RWQ-MWI

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	92	0.0	(0-5') CLAY with SAND and trace SLAG GRAVEL, hard, reddish yellow and light brown with some light gray, dry, low plasticity, cohesive	CL	 <p>4" Protective Steel Casing with Locking Lid          1.5x1.5' concrete pad          1" expandable-type cap          Casing Stickup (ags): 3.06'</p> <p>Riser: Sch 40 PVC          Riser Diameter: 1 in          Riser Stickup (ags): 2.53'          Riser Amount: 27'</p> <p>Wet at 8.5' bgs</p> <p>Grout: Portland w/ 5% Bentonite          Top: 0' bgs          Bottom: 27' bgs</p> <p>Bentonite Seal: 1-3' sleeve          Top: 27' bgs          Bottom: 30' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand          Top: 30' bgs          Bottom: 40' bgs</p> <p>Screen: Sch 40 PVC          Screen Diameter: 1 in          Slot Size: 0.010"          Top: 30' bgs          Bottom: 40' bgs          Total Screen: 10</p>
5	74	0.0	(5-7.5') Non-native SAND and SLAG, SAND and GRAVEL-sized, loose to medium dense, very dark brown, dry to very moist, non-plastic, non-cohesive	SW/GW	
10	100	0.0	(7.5-10.5') SANDY CLAY, firm, reddish yellow, very moist, then wet at 8.5' bgs, low plasticity, cohesive	CL	
15	100	0.0	(10.5-11') CLAYEY SAND, medium dense, reddish yellow, wet, non-plastic, non-cohesive	CL	
20	100	0.0	(11-15.1') SANDY CLAY, firm, reddish yellow, wet, low plasticity, cohesive	CL	
25	100	0.0	(15.1-19') CLAY with some SAND at depth, firm to very firm, light gray, moist, low plasticity, cohesive	SW	
30	100	0.0	(19-21.5') SAND, fine to coarse, yellowish red, wet, non-plastic, non-cohesive	CL	
35	100	0.0	(21.5-27.2') CLAY, soft to very firm, brown, moist, low plasticity, cohesive	SW	
40	100	0.0	(27.2-27.9') SAND, very fine to coarse, grayish brown, wet, non-plastic, non-cohesive	CL	
45	100	0.0	(27.9-32.2') CLAY, firm to very firm, brownish gray, moist, low plasticity, cohesive	SW	
50	100	0.0	(32.2-34.2') SAND, very fine to coarse, medium dense, light grayish brown, wet, non-plastic, non-cohesive	CL	
		0.0	(34.2-35.6') SANDY CLAY, firm, light brownish gray, moist, low plasticity, cohesive	SC	
		0.0	(35.6-37') CLAYEY SAND, loose to medium dense, reddish yellow and yellowish red, wet, non-plastic, non-cohesive	CL	
		0.0	(37-40') CLAY with SAND, soft to firm, light brownish gray with reddish yellow mottling, moist to very moist, low plasticity, cohesive		
		0.0	End of Boring		

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

Monitoring Well Development  
 Date: 04/22/2019  
 Purged Amount: 4.50 gallons  
 Well Volumes Removed: 4.05



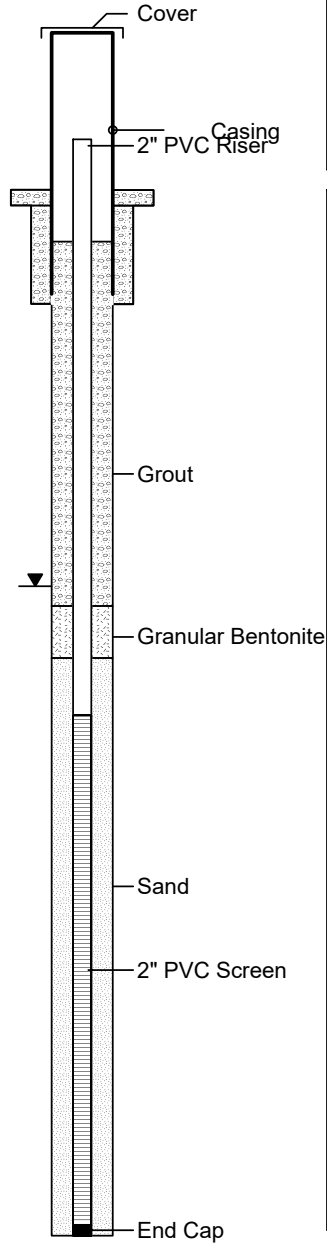
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572458.02  
Easting (ft) : 1456935.48  
Date/Time Started : 4/17/19 1415  
Date/Time Completed : 4/17/19 1515  
Surf. Elev. (ft AMSL) : 13.42'  
TOC Elev. (ft AMSL) : 15.63'  
Total Well Depth (ft) : 20.10' bgs  
Depth to Water (ft) : 0 Hr: 11.53' TOC  
Depth to Water (ft) : Static: 10.37' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWQ-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0		0.1	(0-4.9') CLAY with SAND and trace ORGANICS, hard, brown grading to light brown, dry, low plasticity, cohesive	CL	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.05'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.84' Riser Amount: 10.10'</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 8' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs</p> <p>Wet at 7.7' bgs</p> <p>Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.10' bgs</p> <p>2-5' prepack with #2 Sand: Top: 10.10' bgs Bottom: 20.10' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.10' bgs Bottom: 20.10' bgs Total Screen: 10'</p>
5	86	0.6			
		0.8			
		1.2			
		2.1			
		-	(4.9-7.7') Non-native SAND and SLAG, SAND and GRAVEL-sized, dense, very dark brown, dry, non-plastic, non-cohesive	SW/GW	
		1.8			
		0.2	(7.7-8.8') SAND with CLAY, dense, reddish yellow, wet, non-plastic, non-cohesive	SW-SC	
		0.1	(8.8-9.8') CLAYEY SAND, dense, reddish yellow and pale brown, wet, non-plastic, non-cohesive	SC	
10	76	0.1	(9.8-11.8') SAND, fine to medium, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW	
		0.1			
		0.4	(11.8-12.5') CLAYEY SAND, medium dense, reddish yellow and light gray, wet, non-plastic, non-cohesive	SC	<p>End Cap</p>
		0.1	(12.5-18.5') CLAY with trace SAND, light gray and reddish yellow, moist, non-plastic, non-cohesive	CL	
15		0.2			
		0.2			
		0.2			
		0.2			
		0.2			
		0.2			
		0.2			
		0.2			
		0.3	(18.5-19.2') SANDY CLAY, firm, light gray and pale brown, moist, low plasticity, cohesive	CL	
20	84	0.3	(19.2-20') SAND, fine to coarse, medium dense, yellowish red with black streaks, wet, non-plastic, non-cohesive	SW	
			End of boring		

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

Monitoring Well Development  
Date: 04/22/2019  
Purged Amount: 4.50 gallons  
Well Volumes Removed: 9.00



# ARM Group Inc.

Engineers and Scientists

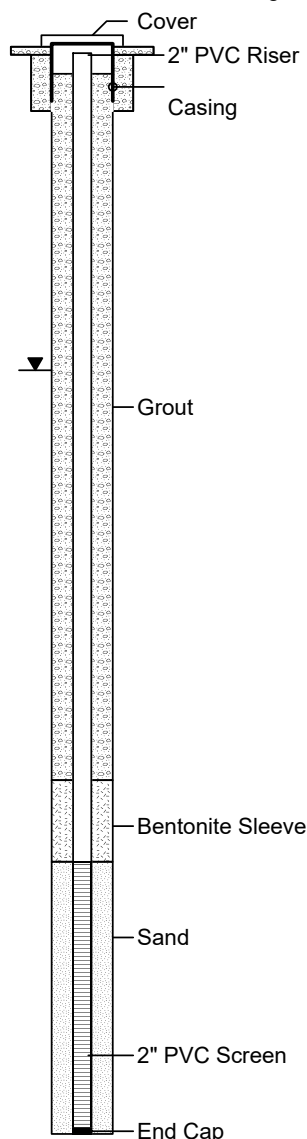
Well ID: RWR-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571982.52  
Easting (ft) : 1456768.65  
Date/Time Started : 4/25/19 1125  
Date/Time Completed : 4/25/19 1400  
Surf. Elev. (ft AMSL) : 13.99'  
TOC Elev. (ft AMSL) : 13.61'  
Total Well Depth (ft) : 40' bgs  
Depth to Water (ft) : 0 Hr: 11.98' TOC  
Depth to Water (ft) : Static: 11.66' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		0.2	(0-2.3') CLAY with SAND near surface, hard, brown, moist, low plasticity, cohesive, trace ORGANICS	CL	Cover	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'  Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.35' Riser Amount: 26.62'  Wet at 16.6' bgs  Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 26.97' bgs  Bentonite Seal: 1-3' sleeve Top: 26.97' bgs Bottom: 29.97' bgs  Filter Pack: 2-5' prepack with #2 Sand Top: 29.97' bgs Bottom: 39.97' bgs  Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 29.97' bgs Bottom: 39.97' bgs Total Screen: 10
5	90	0.2	(2.3-5.8') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense to medium dense, dark brown, brown, and gray, dry, non-plastic, non-cohesive	SW/GW	2" PVC Riser	
10		0.2	(5.8-16.6') CLAY, hard grading to soft, reddish yellow and light gray then light gray 14-16.6' bgs, dry then moist at 14' bgs, low plasticity, cohesive	CL	Casing	
15		1.2				
20		9.3				
25		6.9				
30		2.3				
35		0.4				
40		0.0				
45		0.3				
50		0.6				
55		0.3				
60		0.1				
65		0.0				
70		0.0				
75		0.0				
80		0.0				
85		0.0				
90		0.0				
95		0.0				
100		0.0				
105		0.0				
110		0.0				
115		0.0				
120		0.0				
125		0.0				
130		0.0				
135		0.0				
140		0.0				
145		0.0				
150		0.0				
155		0.0				
160		0.0				
165		0.0				
170		0.0				
175		0.0				
180		0.0				
185		0.0				
190		0.0				
195		0.0				
200		0.0				
205		0.0				
210		0.0				
215		0.0				
220		0.0				
225		0.0				
230		0.0				
235		0.0				
240		0.0				
245		0.0				
250		0.0				
255		0.0				
260		0.0				
265		0.0				
270		0.0				
275		0.0				
280		0.0				
285		0.0				
290		0.0				
295		0.0				
300		0.0				
305		0.0				
310		0.0				
315		0.0				
320		0.0				
325		0.0				
330		0.0				
335		0.0				
340		0.0				
345		0.0				
350		0.0				
355		0.0				
360		0.0				
365		0.0				
370		0.0				
375		0.0				
380		0.0				
385		0.0				
390		0.0				
395		0.0				
400		0.0				
405		0.0				
410		0.0				
415		0.0				
420		0.0				
425		0.0				
430		0.0				
435		0.0				
440		0.0				
445		0.0				
450		0.0				
455		0.0				
460		0.0				
465		0.0				
470		0.0				
475		0.0				
480		0.0				
485		0.0				
490		0.0				
495		0.0				
500		0.0				
505		0.0				
510		0.0				
515		0.0				
520		0.0				
525		0.0				
530		0.0				
535		0.0				
540		0.0				
545		0.0				
550		0.0				
555		0.0				
560		0.0				
565		0.0				
570		0.0				
575		0.0				
580		0.0				
585		0.0				
590		0.0				
595		0.0				
600		0.0				
605		0.0				
610		0.0				
615		0.0				
620		0.0				
625		0.0				
630		0.0				
635		0.0				
640		0.0				
645		0.0				
650		0.0				
655		0.0				
660		0.0				
665		0.0				
670		0.0				
675		0.0				
680		0.0				
685		0.0				
690		0.0				
695		0.0				
700		0.0				
705		0.0				
710		0.0				
715		0.0				
720		0.0				
725		0.0				
730		0.0				
735		0.0				
740		0.0				
745		0.0				
750		0.0				
755		0.0				
760		0.0				
765		0.0				
770		0.0				
775		0.0				
780		0.0				
785		0.0				
790		0.0				
795		0.0				
800		0.0				
805		0.0				
810		0.0				
815		0.0				
820		0.0				
825		0.0				
830		0.0				
835		0.0				
840		0.0				
845		0.0				
850		0.0				
855		0.0				
860		0.0				
865		0.0				
870		0.0				
875		0.0				
880		0.0				
885		0.0				
890		0.0				
895		0.0				
900		0.0				
905		0.0				
910		0.0				
915		0.0				
920		0.0				
925		0.0				
930		0.0				
935		0.0				
940		0.0				
945		0.0				
950		0.0				
955		0.0				
960		0.0				
965		0.0				
970		0.0				
975		0.0				
980		0.0				
985		0.0				
990		0.0				
995		0.0				
1000		0.0				



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

Monitoring Well Development  
Date: 05/08/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 4.46





**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Don Marchese  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 571986.20  
Easting (ft) : 1456769.23  
Date/Time Started : 4/25/19 1411  
Date/Time Completed : 4/25/19 1545  
Surf. Elev. (ft AMSL) : 14.07'  
TOC Elev. (ft AMSL) : 13.68'  
Total Well Depth (ft) : 20.18' bgs  
Depth to Water (ft) : 0 Hr: 10.48' TOC  
Depth to Water (ft) : Static: 10.05' TOC  
Bit/Auger Size (in.) : 3.50"

Well ID: RWR-MWS

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	Casing	COMPLETION DETAILS
0		0.2	(0-0.9') CLAY with SAND, hard, brown and dark brown, dry, low plasticity, cohesive	CL	Cover	6" Protective Steel Casing with Locking Flush Mount Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 0'  Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (bgs): 0.32' Riser Amount: 9.86'  Grout: Portland w/ 5% Bentonite Top: 1' bgs Bottom: 8' bgs  Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs  Wet at 17.4' bgs  Filter Pack: #2 sand Top: 9' bgs Bottom: 10.18' bgs  2-5' prepack with #2 Sand: Top: 10.18' bgs Bottom: 20.18' bgs  Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.18' bgs Bottom: 20.18' bgs Total Screen: 10'
92	0.6	0.6	(0.9-7.5') Non-native SAND with SLAG, SAND and GRAVEL-sized, medium dense to dense, dark brown and brown, dry, non-plastic, non-cohesive	SW/GW	2" PVC Riser Casing	
5	0.0	0.0			Grout	
100	0.1	0.1	(7.5-17.4') CLAY, hard grading to soft, yellowish red and pale brown then light gray at 15' bgs, dry grading to very moist, low plasticity, cohesive			
10	-	1.8			Granular Bentonite	
82	3.3	0.0		CL	Sand	
15	0.0	0.0			2" PVC Screen	
86	0.0	0.0	(17.4-17.8') CLAYEY SAND, medium dense, yellowish red and pale brown, wet, non-plastic, non-cohesive	SC		
	0.0	0.0	(17.8-20') SAND, medium dense, reddish yellow, wet, non-plastic, non-cohesive	SW		
20			End of boring		End Cap	

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

Monitoring Well Development  
Date: 05/08/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 12.82



# ARM Group Inc.

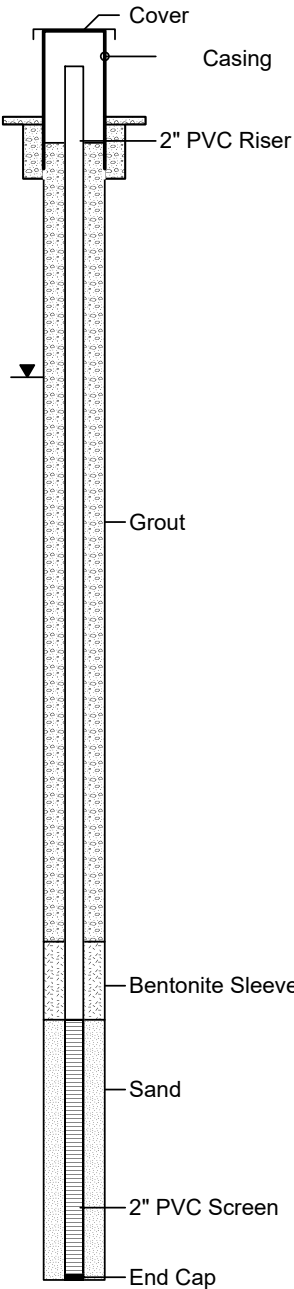
Engineers and Scientists

Well ID: RWS-MWI

(page 1 of 1)

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572074.85  
Easting (ft) : 1457037.25  
Date/Time Started : 4/18/19 1217  
Date/Time Completed : 4/18/19 1437  
Surf. Elev. (ft AMSL) : 11.89'  
TOC Elev. (ft AMSL) : 14.30'  
Total Well Depth (ft) : 45' bgs  
Depth to Water (ft) : 0 Hr: 13.33' TOC  
Depth to Water (ft) : Static: 12.76' TOC  
Bit/Auger Size (in.) : 3.50"

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0	94	0.2	(0-0.5') SILT with ORGANICS, soft, dark brown, dry, non-plastic, non-cohesive	ML	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.10'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.65' Riser Amount: 31.71' Wet at 3.7' bgs</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 31.71' bgs</p> <p>Bentonite Seal: 1-3' sleeve Top: 31.71' bgs Bottom: 34.71' bgs</p> <p>Filter Pack: 2-5' prepack with #2 Sand Top: 34.71' bgs Bottom: 44.71' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 34.71' bgs Bottom: 44.71' bgs Total Screen: 10</p>
5	78	0.0	(0.5-6') Non-native SAND with SLAG, SAND and GRAVEL-sized, dense, dark brown, dry, non-plastic, non-cohesive	SW/GW	
10	74	0.0	(6-15') CLAY grading to CLAY with SAND, soft the firm to very firm, light gray then light brownish gray with some reddish yellow mottling, very moist the dry to moist from 7.5-15' bgs, low plasticity, cohesive, WOOD FRAGMENTS from 6.5-7.5' bgs	CL	
15	66	0.0	(15-20') SAND, very fine to medium, medium dense, pale brown grading to reddish yellow, wet, non-plastic, cohesive	SW	
20	100	0.0	(20-28.5') CLAY, soft, reddish brown grading to brown, very moist, low plasticity, cohesive	CL	
25	100	0.0	(28.5-29') SAND, fine to medium, dark gray, wet, non-plastic, non-cohesive	SW	
30	100	0.0	(29-40') CLAY, soft grading to very firm, brownish gray grading to bluish gray, very moist to moist, low plasticity, cohesive	CL	
35	100	0.0	(40-45') SAND, fine to medium, medium dense, light gray, wet, non-plastic, non-cohesive	SW	
40	62	0.0			
45		0.0	End of Boring		

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

Monitoring Well Development  
Date: 04/22/2019  
Purged Amount: 5.25 gallons  
Well Volumes Removed: 3.83



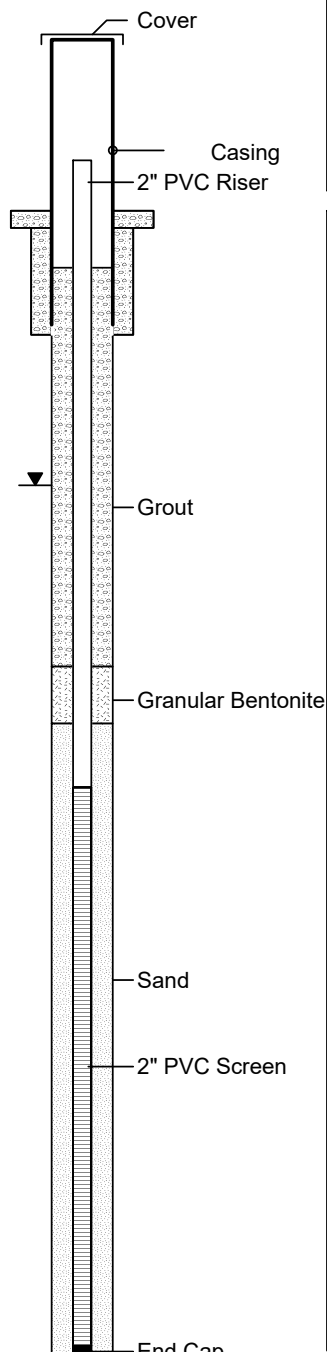
**ARM Group Inc.**  
Engineers and Scientists

Project Name : RWM Onshore Supp. Inv.  
Project Number : 190341M-2  
Client : EnviroAnalytics Group  
Site : Sparrow's Point  
Borehole Location : Parcel A3  
ARM Representative : L. Perrin  
Checked by : M. Replogle, EIT  
Drilling Company : GSI, Inc.  
Driller : Kevin Pumphrey  
Drilling Equipment : Geoprobe 7822DT

Northing (ft) : 572077.73  
Easting (ft) : 1457037.46  
Date/Time Started : 4/18/19 1030  
Date/Time Completed : 4/18/19  
Surf. Elev. (ft AMSL) : 12.21'  
TOC Elev. (ft AMSL) : 14.65'  
Total Well Depth (ft) : 20.12' bgs  
Depth to Water (ft) : 0 Hr: 7.47' TOC  
Depth to Water (ft) : Static: 7.57' TOC  
Bit/Auger Size (in.) : 3.50"

**Well ID: RWS-MWS**

(page 1 of 1)

Depth (ft.)	%Recovery	PID (ppm)	DESCRIPTION	USCS	COMPLETION DETAILS
0		0.0	(0-0.8') SANDY SILT with ORGANICS, dark brown, moist, non-plastic, non-cohesive	ML	 <p>4" Protective Steel Casing with Locking Lid 1.5x1.5' concrete pad 1" expandable-type cap Casing Stickup (ags): 3.02'</p> <p>Riser: Sch 40 PVC Riser Diameter: 1 in Riser Stickup (ags): 2.75' Riser Amount: 10.12'</p> <p>Grout: Portland w/ 5% Bentonite Top: 0' bgs Bottom: 8' bgs</p> <p>Bentonite Seal: Granular Top: 8' bgs Bottom: 9' bgs</p> <p>Wet at 6' bgs</p> <p>Filter Pack: #2 Sand Top: 9' bgs Bottom: 10.12' bgs</p> <p>2-5' prepack with #2 Sand: Top: 10.12' bgs Bottom: 20.12' bgs</p> <p>Screen: Sch 40 PVC Screen Diameter: 1 in Slot Size: 0.010" Top: 10.12' bgs Bottom: 20.12' bgs Total Screen: 10'</p>
90	0.0	0.0	(0.8-6') Non-native SAND and SLAG/BRICK, SAND and GRAVEL-sized, dense, very dark brown and red, dry then wet at 5.5' bgs, non-plastic, non-cohesive	SW/GW	
5	-	0.0	(6-12.5') CLAYEY SAND grading to SAND, very fine to medium, medium dense, pale brown, wet, non-plastic, non-cohesive	SC/SW	
10	-	0.0	(12.5-15') CLAY with SAND, firm, light brownish gray, moist, low plasticity, cohesive	CL	
15	-	0.0	(15-20') SAND with CLAY grading to SAND, medium dense, light brownish gray grading to reddish yellow, wet, non-plastic, non-cohesive	SW-SC	
86	0.0	0.0			
81	0.0	0.0			
20		0.0	End of boring		

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

Monitoring Well Development  
Date: 04/22/2019  
Purged Amount: 5.00 gallons  
Well Volumes Removed: 8.20



**ARM Group Inc.**  
Engineers and Scientists

Client : EnviroAnalytics Group  
ARM Project No. : 190341M-2  
Project Description : RWM Onshore Supp. Inv.  
Site Location : Sparrows Point, MD  
ARM Representative : L. Perrin  
Checked by : M. Replogle E.I.T.  
Drilling Company : GSI, Inc.  
Driller : Don Marchese  
Drilling Equipment : Geoprobe 7822DT

Date : 04/30/2019  
Weather : 60s, Cloudy

Northing (US ft) : 572151.09  
Easting (US ft) : 1456563.52

**Boring ID: RWU-SB**

(page 1 of 1)

Depth (ft.)	% Recovery	PID Reading (PPM)	Sample ID/Interval	DESCRIPTION	USCS	REMARKS
0		0.1		(0-0.5') ASPHALT	NA	
	100	4.4		(0.5-8') Non-native SAND and SLAG, SAND and GRAVEL-sized, with SILT, dense, dark brown with gray, dry, non-plastic, non-cohesive		
		5.5				
		0.6				
		0.4			SW/GW	
5		-				
	60	-				
		2.3				
		0.6		(8-8.5') LIMESTONE GRAVEL, coarse, medium dense, white, dry, non-plastic, non-cohesive	GP	
		3.9		(8.5-10.3') SLAG GRAVEL, coarse, with some non-native SAND, loose to medium dense, brown and gray, moist, non-plastic, non-cohesive	GP	
10		0.0				
	100	0.0	Composite	(10.3-23') LIMESTONE GRAVEL with non-native SILT, medium dense to dense, white and light reddish brown, with grayish brown 12-12.8' bgs, moist then wet at 12.8' bgs, non-plastic, non-cohesive		
		0.0				
		0.0				
		0.0			GP/ML	
	100	0.0				
		0.0				
		0.0				
15		0.0				
		0.0				
		0.0				
	100	0.0				
		0.0				
		0.0				
20		0.0				
		0.0				
		0.0				
	90	0.0				
		0.0		(23-23.4') CLAYEY SAND, medium dense, brownish gray, wet, non-plastic, non-cohesive	SC	
		0.0		(23.4-25') CLAY, very firm, brownish gray, moist, low plasticity, cohesive	CL	
25		0.0		End of Boring		

Total Borehole Depth: 25' bgs.

Boring terminated at 25' bgs due to water and work plan.



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## **APPENDIX B**

### **Well Development Logs**

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# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWOSR - MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>5-1-19</u> / <u>0852</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>5-1-19</u> / <u>1003</u>	Company: _____
Well Location: <u>Area A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 50's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>33</u> to <u>43</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.63</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>42.54</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>42.57</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>12.21</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) _____ ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) _____ 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	39.67 - 43	10	2.5		greyish brown
2	36.33 - 39.67	10	2.0		grey
3	33 - 36.33	10	2.0		grey
Cumulative Totals: (Minimum of 3 Well Volumes)			6.5		

Final Depth to Water (from TOC): 12.49

Final Total Well Depth (from TOC): 42.57

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW21-MWT

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>4-30-19 / 0729</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>4-30-19 / 0858</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Cloudy 50's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-) <u>0.25</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>40.04</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>40.14</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>13.00</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>27.14</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>1.09</u> 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	36.67 - 40	10	1.5		greyish brown
2	33.33 - 36.67	10	1.5		greyish brown
3	30 - 33.33	10	1.5		
Cumulative Totals: (Minimum of 3 Well Volumes)			4.5		

Final Depth to Water (from TOC): 17.42

Final Total Well Depth (from TOC): 40.28

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW22R-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-18-19 / 0915

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-18-19 / 0907

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Cloudy 50°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>32</u> to <u>42</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (G/-) <u>2.92</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>42.72</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>41.98</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>15.97</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>26.01</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.74</u> ft.	Wetted Well Volume: (A x D) <u>1.04</u> 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	1.5		grey
2	35.33 - 38.67	10	1.0		grey
3	32 - 35.33	10	1.0		grey
Cumulative Totals: (Minimum of 3 Well Volumes)			3.5		

Final Depth to Water (from TOC): 29.58

Final Total Well Depth (from TOC): 42.77

Thickness of Any Sediment Remaining in Well: 0.00

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradeport Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW 22R - MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341 M

Date/Time Started: 4-17-19 / 1426

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-17-19 / 1510

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 65°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>13</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: ( $\oplus/-$ ) <u>2.7</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>22.95</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>22.96</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal./ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>15.61</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>7.35</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>0.29</u> 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	<u>19.67 - 23</u>	<u>10</u>	<u>1.0</u>		<u>brown</u>
2	<u>16.33 - 19.67</u>	<u>10</u>	<u>0.75</u>		<u>brown</u>
3	<u>13 - 16.33</u>	<u>10</u>	<u>1.0</u>		<u>brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>2.75</u>		

Final Depth to Water (from TOC): 15.62

Final Total Well Depth (from TOC): 22.99

Thickness of Any Sediment Remaining in Well: 0.0

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW23-MW1

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4/16/19 / 0953

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4/16/19 / 1126

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 50°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+ / -)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>40.04</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.93</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>14.00</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>25.93</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.11</u> ft.	Wetted Well Volume: (A x D) <u>1.04</u> 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	<u>36.67 - 40</u>	<u>10</u>	<u>3.5</u>		<u>brown</u>
2	<u>33.33 - 36.67</u>	<u>10</u>	<u>2.25</u>		<u>brown</u>
3	<u>30 - 33.33</u>	<u>10</u>	<u>3.5</u>		<u>light brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>9.25</u>		

Final Depth to Water (from TOC): 14.20

Final Total Well Depth (from TOC): 39.92

Thickness of Any Sediment Remaining in Well: 0.12

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW23-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4/16/19 / 0840

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4/16/19 / 0953

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Partly cloudy 50°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>20.00</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> 0.04 gal/ft	Total Well Depth (TOC): <u>20.01</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>9.74</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>10.27</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>0.41</u> 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
<u>1</u>	<u>16.67 - 20</u>	<u>10</u>	<u>1.5</u>		<u>brown - light brown</u>
<u>2</u>	<u>13.33 - 16.67</u>	<u>10</u>	<u>0.75</u>		<u>brown - light brown</u>
<u>3</u>	<u>10 - 13.33</u>	<u>10</u>	<u>0.75</u>		<u>brown - light brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>3.0</u>		

Final Depth to Water (from TOC): 18.61

Final Total Well Depth (from TOC): 20.01

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW24-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-18-19 / 1000

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-18-19 / 1101

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:  
cloudy 60°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.94</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.89</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.04</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>28.85</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.05</u> ft.	Wetted Well Volume: (A x D) <u>1.15</u> 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	36.67 - 40	10	1.75		brown
2	33.33 - 36.67	10	1.75		brown
3	30 - 33.33	10	1.50		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			5.0		

Final Depth to Water (from TOC): 12.62

Final Total Well Depth (from TOC): 39.89

Thickness of Any Sediment Remaining in Well: 0.05

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradeport Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW24-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-18-19 / 0915

Developed by: ICV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-18-19 / 1000

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

cloudy 60°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>20.14</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>19.91</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>8.78</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>11.13</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.23</u> ft.	Wetted Well Volume: (A x D) <u>0.45</u> 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	16.67 - 20	10	1.0		brown
2	13.33 - 16.67	10	1.0		light brown
3	10 - 13.33	10	1.0		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			3.0		

Final Depth to Water (from TOC): 8.81

Final Total Well Depth (from TOC): 19.91

Thickness of Any Sediment Remaining in Well: 0.23

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradeport Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW25-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341 M

Date/Time Started: 4-16-19 / 1212

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-18-19 / 1356

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Sunny 70°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+ / -)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.91</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.84</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>10.62</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> . Thickness (ft.): _____	Height of Water Column: (B - C) <u>29.22</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.07</u> ft.	Wetted Well Volume: (A x D) <u>1.17</u> 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	36.67 - 40	10	2.75		light reddish brown
2	33.33 - 36.67	10	2.25		light reddish brown
3	30 - 33.33	10	2.5		yellowish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			7.5		

Final Depth to Water (from TOC): 10.98

Final Total Well Depth (from TOC): 39.88

Thickness of Any Sediment Remaining in Well: 0.03

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW25 - MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-18-19 / 1107

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-18-19 / 1212

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Sunny 70°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>20.28</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>19.34</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>8.38</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>11.01</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.49</u> ft.	Wetted Well Volume: (A x D) <u>0.44</u> 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	16.67 - 20	10	2.5		light brown
2	13.33 - 16.67	10	2.0		light brown
3	10 - 13.33	10	1.5		yellowish light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			6.0		

Final Depth to Water (from TOC): 9.25

Final Total Well Depth (from TOC): 20.08

Thickness of Any Sediment Remaining in Well: \_\_\_\_\_

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWA-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190311 M

Date/Time Started: 4-17-19 / 1328

Developed by: JLV

Client: EnviroAnalytics Group

Date/Time Completed: 4-17-19 / 1411

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Checked by: \_\_\_\_\_

Sunny 65°

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>18</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: $(\oplus/-)$ <u>3.09'</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>23.14</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>22.75</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal./ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>9.93</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>12.82</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.39</u> ft.	Wetted Well Volume: (A x D) <u>0.51</u> 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	<u>20.5-23</u>	<u>10</u>	<u>1.0</u>		<u>brown</u>
2	<u>18-20.5</u>	<u>10</u>	<u>1.0</u>		<u>light brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>2.0</u>		

Final Depth to Water (from TOC): 17.09

Final Total Well Depth (from TOC): 23.17

Thickness of Any Sediment Remaining in Well: 0.00

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWA - mws

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-17-19 / 1258

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-17-19 / 1328

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Sunny 65°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>11</u> to <u>16</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: $((+) - )$ <u>3.18'</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>16.90</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>16.96</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal./ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>9.75</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>7.21</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>0.29</u> 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
<u>1</u>	<u>13.5 - 16</u>	<u>10</u>	<u>1.0</u>		<u>greyish brown</u>
<u>2</u>	<u>11 - 13.5</u>	<u>10</u>	<u>1.25</u>		<u>greyish brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>2.25</u>		

Final Depth to Water (from TOC): 9.74

Final Total Well Depth (from TOC): 16.96

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWB-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>150-190341M</u>	Date/Time Started: <u>4-19-19</u> / <u>0913</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-19-19</u> / <u>1059</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 65°</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>32</u> to <u>42</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.95</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>42.35</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in.</u> <u>1.0 in.</u>	Well Total Depth (TOC): <u>42.39</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A)</u> <u>0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>18.14</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>24.25</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.97</u> 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	38.67 - 42	10	1.75		dark grey
2	35.33 - 38.67	10	1.0		grey
3	32 - 35.33	10	1.25		grey
Cumulative Totals: (Minimum of 3 Well Volumes)			4.0		

Final Depth to Water (from TOC): 27.75 Final well depth: 42.39

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWB - mws

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>150 190341M</u>	Date/Time Started: <u>4-19-19</u> / <u>0800</u>	Developed by: <u>JCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>4-19-19</u> / <u>0913</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 60°</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>13</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.76</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>23.30</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in.</u> <u>1.0 in.</u>	Well Total Depth (TOC): <u>23.35</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A)</u> <u>0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>18.76</u> ft. (C)
Petroleum/Product Present? <u>Y or (N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>4.59</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.18</u> 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	19.67 - 23	10	0.75		dark grey
2	16.33 - 19.67	10	0.25		grey
3	13 - 16.33	10	0.25		light grey
Cumulative Totals: (Minimum of 3 Well Volumes)			1.25		

Final Depth to Water (from TOC): 23.31

Final well depth: 23.35

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWD-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341</u>	Date/Time Started: <u>5-1-19</u> / <u>11/19</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>5-1-19</u> / <u>12/31</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>33</u> to <u>43</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: $(\oplus/-) \geq .55$	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>42.57</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> 0.04 gal/ft	Total Well Depth (TOC): <u>42.59</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>14.16</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>28.43</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>1.14</u> 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	39.67 - 43	10	3.0		greyish brown
2	36.33 - 39.67	10	3.0		greyish light brown
3	33 - 36.33	10	3.0		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			9.0		

Final Depth to Water (from TOC): 14.35

Final Total Well Depth (from TOC): 42.59

Thickness of Any Sediment Remaining in Well: 0.00

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWD-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 5-1-19 / 1010

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 5-1-19 / 1119

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 60's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>12</u> to <u>22</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.60</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>22.15</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>22.17</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>12.52</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>9.65</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>0.39</u> 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	<u>18.67-22</u>	<u>10</u>	<u>1.25</u>		<u>light brown</u>
2	<u>15.33-18.67</u>	<u>10</u>	<u>0.5</u>		<u>light brown</u>
3	<u>12-15.33</u>	<u>10</u>	<u>0.25</u>		<u>light brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>2.0</u>		

Final Depth to Water (from TOC): 21.15

Final Total Well Depth (from TOC): 22.17

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWE-MWT

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>5-1-19</u> / <u>0738</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>5-1-19</u> / <u>0848</u>	Company: _____
Well Location: <u>Area A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 50's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>33</u> to <u>43</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.56</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>42.54</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>42.57</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal./ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>12.97</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>29.60</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>1.18</u> 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	39.67-43	10	2.0		dark brown
2	36.33-39.67	10	2.0		dark brown
3	33-36.33	10	2.0		dark brown
Cumulative Totals: (Minimum of 3 Well Volumes)			6.0		

Final Depth to Water (from TOC): 13.35

Final Total Well Depth (from TOC): 42.57

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWE-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>4-30-19</u> / <u>1437</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-30-19</u> / <u>1535</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Sunny 70's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>12</u> to <u>22</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: ( <u>G</u> / -) <u>2.54</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>22.49</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>22.51</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>12.77</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>9.74</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>0.39</u> gal. (E)

#### C. Surge and Pump Event Summary Data

Description of Surge Equipment: 1" surge block

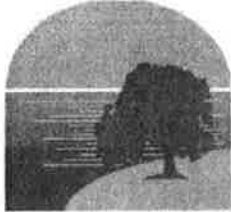
Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	16.67-22	10	1.25		grey
2	15.33-18.67	10	1.5		grey
3	12-15.33	10	1.5		grey
Cumulative Totals: (Minimum of 3 Well Volumes)			4.25		

Final Depth to Water (from TOC): 12.40

Final Total Well Depth (from TOC): 22.61

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWF-MWT

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 150 A034/M

Date/Time Started: 4-26-19 / 0845

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-26-19 / 1008

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Checked by: \_\_\_\_\_

Cloudy 50's

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>32</u> to <u>42</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 3.13</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>42.55</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in.</u> <u>1.0 in.</u>	Well Total Depth (TOC): <u>42.55</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft.</u> <u>(A) 0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>11.03</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>31.55</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>1.26</u> 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	<u>38.67 - 42</u>	<u>10</u>	<u>2.0</u>		<u>grey</u>
2	<u>35.33 - 38.67</u>	<u>10</u>	<u>1.75</u>		<u>grey</u>
3	<u>32 - 35.33</u>	<u>10</u>	<u>1.5</u>		<u>grey</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>5.25</u>		

Final Depth to Water (from TOC): 11.24 Final well depth: 42.60

Thickness of Any Sediment Remaining in Well: 0.00

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWF-mws

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 150-190341M

Date/Time Started: 4-26-19 / 0742

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-26-19 / 0842

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 50's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>13</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(G/-) 2.77</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>22.75</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. - 1.0 in</u>	Well Total Depth (TOC): <u>22.75</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A)</u> <u>0.04 gal./ft</u>	Depth to Static Water Level (TOC): <u>11.99</u> ft. (C)
Petroleum/Product Present? <u>Y or N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>10.76</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.43</u> 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	19.67 - 23	10	1.25		brownish grey
2	16.33 - 19.67	10	1.25		light grey
3	13 - 16.33	10	1.25		light brownish grey
Cumulative Totals: (Minimum of 3 Well Volumes)			3.75		

Final Depth to Water (from TOC): 11.99 Final well depth: 22.77

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWG-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>19034/M</u>	Date/Time Started: <u>4-30-19</u> / <u>1145</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-30-19</u> / <u>1302</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Sunny 70's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>28</u> to <u>38</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: ( $\oplus$ / -) <u>2.79</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>37.54</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>37.54</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.60</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>25.94</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>1.04</u> 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	34.67 - 38	10	2.0		greyish brown
2	31.33 - 34.67	10	2.0		greyish brown
3	28 - 31.33	10	2.5		greyish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			6.5		

Final Depth to Water (from TOC): 11.75

Final Total Well Depth (from TOC): 37.56

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWG-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>4-30-19</u> / <u>1041</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-30-19</u> / <u>1145</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Sunny 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>13</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: ( <u>3</u> / -) <u>2.79</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>22.72</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.01 gal/ft</u>	Total Well Depth (TOC): <u>22.72</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.70</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>11.02</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Well Volume: (A x D) <u>0.44</u> gal. (E)

#### C. Surge and Pump Event Summary Data

Description of Surge Equipment: 1" surge block

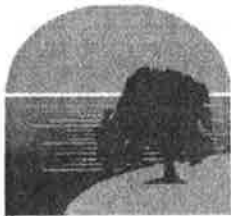
Event No.	Screen Interval (ft.)	No. of Surge Strokes	Volume of Water Removed (gal.)	Bore Volumes of Water Removed	Qualitative Description of Color/Turbidity/Odors/Other
1	19.67 - 23	10	1.5		greyish light brown
2	16.33 - 19.67	10	1.5		light brown
3	13 - 16.33	10	1.5		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			4.5		

Final Depth to Water (from TOC): 12.11

Final Total Well Depth (from TOC): 22.72

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWH-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 150 190341M

Date/Time Started: 4-26-19 / 1250

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-26-19 / 1428

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 70's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>23</u> to <u>33</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+16) 0.38</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>33.53</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. 1.0 in</u>	Well Total Depth (TOC): <u>33.61</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A) 0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>10.38</u> ft. (C)
Petroleum/Product Present? <u>Y or (N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>23.23</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.93</u> 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	<u>29.67 - 33</u>	<u>10</u>	<u>3.0</u>		<u>grey</u>
2	<u>26.33 - 29.67</u>	<u>10</u>	<u>2.5</u>		<u>grey</u>
3	<u>23 - 26.33</u>	<u>10</u>	<u>2.5</u>		<u>brownish grey</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>8.0</u>		

Final Depth to Water (from TOC): 10.98 Final well depth: 33.62

Thickness of Any Sediment Remaining in Well: 0.00

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWH-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>15019034/M</u>	Date/Time Started: <u>4-26-11</u> / <u>1040</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-26-11</u> / <u>1130</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Drizzle 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-) <u>0.15</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>20.05</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in</u> / <u>1.0 in</u>	Well Total Depth (TOC): <u>20.02</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft.</u> (A) <u>0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>10.23</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>9.79</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.03</u> ft.	Wetted Bore Volume: (A x D) <u>0.39</u> 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	16.67 - 20	10	1.25		brown
2	13.33 - 16.67	10	1.0		light brown
3	10 - 13.33	10	1.0		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			3.25		

Final Depth to Water (from TOC): 10.39 Final well depth: 20.05

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWI-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 19034/M

Date/Time Started: 4-12-19 / 1000

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-17-19 / 1123

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Cloudy 60°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.85</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.49</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal./ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.39</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>28.1</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.36</u> ft.	Wetted Well Volume: (A x D) <u>1.12</u> 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	36.67 - 40	10	2.75		brown
2	33.33 - 36.67	10	2.0		brown
3	30 - 33.33	10	2.75		brown
Cumulative Totals: (Minimum of 3 Well Volumes)			7.5		

Final Depth to Water (from TOC): 12.26

Final Total Well Depth (from TOC): 39.61

Thickness of Any Sediment Remaining in Well: 0.24

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWI-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-17-19 / 1123

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-17-19 / 1231

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Checked by: \_\_\_\_\_

Cloudy 60°

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>20.00</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>19.68</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>9.18</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>10.50</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.32</u> ft.	Wetted Well Volume: (A x D) <u>0.42</u> 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	<u>16.67 - 20</u>	<u>10</u>	<u>2.0</u>		<u>dark brown</u>
2	<u>13.33 - 16.67</u>	<u>10</u>	<u>1.5</u>		<u>brown</u>
3	<u>10 - 13.33</u>	<u>10</u>	<u>2.0</u>		<u>brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>5.5</u>		

Final Depth to Water (from TOC): 9.28

Final Total Well Depth (from TOC): 19.85

Thickness of Any Sediment Remaining in Well: 0.15

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWJ-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>5-1-19</u> / <u>1305</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>5-1-19</u> / <u>1441</u>	Company: _____
Well Location: <u>Area A, Parcel 3</u>	Weather/Site Conditions: <u>Cloudy 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-) <u>0.3</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.93</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u>	<u>0.04</u> gal./ft.	Total Well Depth (TOC): <u>39.66</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal./ft. (4" PVC) (A)		Depth to Static Water Level (TOC): <u>13.11</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____		Height of Water Column: (B - C) <u>26.55</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.27</u> ft.		Wetted Well Volume: (A x D) <u>1.06</u> 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	36.67 - 40	10	3.0		brown
2	33.33 - 36.67	10	2.5		yellowish brown
3	30 - 33.33	10	3.0		yellowish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			8.5		

Final Depth to Water (from TOC): 13.40

Final Total Well Depth (from TOC): 39.67

Thickness of Any Sediment Remaining in Well: 0.26

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWJ-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 15019034/M

Date/Time Started: 5-1-19 / 1441

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 5-1-19 / 1527

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 60's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 0.49</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>20.60</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. 1.0 in.</u>	Well Total Depth (TOC): <u>20.16</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A) 0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>11.50</u> ft. (C)
Petroleum/Product Present? <u>Y or (N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>8.66</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.44</u> ft.	Wetted Bore Volume: (A x D) <u>0.34</u> gal. (E)

#### C. Surge and Pump Event Summary Data

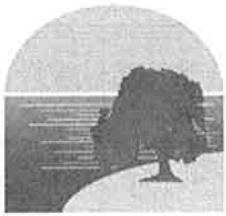
Description of Surge Equipment: 1" surge block

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	16.67-20	10	1.0		light brown
2	13.33-16.67	10	0.5		pale brown/mostly clear
3	10-13.33	10	0.5		pale brown/mostly clear
Cumulative Totals: (Minimum of 3 Well Volumes)			2.0		

Final Depth to Water (from TOC): 11.56 Final well depth: 20.16

Thickness of Any Sediment Remaining in Well: 0.44

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWK-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190311/M

Date/Time Started: 4-16-19 / 1418

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-16-19 / 1848

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Sunny 60°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.97</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.72</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>13.45</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>26.27</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.25</u> ft.	Wetted Well Volume: (A x D) <u>1.05</u> 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
<u>1</u>	<u>36.67 - 40</u>	<u>10</u>	<u>2.75</u>		<u>brown</u>
<u>2</u>	<u>33.33 - 36.67</u>	<u>10</u>	<u>1.75</u>		<u>brown</u>
<u>3</u>	<u>30 - 33.33</u>	<u>10</u>	<u>2.0</u>		<u>yellowish brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>6.5</u>		

Final Depth to Water (from TOC): 13.79

Final Total Well Depth (from TOC): 39.77

Thickness of Any Sediment Remaining in Well: 0.20

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWK - MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>4-17-19 / 0721</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-17-19 / 0817</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Cloudy 55°</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+ / - )	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>19.84</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>19.41</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.38</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>8.03</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.43</u> ft.	Wetted Well Volume: (A x D) <u>0.32</u> 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	16.67 - 20	10	1.5		dark yellowish brown
2	13.33 - 16.67	10	0.75		yellowish brown
3	10 - 13.33	10	0.75		yellowish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			3.0		

Final Depth to Water (from TOC): 13.91

Final Total Well Depth (from TOC): 19.90

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWL-MW-1

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-16-19 / 1137

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-16-19 / 1319

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Partly cloudy 50°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.95</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.81</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>13.82</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>25.99</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.14</u> ft.	Wetted Well Volume: (A x D) <u>1.04</u> 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	36.67 - 40	10	2		brown
2	33.33 - 36.67	10	2.75		yellowish brown
3	30 - 33.33	10	3.25		yellowish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			8		

Final Depth to Water (from TOC): 14.17

Final Total Well Depth (from TOC): 39.88

Thickness of Any Sediment Remaining in Well: 0.07

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWL-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 4-16-19 / 1319

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 4-16-19 / 1418

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Sunny 55°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+ / -)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>20.03</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>19.81</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.03</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>8.78</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.22</u> ft.	Wetted Well Volume: (A x D) <u>0.35</u> 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	16.67 - 20	10	1.5		yellowish brown
2	13.33 - 16.67	10	0.5		yellowish brown
3	10 - 13.33	10	0.5		brownish yellow
Cumulative Totals: (Minimum of 3 Well Volumes)			2.0		

Final Depth to Water (from TOC): 16.32

Final Total Well Depth (from TOC): 19.81

Thickness of Any Sediment Remaining in Well: 0.22

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



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1 gal = 134 ft<sup>3</sup>

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWM-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190341M

Date/Time Started: 1/15/19 / 10:5

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 1/15/19 / 12:12

Company: 112

Well Location: Area A, Parcel 3

Weather/Site Conditions:

Breezy 60°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.95</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1 inch</u> <u>0.04 gal/ft 1" PVC</u>	Total Well Depth (TOC): <u>39.79</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>13.62</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>26.17</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.16</u> ft.	Wetted Well Volume: (A x D) <u>1.05</u> gal. (E)

#### C. Surge and Pump Event Summary Data

Description of Surge Equipment: 1 inch 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	<u>36.67-40</u>	<u>10</u>	<u>~2</u>		<u>brownish-yellow</u>
2	<u>33.33-36.67</u>	<u>10</u>	<u>~2</u>		<u>brownish-yellow</u>
3	<u>30-33.33</u>	<u>10</u>	<u>~3.5</u>		<u>brownish-yellow</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>~7</u>		

Final Depth to Water (from TOC): 13.90

Final Total Well Depth (from TOC): 39.85

1 inch = 0.0833 ft

Thickness of Any Sediment Remaining in Well: 0.10

0.0055 ft<sup>2</sup>  
Area of circle w/ 1 inch radius

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

Sparrows Point

Well ID: \_\_\_\_\_

Date: \_\_\_\_\_

ID Numbers of IDW Drums Generated:

1. \_\_\_\_\_
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 appropriate 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**

Field Representative(s): Tyler Van Ness  4-15-19  
 Print Name Signature Date

\_\_\_\_\_  
Print Name\_\_\_\_\_  
Signature\_\_\_\_\_  
Date

All depths reported are from reference notch in top of TOC.  
 All measurements made in 10<sup>th</sup>s of feet

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



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## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWM-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341 M</u>	Date/Time Started: <u>4/15/19 / 1430</u>	Developed by: <u>JCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4/15/19 / 1550</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 50°</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10.07</u> to <u>20.07</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>20.07</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft.</u>	Total Well Depth (TOC): <u>19.83</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>12.22</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>7.61</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.24</u> ft.	Wetted Well Volume: (A x D) <u>0.30</u> 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	16.67 - 20	10	~ 2		brownish-yellow
2	13.33 - 16.67	10	~ 1		brownish-yellow
3	10 - 13.33	10	~ 2		brownish-yellow
Cumulative Totals: (Minimum of 3 Well Volumes)			~ 16.5		

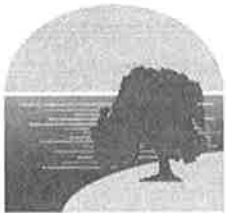
Final Depth to Water (from TOC): 13.51'

Final Total Well Depth (from TOC): 19.84'

Thickness of Any Sediment Remaining in Well: 0.23'

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWN-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 190311M

Date/Time Started: 4-17-19 / 0846

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 4-17-19 / 0953

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions:

cloudy 55°

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>15</u> to <u>25</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+ / -)	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>25.17</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>24.92</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.81</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>13.11</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.25</u> ft.	Wetted Well Volume: (A x D) <u>0.52</u> 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
<u>1</u>	<u>21.67 - 25</u>	<u>10</u>	<u>1.5</u>		<u>brown</u>
<u>2</u>	<u>18.33 - 21.67</u>	<u>10</u>	<u>1.75</u>		<u>brown</u>
<u>3</u>	<u>15 - 18.33</u>	<u>10</u>	<u>1.75</u>		<u>light brown</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>5.0</u>		

Final Depth to Water (from TOC): 12.08

Final Total Well Depth (from TOC): 24.98

Thickness of Any Sediment Remaining in Well: 0.19

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



# ARM Group Inc.

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## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWO-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 150-190341M

Date/Time Started: 5-8-11 / 1438

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 5-8-11 / 1536

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 70's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 0.35</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>39.99</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. 1.0 in</u>	Well Total Depth (TOC): <u>40.09</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A) 0.04 gal./ft</u>	Depth to Static Water Level (TOC): <u>9.90</u> ft. (C)
Petroleum/Product Present? <u>Y or N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>30.19</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>1.21</u> 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	36.67-40	10	2.0		brown
2	33.33-36.67	10	1.5		brown
3	30-33.33	10	1.5		brown
Cumulative Totals: (Minimum of 3 Well Volumes)			5.0		

Final Depth to Water (from TOC): 11.03 Final well depth: 40.18

Thickness of Any Sediment Remaining in Well: 0.00

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



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## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RW0-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 150-190341/M

Date/Time Started: 5-8-19 / 1401

Developed by: TCV

Client: **EnviroAnalytics Group**

Date/Time Completed: 5-8-19 / 1438

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 70's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-) <u>0.40</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>20.29</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. 1.0 in</u>	Well Total Depth (TOC): <u>20.41</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A) 0.04 gal./ft</u>	Depth to Static Water Level (TOC): <u>10.37</u> ft. (C)
Petroleum/Product Present? <u>(Y) or N</u> . Thickness (ft.): <u>Trace</u>	Height of Water Column: (B - C) <u>10.04</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.40</u> 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	16.67 - 2.0	10	1.0		dark brown
2	13.33 - 16.67	10	1.0		dark brown
3	10 - 13.33	10	1.0		dark brown
Cumulative Totals: (Minimum of 3 Well Volumes)			3.0		

Final Depth to Water (from TOC): 10.37 Final well depth: 20.42

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWP-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>4-30-19</u> / <u>0901</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-30-19</u> / <u>1035</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Cloudy 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>32</u> to <u>42</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: ( <u>6</u> ) - ) <u>2.54</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>42.56</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>41.71</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.24</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>30.47</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.45</u> ft.	Wetted Well Volume: (A x D) <u>1.22</u> 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	2.0		light brown
2	35.33- 38.67	10	1.5		light brown
3	32.- 35.33	10	1.5		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			5.0		

Final Depth to Water (from TOC): 17.51

Final Total Well Depth (from TOC): 42.57

Thickness of Any Sediment Remaining in Well: 0.00

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWQ-MW1

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>150 190341M</u>	Date/Time Started: <u>4-22-19 / 0740</u>	Developed by: <u>TCLV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-22-19 / 0848</u>	Company: _____
Well Location: <u>Area A, Parcel 3</u>	Weather/Site Conditions: <u>Sunny 50's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>32</u> to <u>42</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.53</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>42.53</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. 1.0 in.</u>	Well Total Depth (TOC): <u>41.74</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A) 0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>14.16</u> ft. (C)
Petroleum/Product Present? <u>Y or (N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>27.63</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.74</u> ft.	Wetted Bore Volume: (A x D) <u>1.11</u> 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	1.5		grey
2	35.33 - 38.67	10	1.5		light grey
3	32 - 35.33	10	1.5		light grey
Cumulative Totals: (Minimum of 3 Well Volumes)			4.5		

Final Depth to Water (from TOC): 14.56 Final well depth: 42.54

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWQ - MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>150 190341/M</u>	Date/Time Started: <u>4-22-19 10848</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>4-22-19 10936</u>	Company: _____
Well Location: <u>Area A, Parcel 3</u>	Weather/Site Conditions: <u>Sunny 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>13</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.84</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>22.94</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in. 1.0 in</u>	Well Total Depth (TOC): <u>22.95</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft. (A) 0.04 gal./ft</u>	Depth to Static Water Level (TOC): <u>10.37</u> ft. (C)
Petroleum/Product Present? <u>Y or N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>12.58</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.50</u> 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	19.67 - 23	10	1.25		yellowish brown
2	16.33 - 19.67	10	1.75		yellowish brown
3	13 - 16.33	10	1.5		light yellowish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			4.5		

Final Depth to Water (from TOC): 10.90 Final well depth: 22.95

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Tradepoint Atlantic – Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWR-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>190341M</u>	Date/Time Started: <u>5-8-19</u> / <u>1145</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>5-8-19</u> / <u>1257</u>	Company: _____
Well Location: <u>Area A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>cloudy 70's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>30</u> to <u>40</u>
Well riser/screen material: <u>PVC</u>	Sand Pack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-) <u>0.35</u>	Measured Total Depth of Well When Installed (TOC) (F): _____ ft. (See Original Well Construction Diagram) <u>39.97</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter (in.): <u>1.0</u> <u>0.04 gal/ft</u>	Total Well Depth (TOC): <u>39.68</u> ft. (B)
Well Volume: 0.163 gal./ft. (2" PVC) or 0.652 gal/ft (4" PVC) (A)	Depth to Static Water Level (TOC): <u>11.66</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> . Thickness (ft.): _____	Height of Water Column: (B - C) <u>28.02</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.29</u> ft.	Wetted Well Volume: (A x D) <u>1.12</u> 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	36.67 - 40	10	1.75		greyish brown
2	33.33 - 36.67	10	1.75		light brown
3	30 - 33.33	10	1.5		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			5.0		

Final Depth to Water (from TOC): 12.00

Final Total Well Depth (from TOC): 39.68

Thickness of Any Sediment Remaining in Well: 0.29

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWR-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: 150-190341M

Date/Time Started: 5-8-19 / 1257

Developed by: TCV

Client: EnviroAnalytics Group

Date/Time Completed: 5-8-19 / 1356

Company: \_\_\_\_\_

Well Location: Area A, Parcel 3

Weather/Site Conditions: \_\_\_\_\_

Cloudy 70's

Checked by: \_\_\_\_\_

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>10</u> to <u>20</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: (+/-) <u>0.32</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>20.18</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in.</u> <u>1.0 in.</u>	Well Total Depth (TOC): <u>19.90</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft.</u> (A) <u>0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>10.05</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>N</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>9.85</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.28</u> ft.	Wetted Bore Volume: (A x D) <u>0.39</u> 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	16.67 - 20	10	2.0		brownish yellow
2	13.33 - 16.67	10	1.5		yellowish brown
3	10 - 13.33	10	1.5		yellowish brown
Cumulative Totals: (Minimum of 3 Well Volumes)			5.0		

Final Depth to Water (from TOC): 10.20 Final well depth: 19.90

Thickness of Any Sediment Remaining in Well: 0.28

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





# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWS-MWI

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>150-190341/M</u>	Date/Time Started: <u>4-22-19</u> / <u>1050</u>	Developed by: <u>TCV</u>
Client: <u>EnviroAnalytics Group</u>	Date/Time Completed: <u>4-22-19</u> / <u>1229</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Sunny 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>37</u> to <u>47</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 2.65</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>47.36</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0 in.</u> <u>1.0 in.</u>	Well Total Depth (TOC): <u>46.98</u> ft. (B)
Well (PVC) Volume: <u>0.163 gal./ft.</u> (A) <u>0.04 gal./ft.</u>	Depth to Static Water Level (TOC): <u>12.76</u> ft. (C)
Petroleum/Product Present? <u>Y</u> or <u>(N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>34.22</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.38</u> ft.	Wetted Bore Volume: (A x D) <u>1.37</u> 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	<u>43.67 - 47</u>	<u>10</u>	<u>2.0</u>		<u>grey</u>
2	<u>40.33 - 43.67</u>	<u>10</u>	<u>1.75</u>		<u>grey</u>
3	<u>37 - 40.33</u>	<u>10</u>	<u>1.5</u>		<u>grey</u>
Cumulative Totals: (Minimum of 3 Well Volumes)			<u>5.25</u>		

Final Depth to Water (from TOC): 13.35 Final well depth: 47.64

Thickness of Any Sediment Remaining in Well: 0.00

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



# ARM Group Inc.

Earth Resource Engineers and Consultants

## Sparrows Point

### Monitoring Well Development Form – Surge and Pump Method

Well ID: RWS-MWS

Well Permit No.: \_\_\_\_\_

Page 1 of 2

ARM Project No.: <u>150 190341</u>	Date/Time Started: <u>4-22-19 / 0945</u>	Developed by: <u>TCV</u>
Client: <b>EnviroAnalytics Group</b>	Date/Time Completed: <u>4-22-19 / 1039</u>	Company: _____
Well Location: Area <u>A</u> , Parcel <u>3</u>	Weather/Site Conditions: <u>Cloudy 60's</u>	Checked by: _____

#### A. Well Construction Details

Well Cover Type: <u>Stick-up</u> or <u>Flush-Mount</u>	PVC Screen Interval: <u>13</u> to <u>23</u>
Well riser/screen material: <u>PVC</u>	Sandpack Interval: _____ to _____
Difference between Ground Surface and TOC: <u>(+/-) 3.02</u>	Measured Total Depth of Well When Installed (TOC) (F): (See Original Well Construction Diagram) <u>22.97</u>

#### B. Wetted Bore Volume Determination

Well (PVC) Diameter: <u>2.0-in. 1.0 in</u>	Well Total Depth (TOC): <u>22.90</u> ft. (B)
Well (PVC) Volume: <u>0.163-gal./ft. (A) 0.04 gal/ft</u>	Depth to Static Water Level (TOC): <u>7.57</u> ft. (C)
Petroleum/Product Present? <u>Y or (N)</u> Thickness (ft.): _____	Height of Water Column: (B - C) <u>15.33</u> ft. (D)
Initial Thickness of Sediment in Bottom of Well (F - B): <u>0.00</u> ft.	Wetted Bore Volume: (A x D) <u>0.61</u> 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	19.67 - 23	10	2.0		brown
2	16.33 - 19.67	10	1.5		light brown
3	13 - 16.33	10	1.5		light brown
Cumulative Totals: (Minimum of 3 Well Volumes)			5.0		

Final Depth to Water (from TOC): 8.35 Final well depth: 22.90

Thickness of Any Sediment Remaining in Well: 0.00

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

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## **APPENDIX C**

### **Survey Data**

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Mr. James Calenda  
EnviroAnalytis Group, LLC  
1650 Des Peres Road, Suite 303  
St. Louis, MO 63131

Mr. Calenda:  
Below are the specified surveyed wells, date of last field work completed on June 6, 2019. The coordinate values shown were derived from G.P.S. observations based on National Geodetic Surveys stations "GIS 1", PID AC7684 and "GIS 2", PID AC7685 which purport to be on NAD83(2011) Maryland Grid coordinate system with NAVD88 (AMSL) elevations.

FORMER COKE OVEN AREA WELL LOCATIONS					
DESCRIPTION	NORTHING	EASTING	TOP CASING ELEVATION	GROUND AT WELL ELEVATION	NOTES
COAA-MWS	561979.891	1457970.981	10.65	11.27	FLUSH MOUNT
COA-MWS	NO WELL FOUND				
COBB-MWS	561776.152	1457813.750	16.27	13.61	
COB-MWS	561768.065	1454242.766	14.23	11.30	
COCC-MWS	561794.484	1457978.386	15.55	13.16	
COC-MWS	561775.581	1454539.223	14.32	11.56	
CODD-MWS	561604.499	1457576.287	14.37	12.30	
COD-MWS	561792.574	1454723.993	13.74	11.63	
COEE-MWS	NO WELL FOUND				
COE-MWS	561802.955	1454925.926	13.98	11.34	
COFF-MWS	561492.274	1458030.691	14.78	11.72	GROUND SHOT TAKEN ON SOUTHERN SIDE
COF-MWS	561671.419	1454219.187	14.51	11.62	
COGG-MWS	561156.320	1458040.330	12.69	10.60	
COG-MWS	561660.615	1454465.549	13.77	11.28	
COH-MWS	561707.142	1454648.497	13.76	10.60	
COI-MWS	561676.613	1454778.725	13.30	10.77	
COJ-MWS	561684.219	1454936.945	13.86	10.38	
COK-MWI	563234.629	1454749.248	6.83	4.60	



<b>DESCRIPTION</b>	<b>NORTHING</b>	<b>EASTING</b>	<b>TOP CASING ELEVATION</b>	<b>GROUND AT WELL ELEVATION</b>	<b>NOTES</b>
COK-MWS	563234.958	1454751.722	6.62	4.61	
COL-MWI	563246.333	1454911.001	7.56	4.62	
COL-MWS	563247.848	1454916.386	7.38	4.65	WELL SHOT ON LOWER, EASTERN POINT OF CASING
COM-MWI	563260.434	1455059.494	7.43	5.70	
COM-MWS	563262.594	1455064.514	8.11	5.80	
CON-MWI	563192.145	1454354.472	11.99	10.11	
CON-MWS	563190.136	1454350.586	12.01	10.03	
COO-MWI	563028.379	1454319.031	12.68	10.38	
COO-MWS	563024.252	1454318.335	12.70	10.31	
COP-MWI	563127.662	1454935.030	7.53	5.11	
COQ-MWI	563001.855	1454907.172	6.42	3.78	
COR-MWI	562836.854	1454628.124	11.65	9.59	
COS-MWS	562664.676	1454530.099	14.43	11.47	
COT-MWS	562911.804	1455128.854	11.74	9.39	
COU-MWS	562820.595	1455382.444	14.48	11.64	
COV-MWI	562760.829	1455004.678	12.20	10.36	
COW-MWS	562667.550	1455015.345	13.97	11.75	
COX-MWS	562623.230	1455434.171	15.45	12.18	GROUND SHOT TAKEN ON WESTERN SIDE
COY-MWS	562392.829	1455088.298	13.48	11.49	
COZ-MWS	562421.661	1455560.773	14.70	11.88	

<b>ROD &amp; WIRE MILL ONSHORE SUPPLEMENTAL WELL LOCATIONS</b>					
<b>DESCRIPTION</b>	<b>NORTHING</b>	<b>EASTING</b>	<b>TOP CASING ELEVATION</b>	<b>GROUND AT WELL ELEVATION</b>	<b>NOTES</b>
RW05R-MWI	571732.443	1455877.003	12.95	10.56	WELL SHOT ON LOWER, EASTERN POINT OF CASING
RW21-MWI	572350.773	1456246.875	14.46	14.63	FLUSH MOUNT
RW22R-MWI	572405.722	1456075.106	16.63	14.02	
RW22R-MWS	572408.255	1456073.268	16.56	14.02	
RW23-MWI	571880.798	1456165.126	14.36	14.60	FLUSH MOUNT
RW23-MWS	571883.604	1456164.804	14.24	14.50	FLUSH MOUNT
RW24-MWI	572223.805	1456460.411	12.57	12.74	FLUSH MOUNT
RW24-MWS	572226.487	1456460.200	12.55	12.78	FLUSH MOUNT
RW25-MWI	572283.559	1456605.078	12.08	12.28	FLUSH MOUNT
RW25-MWS	572286.204	1456604.855	11.94	12.16	FLUSH MOUNT
RWA-MWI	572453.190	1455934.708	10.20	7.52	
RWA-MWS	572455.753	1455935.886	10.59	7.74	
RWB-MWI	572273.713	1455907.075	19.73	17.57	
RWB-MWS	572277.119	1455907.945	20.17	17.66	WELL SHOT ON LOWER, WESTERN POINT OF CASING
RWD-MWI	572013.829	1455886.200	14.87	12.72	
RWD-MWS	572016.631	1455886.265	14.93	12.68	
RWE-MWI	571901.499	1455879.816	13.92	11.43	GROUND SHOT FROM 60D NAIL SET
RWE-MWS	571905.453	1455879.938	13.96	11.57	
RWF-MWI	571606.108	1455890.867	12.31	10.30	
RWF-MWS	571610.231	1455890.581	12.74	10.24	
RWG-MWI	571293.176	1455914.969	12.48	9.96	
RWG-MWS	571296.068	1455914.820	12.50	10.07	WELL SHOT ON LOWER, SOUTHERN POINT OF CASING
RWH-MWI	572408.040	1456263.434	12.03	12.40	FLUSH MOUNT
RWH-MWS	572410.751	1456262.361	11.83	12.29	FLUSH MOUNT
RWI-MWI	572313.757	1456316.674	12.95	13.23	FLUSH MOUNT
RWI-MWS	572311.024	1456316.938	12.89	13.23	FLUSH MOUNT
RWJ-MWI	572086.735	1456289.529	14.10	14.40	FLUSH MOUNT
RWJ-MWS	572088.705	1456289.306	13.81	14.31	FLUSH MOUNT
RWK-MWI	572080.786	1456279.773	14.22	14.54	FLUSH MOUNT
RWK-MWS	572082.893	1456279.782	14.24	14.50	FLUSH MOUNT

<b>DESCRIPTION</b>	<b>NORTHING</b>	<b>EASTING</b>	<b>TOP CASING ELEVATION</b>	<b>GROUND AT WELL ELEVATION</b>	<b>NOTES</b>
RWL-MWI	572073.093	1456266.836	14.36	14.60	FLUSH MOUNT
RWL-MWS	572075.553	1456266.813	14.26	14.55	FLUSH MOUNT
RWM-MWI	572014.780	1456177.443	14.92	15.20	FLUSH MOUNT
RWM-MWS	572017.304	1456177.362	14.97	15.21	FLUSH MOUNT
RWN-MWS	572065.768	1456392.441	14.86	15.12	FLUSH MOUNT
RWO-MWI	572456.369	1456443.368	11.67	11.99	FLUSH MOUNT
RWO-MWS	572459.658	1456442.964	11.59	11.93	FLUSH MOUNT
RWP-MWI	572456.912	1456719.408	12.55	10.25	
RWQ-MWI	572458.019	1456935.483	15.63	13.42	
RWQ-MWS	572461.924	1456935.546	15.93	13.39	
RWR-MWI	571982.522	1456768.645	13.61	13.99	FLUSH MOUNT
RWR-MWS	571986.201	1456769.228	13.68	14.07	FLUSH MOUNT
RWS-MWI	572074.853	1457037.250	14.30	11.89	
RWS-MWS	572077.727	1457037.464	14.65	12.21	
<b>*ALL WELL SHOTS LOCATED ON NORTH SIDE OF CASING (UNLESS NOTED)</b>					
<b>*ALL GROUND SHOTS ON CONCRETE ON NORTH SIDE OF WELL (UNLESS NOTED)</b>					

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## **APPENDIX D**

### **Purge and YSI Calibration Logs**

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# Low Flow Sampling Permanent Wells



# ARM Group Inc.

Earth Resource Engineers and Consultants

Project Name: A3 onshore GW  
Well Number: RWDSR-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.95  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.50

Project Number: 190341m-2  
Date: 5/13/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 341  
Length of time Purged (min): 30  
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
1414	0.0	10.93	16.1	6.57	7.627	4.40	-97.6	53.11	
1419	0.45	10.93	16.0	6.50	7.609	3.73	-96.7	29.9	
1424	0.90	10.93	16.1	6.49	7.589	3.22	-97.5	14.0	
1429	1.35	10.92	16.3	6.48	7.577	2.83	-98.9	11.9	
1434	1.80	10.92	16.2	6.47	7.568	2.61	-99.1	8.78	
1439	2.25	10.92	16.2	6.46	7.549	2.50	-99.4	9.13	
1444	2.70	10.92	16.2	6.46	7.551	2.39	-99.8	8.77	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWDSR-MWI	1435	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					N
Duplicate					N

Sampled By: LUP

Comments: total + diss Zn + Cd  
Alk + Acid

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: A3 onshore GW  
Well Number: RW21-mwI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 13.70  
Product Thickness (ft): NA  
Depth to Bottom (ft): 40.25

Project Number: 190341M-2  
Date: 5/9/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min) 30.3  
Length of time Purged (min) 30  
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
14.01	0.0	20.82	17.3	5.60	3.508	4.32	-37.2	117	
14.06	0.40	20.55	17.4	5.52	3.443	3.56	-33.8	44.2	
14.11	0.80	20.55	17.6	5.49	3.422	3.31	-32.3	42.6	
14.16	1.20	20.54	17.7	5.46	3.395	3.07	-31.7	40.8	
14.21	1.60	20.54	17.3	5.43	3.348	2.81	-29.9	40.4	
14.26	2.00	20.54	17.3	5.41	3.292	2.63	-28.8	42.9	
14.31	2.40	20.54	17.5	5.40	3.322	2.53	-29.0	38.89	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW21 - MW <u>I</u>	1445	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					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss. Zn + Cd  
Alk. + A cid

**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: A3 GWD Well Support  
Well Number: RW22R-MWF  
Well Diameter (in): 2 1/2  
Depth to Product (ft): NA  
Depth to Water (ft): 15.30  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.75

Project Number: 180-19034M-2  
Date: 5/30/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 341  
Length of time Purged (min): 35  
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
1126	0.0	28.70	19.5	5.92	2.634	2.63	-18.9	37.8	
1131	0.35	29.12	19.9	5.86	2.677	2.30	-19.6	47.2	
1136	0.80	29.51	20.4	5.87	2.687	2.07	-21.8	39.9	
1141	1.25	29.86	20.6	5.86	2.662	1.94	-21.2	27.6	
1146	1.70	29.96	20.7	5.85	2.640	1.84	-21.0	22.5	
1151	2.15	30.05	20.9	5.84	2.634	1.76	-20.9	18.8	
1156	2.65	30.21	20.5	5.84	2.612	1.69	-21.1	17.2	
1201	3.15	30.65	20.5	5.82	2.597	1.64	-19.8	16.6	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW22R-MWF	1210	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: UP

Comments: total + Diss Zn + Cd Resample

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: A3 onshore b/w  
Well Number: RW22R-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 15.47  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.73

Project Number: 190341M-2  
Date: 5/14/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 227  
Length of time Purged (min): 30  
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
1434	0.0	28.12	16.0	6.26	2.882	2.09	-53.5	31.3	
1439	0.3	28.93	16.3	6.15	2.857	2.46	-49.5	26.2	
1444	0.6	29.07	16.3	6.13	2.850	2.39	-48.3	19.5	
1449	0.9	29.21	16.3	6.11	2.826	2.28	-46.3	17.9	
1454	1.20	29.50	16.3	6.08	2.805	2.23	-44.7	16.7	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW22R-MWI	1500	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: LUP

Comments: zn + cd (total + diss)  
Alk. + Acid

**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)



Onshore



Earth Resource Engineers and Consultants

Project Number: 190341m-2

Date: 5-30/19

One Well Volume (gal): \_\_\_\_\_

QED Controller Settings:

Flow Rate (mL/min)

Length of time Purged (min)

Condition of Pad/Cover: Good / Good

## PURGING RECORD

[illegible]

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW22R-mals	1320	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					

Comments: total + diss Zn + Cd.  
Resample

**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

# Low Flow Sampling Permanent Wells



**ARM Group Inc.**  
Earth Resource Engineers and Consultants

Project Name: A3 onshore GW  
Well Number: RW22R-MWS  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 14.70  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.95

Project Number: 190344m-2  
Date: 5/15/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 379  
Length of time Purged (min): 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
1400	0.0	14.75	16.5	6.64	2.391	5.93	-31.9	32.4	
1405	0.5	14.75	16.4	6.58	2.430	5.11	-30.6	21.2	
1410	1.00	14.75	16.4	6.65	2.450	4.69	-35.1	4.80	
1415	1.50	14.75	16.5	6.69	2.480	4.53	-38.1	1.75	
1420	2.00	14.75	16.0	6.70	2.471	4.49	-39.4	1.10	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW22R-MWS	1430	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					NW
Duplicate					

Sampled By: UP

Comments: total + Diss Zn + Cd  
Alk + Acidity

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: 190341m-2 A3 onshore  
Well Number: RW23-mwI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 13.17  
Product Thickness (ft): NA  
Depth to Bottom (ft): 39.78

Project Number: 190341m-2  
Date: 5/3/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min) 227  
Length of time Purged (min) 30  
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
800	0.0	13.17	16.7	5.42	2.129	6.87	83.9	242.3	
805	0.3	13.19	16.6	5.53	2.185	5.47	49.5	160.3	
810	0.6	13.22	16.7	5.62	2.267	5.15	32.9	163.6	
815	0.9	13.25	16.7	5.65	2.268	3.68	29.1	263.3	
820	1.2	13.25	16.7	5.67	2.288	3.30	25.0	186.1	
825	1.5	13.26	16.7	5.69	2.283	3.17	23.2	85.4	
830	1.8	13.26	16.7	5.72	2.283	3.01	20.8	196.5	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW23-mwI	835	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: LUP

Comments: Diss + total Zn + Cd  
Alk + Acid.

Turb. meter not working

**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: A3 onshore sampling  
Well Number: RW23-mws  
Well Diameter (in):     
Depth to Product (ft): NA  
Depth to Water (ft): 10.74  
Product Thickness (ft): NA  
Depth to Bottom (ft): 19.97

Project Number: 1903um-2  
Date: 5/2/19  
One Well Volume (gal):     
QED Controller Settings:     
Flow Rate (mL/min): 284  
Length of time Purged (min): 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
9:10	0.0	10.74	15.3	6.46	0.631	4.55	-2.3	267.1	
9:15	0.3	12.49	15.2	6.48	0.645	3.51	6.8	163.1	
9:20	0.7	13.76	15.2	6.44	0.621	3.08	16.4	270.5	
9:25	1.10	15.23	15.2	6.34	0.628	2.95	21.3	324.7	
9:30	1.50	16.10	15.3	6.27	0.633	2.47	25.1	429.9	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW23-mws	9:35	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	

Matrix Spike

Duplicate

Sampled By: LUP

Comments: Total + Diss Zn + Alk. + Acid. Turb not working.

**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: A3 onshore G.W.  
Well Number: RW24 - mwf  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.82  
Product Thickness (ft): NA  
Depth to Bottom (ft): 39.70

Project Number: 190341m-2  
Date: 5/8/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 288  
Length of time Purged (min): 30  
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
1016	0.0	11.33	17.1	5.37	3.232	5.45	28.5	140	
1021	0.45	12.79	17.1	5.24	3.142	4.07	18.1	92.3	
1026	0.85	12.95	17.1	5.17	3.137	3.40	12.6	61.9	
1031	1.20	13.02	17.1	5.11	3.133	3.06	12.5	30.3	
1036	1.55	13.06	17.2	5.08	3.120	2.79	11.6	31.4	
1041	1.90	13.11	17.2	5.05	3.087	2.59	13.4	32.9	
1046	2.25	13.12	17.2	5.02	3.067	2.44	15.9	31.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RW24-mwf</u>	<u>1050</u>	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: LUP

Comments: total + Diss Zn + Cd  
Alk. # Acid.

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: A3 onshore GWS  
Well Number: RW24-mw5  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 9.04  
Product Thickness (ft): NA  
Depth to Bottom (ft): 19.85

Project Number: 190341m-2  
Date: 5/8/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 310  
Length of time Purged (min): 25  
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
1055	0.0	9.10	16.1	11.96	2.137	4.56	-252.2	66.6	
1100	0.45	9.10	16.3	12.10	2.533	3.34	-262.1	38.8	
1105	0.85	9.11	16.2	12.13	2.605	2.86	-258.0	14.2	
1110	1.25	9.11	16.3	12.15	2.636	2.58	-244.7	14.4	
1115	1.65	9.11	16.3	12.15	2.644	2.45	-235.0	13.1	
1120	2.05	9.11	16.3	12.16	2.652	2.34	-225.3	12.7	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW24-mw5	1130	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: LCP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

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: A3 onshore GW  
Well Number: RW25-mwf  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.09  
Product Thickness (ft): NA  
Depth to Bottom (ft): 39.81

Project Number: 190341m-2  
Date: 5/8/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 416  
Length of time Purged (min): 25  
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
1307	0.45	10.29	16.5	6.99	2.053	6.84	-141.6	76.2	
1312	0.90	10.31	16.5	6.17	2.033	5.03	-130.2	58.8	
1317	1.35	10.31	16.4	5.93	2.041	2.945	-116.6	23.5	
1322	1.85	10.33	16.4	5.79	2.050	3.59	-105.3	19.1	
1327	2.30	10.35	16.4	5.73	2.029	3.32	-100.5	15.9	
1332	2.75	10.36	16.4	5.66	2.029	3.03	-94.0	16.7	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RW25-mwf</u>	<u>1345</u>	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: LHP

Comments: Total Zn + Cd, Diss Zn + Cd  
Alk. + Acid.

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: A3 onshore (616)  
Well Number: RW25-MWS  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 8.53  
Product Thickness (ft): NA  
Depth to Bottom (ft): 20.00

Project Number: 19034UM-2  
Date: 5/8/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 265  
Length of time Purged (min): 35  
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
1426	0.0	10.89	16.4	6.14	31.333	2.93	-64.1	1002 AW	
1431	0.35	9.75	16.3	6.12	1.313	2.73	-68.6	184	
1436	0.20	9.79	16.3	6.10	1.327	2.62	-68.5	84.2	
1441	1.05	9.83	16.2	6.09	1.333	2.56	-68.6	76.9	
1446	1.40	9.88	16.1	6.10	1.328	2.52	-69.2	49.0	
1451	1.75	9.89	16.2	6.10	1.319	2.43	-69.6	28.0	
1456	2.10	9.90	16.2	6.09	1.336	2.36	-68.8	28.7	
1501	2.45	9.90	16.1	6.08	1.339	2.29	-68.3	28.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW25-MWS	1570	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	

Matrix Spike

Duplicate

Sampled By: LCP

Comments: total + Diss Zn - cd  
Alk. + Acid.

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: A3 GW Direct Support  
Well Number: RWA-mwI  
Well Diameter (in): 1  
Depth to Product (ft): N/A  
Depth to Water (ft): 9.17  
Product Thickness (ft): N/A  
Depth to Bottom (ft): 23.15

Project Number: 190341m-2  
Date: 5/30/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 227  
Length of time Purged (min): 30  
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
1111	0.0	14.94	18.2	5.41	3.159	4.46	73.6	38	
1116	0.3	15.08	18.3	5.29	3.074	3.72	72.1	35.8	
1121	0.6	15.25	18.0	5.27	3.000	3.39	71.4	28.6	
1126	0.9	15.41	18.1	5.25	2.916	3.09	71.4	16.6	
1131	1.20	15.60	18.3	5.25	2.859	2.89	71.1	16.2	
1136	1.50	15.84	18.1	5.24	2.796	2.74	71.5	15.7	
1141	1.80	16.02	18.0	5.23	2.730	2.60	72.1	14.33	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW A-mwI	1150	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: Ulf

Comments: total + Diss Zn + Cd  
Resample

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: A3 onshore baw  
Well Number: RWA-mw7  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 9.34  
Product Thickness (ft): NA  
Depth to Bottom (ft): 23.14

Project Number: 190341m-2  
Date: 5/15/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 265  
Length of time Purged (min): 25  
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
<del>1208</del>	<del>0.0</del>	<del>14.40</del>	<del>18.0</del>	<del>5.36</del>	<del>3.075</del>	<del>6.73</del>	<del>73.3</del>	<del>85.1</del>	
<del>1213</del>	<del>0.35</del>		<del>19.3</del>	<del>5.32</del>	<del>3.170</del>	<del>6.45</del>	<del>76.3</del>		
<del>1228</del>	<del>0.00</del>	<del>18.64</del>	<del>18.3</del>	<del>5.49</del>	<del>2.968</del>	<del>3.53</del>	<del>60.3</del>	<del>109.0</del>	
<del>1238</del>	<del>0.35</del>	<del>18.63</del>	<del>18.3</del>	<del>5.40</del>	<del>2.945</del>	<del>3.23</del>	<del>61.4</del>	<del>107.3</del>	
<del>1243</del>	<del>0.70</del>	<del>18.82</del>	<del>18.3</del>	<del>5.40</del>	<del>2.927</del>	<del>3.01</del>	<del>61.3</del>	<del>83.4</del>	
<del>1248</del>	<del>1.05</del>	<del>19.12</del>	<del>18.3</del>	<del>5.40</del>	<del>2.915</del>	<del>2.89</del>	<del>61.3</del>	<del>65.1</del>	
<del>1253</del>	<del>1.40</del>	<del>19.24</del>	<del>18.5</del>	<del>5.40</del>	<del>2.907</del>	<del>2.69</del>	<del>60.8</del>	<del>70.9</del>	
<del>1258</del>	<del>1.75</del>	<del>19.32</del>	<del>18.3</del>	<del>5.39</del>	<del>2.888</del>	<del>2.59</del>	<del>61.1</del>	<del>75.7</del>	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<i>RWA-mw7</i>	<i>1300</i>	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					<i>N</i>
Duplicate					<i>N</i>

Sampled By: LUP

Comments: total + diss - zn + cd  
191K + Acid.

**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: A3 GW onshore  
Well Number: RWA-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 9.27  
Product Thickness (ft): NA  
Depth to Bottom (ft): 18.90

Project Number: 190341M-2  
Date: 5/30/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 379  
Length of time Purged (min): 25  
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
1420	0.0	9.27	19.1	8.26	2.452	4.72	-156.5	12.5	
1425	0.5	9.27	18.8	8.51	2.501	3.83	-193.8	10.4	
1430	1.00	9.27	18.3	8.65	2.536	3.17	-213.7	6.93	
1435	1.50	9.27	18.5	8.66	2.574	2.80	-217.5	4.96	
1440	2.00	9.27	18.3	8.74	2.601	2.54	-224.5	4.21	
1445	2.50	9.27	18.2	8.78	2.624	2.39	-229.4	3.78	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWA-mws	1450	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: cup

Comments: total + Diss. Zn + cd  
Resample

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)

Earth Resource Engineers and Consultants

Project Number: 190341m-2

Date: 5/15/19

One Well Volume (gal): \_\_\_\_\_

QED Controller Settings: \_\_\_\_\_

Flow Rate (mL/min) 341

Length of time Purged (min) 20

Condition of Pad/Cover: Good / Good

## PURGING RECORD

[illegible]

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWA-mu25	1335	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					N
Duplicate					N

total + Diss Zn + Cd  
pH. + Acidity

**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



# Low Flow Sampling Permanent Wells

Onshore GW



**ARM Group Inc.**  
Earth Resource Engineers and Consultants

Project Name: A3 data support  
Well Number: RWB-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 18.25  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.35

Project Number: 180227M-1 + 180341M-2  
Date: 5/30/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 466  
Length of time Purged (min): 60  
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
957	0.0	27.69	18.6	6.25	1.486	2.13	-36.8	35	purged prior to startup (very slightly) began @ 8:50
956	0.55	27.80	18.8	6.20	1.478	2.05	-34.5	108	
1001	1.10	27.97	18.9	6.19	1.469	1.95	-33.9	63	
1006	1.65	28.20	19.1	6.24	1.482	1.90	-38.3	61.3	
1011	2.20	28.30	19.1	6.22	1.455	1.86	-36.2	56.2	
1016	2.75	28.51	19.1	6.18	1.463	1.83	-33.5	49.8	
1021	3.30	28.51	19.3	6.23	1.458	1.79	-36.5	55.9	
1026	3.85	28.77	19.8	6.22	1.461	1.72	-35.6	48.2	
1031	4.40	28.98	19.7	6.21	1.450	1.70	-35.2	41.6	
1036	4.95	28.82	19.8	6.21	1.473	1.66	-35.9	38.4	
1041	5.50	28.93	19.5	6.20	1.454	1.65	-34.5	24.6	
1046	6.05	28.98	19.3	6.16	1.444	1.63	-31.4	23.3	
1051	6.60	29.08	19.6	6.16	1.449	1.60	-31.3	17.8	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWB-MWI	1055	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: LLP

Comments: total + Diss Zn + Cd  
Atk + Acid Resample

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)



ARM Group Inc.

**Earth Resource Engineers and Consultants**

Project Name: A3 onshore G12

Project Number: 190341M-2

Well Number: RWB-MWI

Date: 5/15/19

Well Diameter (in): 1

One Well Volume (gal): \_\_\_\_\_

Depth to Product (ft): NA

QED Controller Settings: 

Depth to Water (ft): 18.24

Flow Rate (mL/min) 265

Product Thickness (ft): NA

Length of time Purged (min) 15

Depth to Bottom (ft): 42.32

Condition of Pad/Cover: Good / Good

### PURGING RECORD

[illegible]

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWB-MWI	1020	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:**

**Comments:**

total + Diss Zn + Cd  
Alk. + Acid.

**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



# Low Flow Sampling Permanent Wells



# ARM Group Inc.

Earth Resource Engineers and Consultants

Project Name: A3 Gw onshore

Project Number: 190341m-2

Well Number: RWB-mws

Date: 5/31/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 18.55

Flow Rate (mL/min) 189

Product Thickness (ft): NA

Length of time Purged (min) 10

Depth to Bottom (ft): 23.31

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
1225	0.0	19.62	19.7	9.30	1.141	5.60	-110.6	39.0	
1230	0.25	21.16	19.4	9.39	1.132	4.42	-108.8	23.4	
1235	0.50	22.89	19.1	9.44	1.124	4.10	-100.9	17.6	
									Purged dry after sampling

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWB-mws	1245	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: UP

Comments: total + Diss Zn + Cd  
Resample

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: A3 onshore G.W.

Project Number: 190341m-2

Well Number: RWB-mws

Date: 5/15/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 17.76

Flow Rate (mL/min) 257

Product Thickness (ft): NA

Length of time Purged (min) 20

Depth to Bottom (ft): 23.31

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
1030	0.0	18.73	16.3	10.77	1.455	4.25	-22.4	47.1	
1035	0.3	22.02	16.3	9.37	1.488	3.54	-174.5	32.3	
1040	0.6	22.65	16.8	8.91	1.509	3.09	-204.3	45.3	
1045	0.9	pumped 2mly will return to sample							
1505	1.10	20.35	19.2	9.73	1.328	6.02	-68.7	14.6	
1510	1.35	22.25	20.6	9.20	1.344	4.93	-58.6	12.1	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWB-mws	1515	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					N
Duplicate					N

Sampled By: LEP

Comments: total + diss zn + cd need to purge very slow  
Alk. + Acid.

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: A3 onshore GW  
Well Number: RWD-MW#E  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 13.53  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.58

Project Number: 100341M-2  
Date: 5/14/19  
One Well Volume (gal):       
QED Controller Settings:       
Flow Rate (mL/min): 372  
Length of time Purged (min): 30  
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
1115	0.0	13.42	16.2	6.52	3.332	6.74	148.0	84.3	
1120	0.45	13.40	16.2	5.93	3.210	4.37	10.1	74.8	
1125	0.95	13.39	16.2	5.87	3.175	3.74	3.2	63.0	
1130	1.45	13.38	15.8	5.83	3.117	3.26	6.0	41.7	
1135	1.95	13.38	15.8	5.81	3.092	3.06	6.7	35.5	
1140	2.45	13.37	15.9	5.80	3.072	3.285	7.5	33.9	
1145	2.95	13.35	15.8	5.79	3.046	2.71	8.1	32.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWD-MW#E	1150	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: LVP

Comments: total + diss Zn + Cd  
Alk. + Acid.

**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: A3 onshore GW

Project Number: 190341M-2

Well Number: RWD-mws

Date: 5/14/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 11.76

Flow Rate (mL/min) 227

Product Thickness (ft): NA

Length of time Purged (min) 25

Depth to Bottom (ft): 22.15

Condition of Pad/Cover: 6002 / 6002

### 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
1322	0.0	18.48	14.9	6.71	0.734	3.00	-47.8	43.5	Light odor
1327	0.3	18.47	14.9	6.65	0.741	2.86	-47.7	31.3	very silty
1332	0.6	18.45	14.8	6.57	0.690	2.71	-40.7	17.7	during purging
1337	0.9	18.52	14.8	6.53	0.678	2.58	-37.8	15.2	
1342	1.20	18.64	14.9	6.54	0.669	2.48	-38.3	15.4	
1347	1.50	18.68	15.0	6.53	0.659	2.39	-36.7	15.6	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWD-mws	1355	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: LUP

Comments:

total + Diss. Zn + Cd  
Alk + Acidity

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: A3 onshore Gw

Project Number: 190341M-2

Well Number: RWE-mwI

Date: 5/14/19

Well Diameter (in): 1

One Well Volume (gal):         

Depth to Product (ft): NA

QED Controller Settings:         

Depth to Water (ft): 12.17

Flow Rate (mL/min) 397

Product Thickness (ft): NA

Length of time Purged (min) 25

Depth to Bottom (ft): 42.52

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
914	0.0	12.22	16.2	6.29	4.837	3.70	-100.2	79.5	Very silty
919	0.45	12.24	16.2	6.17	4.800	3.43	-97.8	32.7	during purging
924	0.99	12.28	16.2	6.13	4.767	3.16	-95.3	25.6	
929	1.54	12.26	16.1	6.11	4.746	2.96	-94.2	19.0	
934	2.08	12.28	16.2	6.10	4.717	2.82	-93.7	18.2	
939	2.62	12.28	16.2	6.09	4.699	2.68	-93.1	17.8	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWE-mwI	945	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: LLP

Comments: total + diss int'd  
ALK. + Acid

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: A3 onshore GAO  
Well Number: RWE-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 12.21  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.47

Project Number: 190341M-2  
Date: 5/19/19  
One Well Volume (gal):             
QED Controller Settings:             
Flow Rate (mL/min): 397  
Length of time Purged (min): 25  
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
953	0.0	12.26	15.8	7.13	2.117	6.78	-98.2	30.4	
958	0.54	12.31	15.2	7.70	1.616	4.22	-134.2	22.79	
1003	1.08	12.32	15.2	7.73	1.626	3.54	-146.5	10.65	
1008	1.62	12.33	15.1	7.75	1.639	3.16	-144.9	8.34	
1013	2.16	12.33	15.1	7.76	1.648	2.90	-147.3	7.58	
1018	2.70	12.33	15.1	7.77	1.654	2.73	-148.6	8.14	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWE-mws	1025	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: UP

Comments: total + Diss. Zn + Cd  
Alk. + Acet.

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: A3 onshore GWD  
Well Number: RWF-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.55  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.56

Project Number: 190344n-2  
Date: 5/16/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 416  
Length of time Purged (min): 35  
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
929	0.0	10.73	16.6	6.73	11.360	6.43	-91.0	92.1	
934	0.55	10.75	16.5	6.61	11.213	4.94	-90.5	75.8	
939	1.10	10.75	16.6	6.59	11.090	4.27	-89.1	37.0	
944	1.65	10.76	16.6	6.57	11.010	3.92	-88.0	16.7	
949	2.20	10.76	16.6	6.56	10.913	3.59	-86.9	13.3	
954	2.75	10.76	16.6	6.55	10.830	3.39	-86.3	11.6	
959	3.30	10.74	16.6	6.53	10.763	3.18	-85.6	10.9	
1004	3.85	10.76	16.6	6.54	10.708	2.99	-85.5	11.2	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWF-MWI	1005	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					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acidity

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: 1A3 onshore GW  
Well Number: RWF-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 11.18  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.75

Project Number: 190341M-2  
Date: 5/16/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 379  
Length of time Purged (min): 30  
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
1024	0.0	12.03	15.3	5.58	2.173	4.35	22.2	74.5	
1029	0.450	12.05	15.4	5.44	2.166	3.67	31.7	58.3	
1034	1.00	12.05	15.4	5.42	2.161	3.36	36.0	30.4	
1039	1.50	12.06	15.4	5.40	2.156	3.08	39.7	21.9	
1044	2.00	12.06	15.4	5.37	2.148	2.86	43.2	14.5	
1049	2.50	12.06	15.4	5.37	2.144	2.69	45.3	13.3	
1054	3.00	12.06	15.4	5.35	2.119	2.60	46.9	12.2	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWF-mws	1105	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					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss Zn + Cd  
AVL + Acidity

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: A3 onshore GND

Project Number: 190341M-2

Well Number: RWG-mwt

Date: 5/13/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 11.10

Flow Rate (mL/min) 329

Product Thickness (ft): NA

Length of time Purged (min) 45

Depth to Bottom (ft): 37.54

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
1046	0.0	11.09	15.3	6.73	10.287	5.32	-96.5	82	
1051	0.45	11.08	15.2	6.71	10.322	4.42	-107.7	77.8	
1056	0.90	11.07	15.2	6.71	10.337	3.95	-112.9	57.1	
1101	1.35	11.06	15.2	6.71	10.330	3.57	-116.7	32.2	
1106	1.80	11.05	15.3	6.72	10.353	3.19	-121.3	25.4	
1111	2.25	11.04	15.4	6.72	10.373	3.00	-123.1	19.8	
1116	2.70	11.04	15.3	6.72	10.359	2.88	-124.2	15.3	
1121	3.10	11.03	15.4	6.73	10.388	2.72	-127.2	13.2	
1126	3.50	11.03	15.4	6.74	10.400	2.53	-130.3	12.1	
1131	3.90	11.03	15.4	6.73	10.408	2.45	-130.7	11.7	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWG-mwt	1135	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					N
Duplicate					N

Sampled By: LEP

Comments: total + diss, zn + cd  
Alk + Acid

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: A3 onshore 60

Project Number: 190341M-2

Well Number: A3 onshore 60

Date: 5/13/19

Well Diameter (in): 1 (RWG-mws)

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 11.26

Flow Rate (mL/min) 291

Product Thickness (ft): NA

Length of time Purged (min) 45

Depth to Bottom (ft): 22.71

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
1150	0.0	11.30	14.0	9.74	1.037	5.79	-259.9	51	
1155	0.4	11.34	13.9	9.71	1.539	3.77	-279.9	45.7	
1200	0.8	11.37	14.0	9.71	1.568	3.13	-280.2	39.5	
1205	1.20	11.39	13.9	9.73	1.569	2.74	-280.5	33.8	
1210	1.60	11.46	13.9	9.64	1.974	2.52	-283.7	28.6	
1215	2.00	11.49	13.9	9.52	2.311	2.33	-295.4	19.75	
1220	2.40	11.50	13.9	9.35	2.614	2.18	-307.9	10.39	
1225	2.75	11.42	13.8	9.26	2.830	2.11	-309.9	8.12	
1230	3.10	11.33	13.8	9.18	2.983	2.01	-312.7	5.24	
1235	3.45		13.8	9.09	3.105	1.94	-310.4	4.99	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWG-mws	1240	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: UP

Comments: total + diss. Zn + Cd  
Alk. + Acid + cond 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 Permanent Wells



## ARM Group Inc.

Earth Resource Engineers and Consultants

Project Name: A3 onshore GW  
Well Number: RWH-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 12.41  
Product Thickness (ft): NA  
Depth to Bottom (ft): 33.62

Project Number: 190341m-2  
Date: 5/9/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 341  
Length of time Purged (min): 30  
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
1223	0.0	11.01	16.1	6.24	2.787	6.21	-48.8	18.7	
1228	0.45	11.05	16.0	6.17	2.772	65.20	-54.2	52.2	
1233	0.90	11.07	16.0	6.15	2.735	4.04	-61.6	38.3	
1238	1.35	11.08	16.1	6.15	2.722	3.68	-64.9	16.4	
1243	1.80	11.08	16.1	6.14	2.705	3.33	-68.0	18.0	
1248	2.25	11.08	16.2	6.14	2.687	3.18	-69.1	17.8	
1253	2.70	11.08	16.1	6.14	2.675	3.05	-70.5	16.7	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWH - MWI	1300	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					N
Duplicate					N

Sampled By: UP

Comments: total zn + cd, diss zn + cd  
Alk. + Acid.

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: A3 onshore GW

Project Number: 19034UM-2

Well Number: RWH-mws

Date: 5/9/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 10.12

Flow Rate (mL/min) 341

Product Thickness (ft): NA

Length of time Purged (min) 20

Depth to Bottom (ft): 20.02

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
1310	0.0	10.20	15.2	7.92	0.986	4.46	-176.2	105.6	
1315	0.45	10.21	15.1	8.30	0.983	3.61	-244.4	21.9	
1320	0.90	10.21	15.1	8.51	0.995	3.16	-274.0	15.4	
1325	1.35	10.21	15.2	8.59	1.000	2.97	-291.5	14.1	
1330	1.80	10.21	15.2	8.67	1.007	2.71	-300.1	13.8	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWH-mws</u>	<u>1335</u>	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					<u>N</u>
Duplicate					<u>N</u>

Sampled By: UP

Comments: total + Diss Zn + Cd  
Alk. + Accl.

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: A3 Onshore BW

Project Number: 190341m-2

Well Number: RWI-mwt

Date: 8/19/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 11.45

Flow Rate (mL/min) 341

Product Thickness (ft): NA

Length of time Purged (min) 40

Depth to Bottom (ft): 39.45

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
928	0.0	11.72	16.8	6.14	4.345	6.54	-61.6	117	
933	0.45	11.71	16.8	5.95	4.339	5.25	-53.6	114	
938	0.90	11.70	16.7	5.93	4.282	4.33	-52.9	<del>100.3</del> 157.0	
943	1.35	11.70	16.7	5.93	4.217	3.86	-53.8	42.9	
948	1.80	11.70	16.8	5.93	4.189	3.69	-54.1	25.3	
953	2.25	11.70	16.8	5.93	4.145	3.50	-54.9	15.5	
958	2.70	11.70	16.8	5.94	4.056	3.25	-56.4	11.3	
1003	3.15	11.70	16.8	5.94	4.004	3.10	-57.7	10.41	
1008	3.60	11.70	16.8	5.94	3.985	2.96	-59.4	10.57	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWI - MWI	1010	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					2
Duplicate					2

Sampled By: LLP

Comments: total + diss Zn + Cd  
Alk. + acid.

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: A3 onshore bio

Project Number: 19034M-2

Well Number: RWT-mws

Date: 5/8/19 5/9/19

Well Diameter (in): 1

One Well Volume (gal):     

Depth to Product (ft): NA

QED Controller Settings:     

Depth to Water (ft): 9.35

Flow Rate (mL/min) 303

Product Thickness (ft): NA

Length of time Purged (min) 25

Depth to Bottom (ft): 19.75

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
1034	0.0	9.70	16.2	7.13	2.250	3.38	-89.2	138.0	
1039	0.4	9.73	16.1	7.10	2.239	3.11	-91.2	83.1	
1044	0.8	9.76	16.1	7.04	2.219	2.90	-89.2	34.8	
1049	1.20	9.78	16.1	7.02	2.193	2.71	-87.9	5.11	
1054	1.60	9.79	16.1	7.00	2.175	2.60	-86.9	2.80	
1059	2.00	9.79	16.1	6.99	2.165	2.56	-86.4	2.87	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWT-mws	1105	TCL-VOCs	3 - 40 mL VOA	HCl	1
		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					N
Duplicate					N

Sampled By: UP

Comments: total + diss Zn + Cd  
Alk. + Acid.

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: A3 well install  
Well Number: RWJ-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 12.11  
Product Thickness (ft): NA  
Depth to Bottom (ft): 39.64

Project Number: 190341m-2  
Date: 5/7/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 265  
Length of time Purged (min): 40  
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
840	0.0	12.16	17.6	8.32	2.686	7.68	-185.7	105.9	
845	0.4	12.16	17.4	8.49	2.601	3.19	-230.3	74.4	
850	0.8	12.17	17.4	8.46	2.581	2.65	-238.0	48.6	
855	1.20	12.17	17.4	8.47	2.558	2.32	-246.1	27.9	
900	1.40	12.17	17.4	8.45	2.542	2.06	-256.7	22.3	
905	1.75	12.17	17.5	8.44	2.532	1.91	-263.2	18.7	
910	2.10	12.17	17.5	8.39	2.511	1.81	-271.8	16.5	
915	2.45	12.17	17.4	8.39	2.498	1.72	-281.5	16.0	
920	2.80	12.17	17.4	8.45	2.486	1.63	-288.0	15.7	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWJ-MWI	925	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: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

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: A3 enhance GW sampling  
Well Number: RWJ-MWS  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.96  
Product Thickness (ft): NA  
Depth to Bottom (ft): 20.10

Project Number: 19034LM-2  
Date: 5/7/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 303  
Length of time Purged (min): 30  
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
1020	0.0	11.08	16.0	12.03	1.927	3.86	-357.0	69.5	
1025	0.4	11.08	16.3	12.06	1.999	2.89	-358.4	48.4	
1030	0.8	11.07	16.3	12.09	2.046	2.29	-350.9	27.0	
1035	1.20	11.06	16.4	12.09	2.049	1.94	-334.3	12.6	
1040	1.60	11.05	16.4	12.09	2.027	1.86	-326.6	1.67	
1045	2.00	11.03	16.4	12.09	2.003	1.78	-326.1	18.0	
1050	2.40	11.03	16.5	12.09	2.004	1.66	-318.7	18.6	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWJ-MWS	10.55	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: LUP

Comments: total + Diss 2nt cd  
Alk. + Acid.

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: A3 onshore G.W.

Project Number: 190341M-2

Well Number: RWK-mwI

Date: 5/7/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 12.28

Flow Rate (mL/min) 270

Product Thickness (ft): NA

Length of time Purged (min) 35

Depth to Bottom (ft): 39.65

Condition of Pad/Cover: Good / 6000

## 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
11:33	0.0	12.30	18.0	7.40	2.270	3.88	-170.6	1160.11	
11:36	0.4	12.33	18.0	7.11	2.243	2.66	-168.8	139	
11:43	0.8	12.37	18.0	7.06	2.250	2.33	-167.0	93.2	
11:48	1.20	12.40	18.2	6.99	2.247	2.06	-163.4	40.9	
11:53	1.40	12.42	18.2	6.95	2.248	1.87	-159.6	19.5	
11:58	1.80	12.45	18.4	6.94	2.244	1.79	-158.0	15.7	
12:03	2.10	12.47	18.4	6.93	2.240	1.71	-155.7	14.2	
12:08	2.50	12.48	18.5	6.93	2.238	1.63	-154.7	13.8	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWK-mwI	120	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: LUP

Comments: Total + Diss zmted  
DK. + Acid.

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: <u>A3</u>	Project Number: <u>190341m-2</u>
Well Number: <u>RWK-mws</u>	Date: <u>5/7/19</u>
Well Diameter (in): <u>1</u>	One Well Volume (gal): <u>          </u>
Depth to Product (ft): <u>NA</u>	QED Controller Settings: <u>          </u>
Depth to Water (ft): <u>14.12</u>	Flow Rate (mL/min) <u>254</u>
Product Thickness (ft): <u>NA</u>	Length of time Purged (min) <u>45</u>
Depth to Bottom (ft): <u>19.85</u>	Condition of Pad/Cover: <u>Good/Good</u>

## 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
1330	0.0	11.12	16.6	10.48	0.777	5.13	-36.0	775 AW	
1335	0.35	12.21	16.4	7.81	0.730	3.31	-212.8	221.6	
1340	0.70	13.89	16.3	7.63	0.721	2.86	-196.5	68.0	
1345	1.10	15.01	16.3	7.57	0.735	2.66	-182.7	11.0	
1350	1.50	16.33	16.5	7.50	0.763	2.54	-171.2	83.3	
1355	1.80	15.61	17.0	7.47	0.773	2.49	-167.7	35.5	
1400	2.10	14.34	16.7	7.11	0.746	2.45	-145.4	13.8	
1405	2.40	13.68	16.7	6.85	0.746	2.25	-127.0	12.2	
1410	2.70	13.77	16.8	6.77	0.741	2.11	-118.3	11.8	
1415	3.00	13.84	16.9	6.84	0.749	2.02	-124.8	11.2	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWK-mws	1420	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: LLP

Comments: total + diss + metal  
Alk. + Acid.

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: AB onshore GW  
Well Number: RWL-MWI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 12.56  
Product Thickness (ft): NA  
Depth to Bottom (ft): 39.73

Project Number: 190341M-2  
Date: 5/8/19  
One Well Volume (gal):             
QED Controller Settings:             
Flow Rate (mL/min) 250  
Length of time Purged (min) 35  
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
910	0.2	12.62	17.3	6.19	2.319	6.91	-50.8	784	
915	0.4	12.61	17.2	5.87	2.266	4.54	-23.7	94.9	
920	0.8	12.59	17.3	5.85	2.247	3.99	-19.3	62.1	
925	1.10	12.58	17.4	5.86	2.210	3.42	-16.5	39.8	
930	1.40	12.55	17.4	5.86	2.197	3.23	-16.0	35.2	
935	1.70	12.54	17.5	5.87	2.154	2.96	-15.7	31.3	
940	2.00	12.53	17.5	5.88	2.122	2.75	-15.4	29.1	
945	2.30	12.53	17.5	5.88	2.103	2.64	-15.3	28.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWL-MWI	950	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: UP

Comments: total zn + cd + diss zn + cd  
Alk + Acid.

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: A3 onshore GW

Project Number: 190341M-2

Well Number: RWL-MWS

Date: 5/7/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 11.67

Flow Rate (mL/min) 227

Product Thickness (ft): NA

Length of time Purged (min) 15

Depth to Bottom (ft): 19.75

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
1522	0.10	18.43	18.5	6.40	0.768	2.37	-72.4	22.2	
1527	0.30	18.41	18.4	6.37	0.713	2.41	-68.4	21.7	
1532	0.60	18.40	18.9	6.35	0.716	2.40	-65.5	19.6	
1537	0.90	18.42	19.3	6.33	0.709	2.38	-61.5	20.8	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWL-MWS</u>	<u>1540</u>	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

N  
N

Sampled By: LLP

Comments: total + diss 2ntcd  
Alk. + Acid

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: A3 onshore Sampling  
Well Number: RWM-mwI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 13.83  
Product Thickness (ft): NA  
Depth to Bottom (ft): 39.60

Project Number: 190341M-2  
Date: 5/3/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 303  
Length of time Purged (min): 25  
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
1007	0.0	13.91	16.7	6.08	2.095	4.67	-70.2	944.1	
1012	0.4	13.88	16.6	6.06	2.275	3.66	-80.3	481.4	
1017	0.8	13.89	16.6	6.04	2.115	3.10	-80.8	260.3	
1022	1.20	13.89	16.7	6.02	2.431	2.84	-81.1	213.6	
1027	1.60	13.89	16.7	6.02	2.119	2.68	-82.8	237.4	
1032	2.00	13.89	16.6	6.01	2.118	2.55	-85.6	275.3	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWM-mwI</u>	<u>1037</u>	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	

Matrix Spike

Duplicate

Sampled By: LUP

Comments: Total Diss Zn + Cd  
Alk + Acid.

**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: A3 onshore sampling  
Well Number: RWM-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 12.34  
Product Thickness (ft): NA  
Depth to Bottom (ft): 19.80

Project Number: 190341m-2  
Date: 5/3/19  
One Well Volume (gal):           
QED Controller Settings:           
Flow Rate (mL/min) 265  
Length of time Purged (min) 30  
Condition of Pad/Cover: 600x600

## 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
1058	0.0	13.52	15.7	6.85	0.275	5.16	-22.2	72.5	
1103	0.35	13.43	15.7	6.84	0.269	3.89	-17.3	42.2	
1108	0.70	13.35	15.7	6.82	0.271	3.22	-12.8	34.0	
1113	1.05	13.35	15.7	6.83	0.273	2.89	-10.8	47.2	
1118	1.40	13.35	15.7	6.83	0.276	2.67	-9.3	44.4	
1123	1.75	13.35	15.7	6.84	0.279	2.51	-8.4	46.6	
1128	2.10	13.35	15.7	6.84	0.281	2.36	-7.1	53.0	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWM-mws	1140	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: LLP

Comments: Total zntcd diss zntcd  
Alk. + Acid.

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: A3 onshore sampling  
Well Number: RWN-MWS  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 11.95  
Product Thickness (ft): NA  
Depth to Bottom (ft): 24.90

Project Number: 19034/m-2  
Date: 5/3/19  
One Well Volume (gal):           
QED Controller Settings:           
Flow Rate (mL/min): 303  
Length of time Purged (min): 35  
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
1324	0.0	12.08	15.6	5.17	2.756	5.55	-8.2	1366.5	
1329	0.4	12.17	15.7	5.02	2.780	4.59	-16.2	1328.1	
1334	0.8	12.29	15.5	4.99	2.817	5.90	-1.2	730.1	
1339	1.20	12.37	15.6	4.90	2.826	4.04	-13.00	624.0	
1344	1.60	12.49	15.7	4.89	2.853	3.37	-17.2	402.7	
1349	2.00	12.53	15.7	4.88	2.875	3.10	-19.2	354.0	
1354	2.40	12.56	15.7	4.88	2.886	2.92	-21.5	262.3	
1459	2.80	12.58	15.8	4.86	2.901	2.71	-21.9	165.9	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWN-MWS</u>	<u>1410</u>	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	

Matrix Spike

Duplicate

Sampled By: LLP

Comments: total + diss znt + cd  
Alk + Acid.

**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: A3 onshore EW  
Well Number: RWO-mwf  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 9.81  
Product Thickness (ft): NA  
Depth to Bottom (ft): 40.12

Project Number: 190346m-2  
Date: 5/10/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 288  
Length of time Purged (min): 25  
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
1244	0.0	10.09	16.8	5.69	2.593	3.80	-9.3	68.5	
1249	0.4	11.27	16.9	5.62	2.611	3.19	-9.6	48.1	
1254	0.8	12.53	16.8	5.63	2.641	2.64	-14.4	14.6	
1259	1.20	12.22	17.0	5.63	2.666	2.33	-20.5	12.7	
1304	1.55	11.98	17.2	5.64	2.675	2.17	-24.4	11.4	
1309	1.90	11.91	17.2	5.63	2.689	2.01	-25.5	10.6	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWO-mwf	1315	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: LCP

Comments: total + Diss Zn + Cd  
ALK. + Acid.

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: A3 onshore 600  
Well Number: RWO-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.26  
Product Thickness (ft): NA  
Depth to Bottom (ft): 20.39

Project Number: 19034111-2  
Date: 5/10/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 341  
Length of time Purged (min): 45  
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
1358	0.0	10.27	16.0	6.71	1.478	4.16	-57.1	18.4	Light amount
1403	0.45	10.28	15.9	6.70	1.460	2.99	-62.7	7.01	NAPL during
1408	0.90	10.27	15.7	6.74	1.439	2.56	-67.7	8.08	purging
1413	1.35	10.26	15.7	6.77	1.442	2.29	-71.8	9.15	waited
1418	1.80	10.27	15.8	6.80	1.414	2.10	-74.1	33.1	for show to
1423	2.25	10.27	16.0	6.83	1.445	1.99	-76.5	16.2	dissipate before
1428	2.70	10.27	15.9	6.83	1.442	1.91	-77.4	6.69	using flow thru
1433	3.15	10.27	16.3	6.85	1.439	1.82	-79.4	4.49	cell
1438	3.60	10.27	15.9	6.84	1.429	1.78	-79.7	4.36	
1443	4.05	10.27	15.9	6.86	1.426	1.72	-80.8	4.17	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWO-mws	1445	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					N
Duplicate					N

Sampled By: UEP

Comments: total + Diss. Zn + Cd  
Alk. + Acid

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: A3 Onshore GLO  
Well Number: RWP-mwf  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.80  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.55

Project Number: 190341m-2  
Date: 5/17/19  
One Well Volume (gal):           
QED Controller Settings:           
Flow Rate (mL/min): 318  
Length of time Purged (min): 35  
Condition of Pad/Cover: 6002 / 6002

## 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
1353	0.0	19.14	18.1	5.55	5.900	6.72	61.8	73	
1358	0.4	19.22	17.6	5.23	5.208	4.35	56.6	68.1	
1403	0.8	19.44	17.6	5.21	5.265	3.62	51.8	64.9	
1408	1.20	19.60	17.5	5.21	5.287	3.15	48.2	59.3	
1413	1.60	19.81	17.2	5.19	5.205	2.88	46.7	47.9	
1418	2.05	20.84	17.4	5.18	5.284	2.71	46.2	34.9	
1423	2.50	20.98	17.5	5.19	5.299	2.50	42.0	31.7	
1428	2.95	21.10	17.5	5.19	5.331	2.43	41.2	28.8	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWP-mwf</u>	<u>1435</u>	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: LUP

Comments: total (an + cd) + Diss (Cu + cd)  
Alk. + Acidity

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: A3 onshore 610

Project Number: 190341M-2

Well Number: RWQ-RWQ-mws

Date: 4-5/16/19 5/17/19

Well Diameter (in): 1

One Well Volume (gal): ---

Depth to Product (ft): NA

QED Controller Settings: ---

Depth to Water (ft): 9.50

Flow Rate (mL/min) 416

Product Thickness (ft): NA

Length of time Purged (min) 30

Depth to Bottom (ft): 22.92

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
1146	0.0	10.54	14.4	6.4	0.638	5.35	-23.0	35.6	
1151	0.55	10.52	14.5	6.23	0.634	4.27	-1.8	20.1	
1153	1.10	10.52	14.6	6.47	0.630	3.61	7.7	18.5	
1201	1.65	10.52	14.5	6.14	0.626	3.17	14.6	10.23	
1206	2.20	10.52	14.6	6.14	0.625	3.05	16.1	7.19	
1211	2.75	10.52	14.7	6.14	0.623	2.89	18.0	6.42	
1216	3.30	10.52	15.0	6.12	0.623	2.69	17.5	5.97	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWQ mws	1235	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: LUP

Comments: total + diss Zn + Cd  
Alk. + Acid.

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: A3 onshore GW  
Well Number: RWS - mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 6.19  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.90

Project Number: 190341m-2  
Date: 5/27/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 4lb  
Length of time Purged (min): 30  
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
1047	0.0	6.45	13.9	6.43	1.234	5.84	-41.1	100.0	
1052	0.55	6.83	14.0	6.38	1.226	4.42	-44.1	71.0	
1057	1.10	7.18	13.9	6.37	1.223	4.02	-44.5	46.3	
1102	1.65	7.69	14.0	6.35	1.219	3.63	-44.6	24.5	
1107	2.20	7.72	14.1	6.33	1.219	3.26	-44.5	16.5	
1112	2.75	7.77	14.0	6.32	1.218	3.00	-44.1	14.9	
1117	3.30	7.83	14.1	6.31	1.216	2.90	-43.8	13.7	

## MONITORING SAMPLE RECORD

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

Matrix Spike

Duplicate

Sampled By: LUP

Comments: total + diss. Zn + Cd  
Alk. + Acidity

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: A3 onshore GW

Project Number: 190341m-2

Well Number: RWS-mwt

Date: 5/17/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 12.43

Flow Rate (mL/min) 416

Product Thickness (ft): NA

Length of time Purged (min) 25

Depth to Bottom (ft): 46.40

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
952	0.0	13.30	15.2	5.57	6.047	4.76	14.3	51.6	
957	0.55	13.45	15.4	5.54	5.897	4.14	-15.1	43.7	
1002	1.10	13.49	15.3	5.52	5.817	3.88	-15.2	30.9	
1007	1.65	13.52	15.2	5.50	5.681	3.58	-15.2	28.0	
1012	2.20	13.57	15.1	5.48	5.551	3.36	-15.0	20.7	
1017	2.75	13.60	15.0	5.46	5.486	3.23	-15.0	19.3	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWS-mwt</u>	<u>1025</u>	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: LVP

Comments:

total + Diss. Zn + Cd  
Alk + Acidity

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: A3 onshore GW  
Well Number: RWQ-mwI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 13.54  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.52

Project Number: 190341m-2  
Date: 5/16/19  
One Well Volume (gal):  
QED Controller Settings:  
Flow Rate (mL/min) 416  
Length of time Purged (min) 35  
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
1236	0.0	13.70	16.3	5.90	3.125	4.85	1.4	60.8	
1241	0.55	13.70	16.0	5.76	3.022	3.81	-3.9	30.1	
1246	1.10	13.74	16.3	5.74	2.992	3.24	-7.7	28.9	
1251	1.65	13.78	15.9	5.72	2.938	2.98	-9.2	19.9	
1256	2.20	13.78	16.3	5.66	2.951	2.78	-9.7	13.2	
1301	2.75	13.78	15.7	5.64	2.885	2.62	-10.7	8.10	
1306	3.30	13.78	15.8	5.63	2.877	2.49	-11.8	8.98	
1311	3.85	13.79	16.1	5.63	2.880	2.37	-13.7	8.25	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWQ-mwI	1320	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					N
Duplicate					N

Sampled By: LUP

Comments: total + diss Zn + cel  
Alk + Acid.

**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: At onshore GW

Project Number: 190341M-2

Well Number: RWF-mws

Date: 5/16/19

Well Diameter (in): 1

One Well Volume (gal): ---

Depth to Product (ft): NA

QED Controller Settings: ---

Depth to Water (ft): 11.18

Flow Rate (mL/min) 379

Product Thickness (ft): NA

Length of time Purged (min) 30

Depth to Bottom (ft): 22.75

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
1024	0.0	12.03	15.3	5.58	2.173	4.35	22.2	74.5	
1029	0.450	12.05	15.4	5.44	2.166	3.67	31.7	58.3	
1034	1.00	12.05	15.4	5.42	2.161	3.36	36.0	30.4	
1039	1.50	12.06	15.4	5.40	2.156	3.08	39.7	21.9	
1044	2.00	12.06	15.4	5.37	2.148	2.86	43.2	14.5	
1049	2.50	12.06	15.4	5.37	2.144	2.69	45.3	13.3	
1054	3.00	12.06	15.4	5.35	2.119	2.60	46.9	12.2	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWF-mws	1105	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: LLP

Comments: total + Diss entered  
AVL + Acidity

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: A3 onshore BWO  
Well Number: RWF-mwt  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.55  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.56

Project Number: 19034m-2  
Date: 5/16/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 416  
Length of time Purged (min): 35  
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
929	0.0	10.73	16.6	6.73	11.360	6.43	-91.0	92.1	
934	0.55	10.75	16.5	6.61	11.213	4.94	-90.5	75.8	
939	1.10	10.75	16.6	6.59	11.090	4.27	-89.1	37.0	
944	1.65	10.76	16.6	6.57	11.010	3.92	-88.0	16.7	
949	2.20	10.76	16.6	6.56	10.913	3.59	-86.9	13.3	
954	2.75	10.76	16.6	6.55	10.830	3.39	-86.3	11.6	
959	3.30	10.74	16.6	6.53	10.763	3.18	-85.6	10.9	
1004	3.85	10.76	16.6	6.54	10.708	2.99	-85.5	11.2	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWF-mwt	1005	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					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acidity

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: A3 onshore G.W.

Project Number: 1903/1m-2

Well Number: RWB-mws

Date: 5/15/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 17.76

Flow Rate (mL/min) 257

Product Thickness (ft): NA

Length of time Purged (min) 20

Depth to Bottom (ft): 23.31

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
1030	0.0	18.73	16.3	10.77	1.455	4.25	-221.4	47.1	
1035	0.3	22.02	16.3	9.37	1.488	3.54	-174.5	32.3	
1040	0.6	22.65	16.8	8.91	1.509	3.09	-204.3	45.3	
1045	0.9	pumped 2m will return to sample							
1505	1.10	20.35	19.2	9.73	1.328	6.02	-68.7	14.6	
1510	1.35	22.25	20.6	9.20	1.344	4.93	-58.6	12.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWB-mws	1515	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					N
Duplicate					N

Sampled By: LEP

Comments: total + diss Zn + Cd need to purge very slow  
Alk. + Acid.

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: A3 onshore GW

Project Number: 190344m-2

Well Number: RW22R-MWS

Date: 5/15/19

Well Diameter (in): 1

One Well Volume (gal):     

Depth to Product (ft): NA

QED Controller Settings:     

Depth to Water (ft): 14.70

Flow Rate (mL/min) 379

Product Thickness (ft): NA

Length of time Purged (min) 20

Depth to Bottom (ft): 22.95

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
1400	0.0	14.75	16.5	6.64	2.391	5.93	-31.9	32.4	
1405	0.5	14.75	16.4	6.58	2.430	5.11	-30.6	21.2	
1410	1.00	14.75	16.4	6.65	2.450	4.69	-35.1	4.80	
1415	1.50	14.75	16.5	6.69	2.480	4.53	-38.1	1.75	
1420	2.00	14.75	16.0	6.70	2.471	4.49	-39.4	1.10	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW22R-MWS	1430	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: UP

Comments:

total + Diss Zn + Cd  
Alk + Acidity

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: A3 onshore GW  
Well Number: RWA-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 8.84  
Product Thickness (ft): NA  
Depth to Bottom (ft): 16.90

Project Number: 190341m-2  
Date: 5/15/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 341  
Length of time Purged (min): 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
1313	0.0	8.85	17.2	7.63	2.537	3.91	-63.8	16.5	
1318	0.45	8.85	17.1	7.86	2.638	3.31	-89.2	6.88	
1323	0.90	8.85	17.1	8.21	2.703	2.90	-130.3	4.97	
1328	1.35	8.85	17.3	8.31	2.724	2.76	-144.3	2.29	
1333	1.80	8.85	18.4	8.24	2.748	2.57	-142.5	1.16	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWA-mws	1335	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acidity

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: A3 onshore bldg  
Well Number: RWA-MWF  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 9.34  
Product Thickness (ft): NA  
Depth to Bottom (ft): 23.14

Project Number: 190341m-2  
Date: 5/15/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 265  
Length of time Purged (min): 25  
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
<del>1208</del>	<del>0.10</del>	<del>14.40</del>	<del>18.0</del>	<del>5.36</del>	<del>3.075</del>	<del>6.73</del>	<del>73.3</del>	<del>85.1</del>	
<del>1213</del>	<del>0.35</del>		<del>19.3</del>	<del>5.32</del>	<del>3.170</del>	<del>6.45</del>	<del>76.3</del>		
<del>1238</del>	<del>0.00</del>	<del>18.64</del>	<del>18.3</del>	<del>5.49</del>	<del>2.968</del>	<del>3.53</del>	<del>60.3</del>	<del>109.0</del>	
<del>1238</del>	<del>0.35</del>	<del>18.63</del>	<del>18.3</del>	<del>5.40</del>	<del>2.945</del>	<del>3.23</del>	<del>61.4</del>	<del>107.3</del>	
<del>1243</del>	<del>0.70</del>	<del>18.82</del>	<del>18.3</del>	<del>5.40</del>	<del>2.927</del>	<del>3.01</del>	<del>61.3</del>	<del>83.4</del>	
<del>1248</del>	<del>1.05</del>	<del>19.12</del>	<del>18.3</del>	<del>5.40</del>	<del>2.915</del>	<del>2.89</del>	<del>61.3</del>	<del>65.1</del>	
<del>1253</del>	<del>1.40</del>	<del>19.24</del>	<del>18.5</del>	<del>5.40</del>	<del>2.907</del>	<del>2.69</del>	<del>60.8</del>	<del>70.9</del>	
<del>1258</del>	<del>1.75</del>	<del>19.32</del>	<del>18.3</del>	<del>5.39</del>	<del>2.888</del>	<del>2.59</del>	<del>61.1</del>	<del>75.7</del>	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWA-MWF	1300	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					N
Duplicate					N

Sampled By: LUP

Comments: total + diss. zn + cd  
191K + Acid.

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)



Earth Resource Engineers and Consultants

Project Number: 14034/1M-2

Date: 5/15/19

One Well Volume (gal): \_\_\_\_\_

QED Controller Settings: \_\_\_\_\_

Flow Rate (mL/min) 265

Length of time Purged (min) 15

Condition of Pad/Cover: Good / Good[illegible]

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWB-MWI	1020	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					
Duplicate					

Comments: total + Diss Zn + Cd  
Alk. + Acid.

**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

# Low Flow Sampling Permanent Wells



# ARM Group Inc.

Earth Resource Engineers and Consultants

Project Name: A3 onshore GW

Project Number: 190341m-2

Well Number: RW22R-MWI

Date: 5/14/19

Well Diameter (in): 1

One Well Volume (gal):     

Depth to Product (ft): NA

QED Controller Settings:     

Depth to Water (ft): 15.47

Flow Rate (mL/min) 227

Product Thickness (ft): NA

Length of time Purged (min) 30

Depth to Bottom (ft): 42.73

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
1434	0.0	28.12	16.0	6.26	2.882	2.09	-53.5	31.3	
1439	0.3	28.93	16.3	6.15	2.857	2.46	-49.5	26.2	
1444	0.6	29.07	16.3	6.13	2.850	2.39	-48.3	19.5	
1449	0.9	29.21	16.3	6.11	2.826	2.28	-46.3	17.9	
1454	1.20	29.50	16.3	6.08	2.805	2.23	-44.7	16.7	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW22R-MWI	1500	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: LUP

Comments: zn + cd (total + diss)  
Alk. + Acid

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: A3 onshore GW  
Well Number: RWD-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 11.76  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.15

Project Number: 190341m-2  
Date: 5/14/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min) 227  
Length of time Purged (min) 25  
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
1322	0.0	18.48	14.9	6.71	0.734	3.00	-47.8	43.5	Light color
1327	0.3	18.47	14.9	6.65	0.741	2.86	-47.7	31.3	very silty
1332	0.6	18.45	14.8	6.57	0.690	2.71	-40.7	17.7	during purging
1337	0.9	18.52	14.8	6.53	0.678	2.58	-37.8	15.2	
1342	1.20	18.64	14.9	6.54	0.669	2.48	-38.3	15.4	
1347	1.50	18.68	15.0	6.53	0.659	2.39	-36.7	15.6	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWD-mws</u>	<u>1355</u>	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: LUP

Comments:

total + Diss. Zn + Cd  
Alk + Acidity

**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: A3 onshore GW

Project Number: 660341M-2

Well Number: RWD-MW#1

Date: 5/14/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 13.53

Flow Rate (mL/min) 372

Product Thickness (ft): NA

Length of time Purged (min) 30

Depth to Bottom (ft): 42.58

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
1115	0.0	13.42	16.2	6.52	3.332	6.74	148.0	84.3	
1120	0.45	13.40	16.2	5.93	3.210	4.37	70.1	74.8	
1125	0.95	13.39	16.2	5.87	3.175	3.76	3.2	63.0	
1130	1.45	13.38	15.8	5.83	3.117	3.26	6.0	41.7	
1135	1.95	13.38	15.8	5.81	3.092	3.06	6.7	35.5	
1140	2.45	13.37	15.9	5.80	3.072	2.85	7.5	33.9	
1145	2.95	13.35	15.8	5.79	3.046	2.71	8.1	32.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWD-MW#1</u>	<u>1150</u>	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

NE

Duplicate

N

Sampled By: LUP

Comments: total + diss zn + cd  
Alk. + Acid.

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: A3 onshore GW

Project Number: 190341m-2

Well Number: RWDSR-MWI

Date: 5/13/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 10.95

Flow Rate (mL/min) 341

Product Thickness (ft): NA

Length of time Purged (min) 30

Depth to Bottom (ft): 42.50

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
1414	0.0	10.93	16.1	6.57	7.627	4.40	-97.6	53.1	
1419	0.45	10.93	16.0	6.50	7.609	3.73	-96.7	29.9	
1424	0.90	10.93	16.1	6.49	7.589	3.22	-97.5	14.0	
1429	1.35	10.92	16.3	6.48	7.577	2.83	-98.9	11.9	
1434	1.80	10.92	16.2	6.47	7.568	2.61	-99.1	8.78	
1439	2.25	10.92	16.2	6.46	7.549	2.50	-99.4	9.13	
1444	2.70	10.92	16.2	6.46	7.551	2.39	-99.8	8.77	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWDSR-MWI	1435	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					N
Duplicate					N

Sampled By: CLP

Comments: total + diss Zn + Cd  
Alk + Acid

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: A3 onshore MW

Project Number: 190341M-2

Well Number: A3 onshore MW

Date: 5/13/19

Well Diameter (in): 1 (RWG-MWS)

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 11.26

Flow Rate (mL/min) 291

Product Thickness (ft): NA

Length of time Purged (min) 45

Depth to Bottom (ft): 22.71

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
1150	0.0	11.30	14.0	9.74	1.037	5.79	-259.9	51	
1155	0.4	11.34	13.9	9.71	1.539	3.77	-279.9	45.7	
1200	0.8	11.37	14.0	9.71	1.568	3.13	-280.2	39.5	
1205	1.20	11.39	13.9	9.73	1.569	2.74	-280.5	33.8	
1210	1.60	11.46	13.9	9.64	1.974	2.52	-287.7	28.6	
1215	2.00	11.49	13.9	9.52	2.311	2.33	-295.4	19.75	
1220	2.40	11.50	13.9	9.35	2.614	2.18	-307.9	10.39	
1225	2.75	11.42	13.8	9.26	2.830	2.11	-309.9	8.12	
1230	3.10	11.33	13.8	9.18	2.983	2.01	-312.7	5.24	
1235	3.45		13.8	9.09	3.105	1.94	-310.4	4.99	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWG-MWS	1240	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: UP

Comments: total + diss. Zn + Cd  
ALL. Acid + cond 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 Permanent Wells



# ARM Group Inc.

Earth Resource Engineers and Consultants

Project Name: A3 onshore 610

Project Number: 190341m-2

Well Number: RW6-mwt

Date: 5/13/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 11.10

Flow Rate (mL/min) 329

Product Thickness (ft): N/A

Length of time Purged (min) 45

Depth to Bottom (ft): 37.54

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
1046	0.0	11.09	15.3	6.73	10.287	5.32	-96.5	82	
1051	0.45	11.08	15.2	6.71	10.322	4.42	-107.7	77.8	
1056	0.90	11.07	15.2	6.71	10.337	3.95	-112.9	57.1	
1101	1.35	11.06	15.2	6.71	10.330	3.57	-116.7	32.2	
1106	1.80	11.05	15.3	6.72	10.353	3.19	-121.3	25.4	
1111	2.25	11.04	15.4	6.72	10.373	3.00	-123.1	19.8	
1116	2.70	11.04	15.3	6.72	10.359	2.88	-124.2	15.3	
1121	3.10	11.03	15.4	6.73	10.388	2.72	-127.2	13.2	
1126	3.50	11.03	15.4	6.74	10.400	2.53	-130.3	12.1	
1131	3.90	11.03	15.4	6.73	10.408	2.45	-130.7	11.7	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW6-mwt	1135	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

N  
N

Sampled By: LUP

Comments: total + diss, zn + cd  
Alk + Acid

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: A3 onshore GW  
Well Number: RWQ-mwI  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 13.54  
Product Thickness (ft): NA  
Depth to Bottom (ft): 42.52

Project Number: 190341m-2  
Date: 5/16/19  
One Well Volume (gal):  
QED Controller Settings:  
Flow Rate (mL/min) 416  
Length of time Purged (min) 35  
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
1236	0.0	13.70	16.3	5.90	3.125	4.85	1.4	60.8	
1241	0.55	13.70	16.0	5.76	3.022	3.81	-3.9	30.1	
1246	1.10	13.74	16.3	5.74	2.992	3.24	-7.7	28.9	
1251	1.65	13.78	15.9	5.72	2.938	2.98	-9.2	19.9	
1256	2.20	13.78	16.3	5.66	2.951	2.78	-9.7	13.2	
1301	2.75	13.78	15.7	5.64	2.885	2.62	-10.7	8.10	
1306	3.30	13.78	15.8	5.63	2.877	2.49	-11.8	8.98	
1311	3.85	13.79	16.1	5.63	2.880	2.37	-13.7	8.25	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWQ-mwI	1320	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					N
Duplicate					N

Sampled By: LP

Comments: total + diss Zn + cel  
Alk + Acid.

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: A3 onshore GLO  
Well Number: RWQ-RWQ-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 9.50  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.92

Project Number: 190341M-2  
Date: 4/5/16 to 5/17/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 416  
Length of time Purged (min): 30  
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
1146	0.0	10.54	14.4	6.4	0.638	5.35	-23.0	35.6	
1151	0.55	10.52	14.5	6.23	0.634	4.27	-1.8	20.1	
1153	1.10	10.52	14.6	6.17	0.630	3.61	7.7	18.5	
1201	1.65	10.52	14.5	6.14	0.626	3.17	14.6	10.23	
1206	2.20	10.52	14.6	6.14	0.625	3.05	16.1	7.19	
1211	2.75	10.52	14.7	6.14	0.623	2.89	18.0	6.42	
1216	3.30	10.52	15.0	6.12	0.623	2.69	17.5	5.97	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWQ mws	1235	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: LUP

Comments: total + diss Zn + Cd  
Alk. + Acid.

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: A3 onshore GW

Project Number: 19034um-2

Well Number: RWR-mwI

Date: 5/10/19

Well Diameter (in): 1

One Well Volume (gal): —

Depth to Product (ft): NA

QED Controller Settings: —

Depth to Water (ft): 11.90

Flow Rate (mL/min) 326

Product Thickness (ft): NA

Length of time Purged (min) 35

Depth to Bottom (ft): 39.64

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
931	0.0	11.98	15.3	5.50	6.076	7.16	-35.6	84	
936	0.45	11.93	15.2	5.31	5.855	3.93	-64.5	71.0	
941	0.90	11.87	15.2	5.29	5.685	3.32	-71.8	54.5	
946	1.35	11.86	15.3	5.27	5.539	2.93	-74.2	52.7	
951	1.80	11.85	15.3	5.26	5.396	2.68	-76.2	50.9	
956	2.20	11.85	15.3	5.25	5.335	2.47	-77.6	26.5	
1001	2.60	11.85	15.4	5.24	5.190	2.35	-79.0	24.0	
1006	3.00	11.85	15.3	5.24	5.052	2.24	-79.5	22.8	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWR-mwI	10/10	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: LWP

Comments: Total + Diss Zn + Cd  
Alk + Acid.

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: A3 onshore bwr  
Well Number: RWR-mws  
Well Diameter (in): 1  
Depth to Product (ft): NA  
Depth to Water (ft): 10.03  
Product Thickness (ft): NA  
Depth to Bottom (ft): 19.83

Project Number: 190341M-2  
Date: 5/10/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 288  
Length of time Purged (min): 30  
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
1020	0.0	11.70	14.5	5.03	2.077	3.90	8.8	79.0	
1033	0.4	11.01	14.6	4.88	2.034	3.08	12.6	82.3	
1038	0.8	10.68	14.7	4.88	2.1993	2.60	14.6	84.8	
1043	1.20	10.56	14.9	4.87	1.962	2.36	16.8	63.0	
1048	1.60	10.51	15.2	4.86	1.956	2.22	17.1	58.8	
1053	2.00	10.45	15.5	4.86	1.941	2.11	18.9	55.6	
1058	2.40	10.40	15.6	4.85	1.916	1.98	20.1	58.5	
1103	2.60								

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWR-mws	1105	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: LUP

Comments: total + Diss int cd  
Alk + Acid

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: A3 onshore GW

Project Number: 190341m-2

Well Number: RWS-mwt

Date: 5/17/19

Well Diameter (in): 1

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 12.43

Flow Rate (mL/min) 416

Product Thickness (ft): NA

Length of time Purged (min) 25

Depth to Bottom (ft): 46.40

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
952	0.0	13.30	15.2	5.57	6.047	4.76	14.3	51.6	
957	0.55	13.45	15.4	5.54	5.897	4.14	-15.1	43.7	
1002	1.10	13.49	15.3	5.52	5.817	3.88	-15.2	30.9	
1007	1.65	13.52	15.2	5.50	5.681	3.58	-15.2	28.0	
1012	2.20	13.57	15.1	5.48	5.551	3.36	-15.0	20.7	
1017	2.75	13.60	15.0	5.46	5.486	3.23	-15.0	19.3	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RWS-mwt</u>	<u>1025</u>	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	

Matrix Spike

Duplicate

Sampled By: LVP

Comments: total + Diss. Zn + Cd  
Alk + Acidity

**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: A3 onshore GW

Project Number: 190341m-2

Well Number: RWS - mws

Date: 5/27/19

Well Diameter (in): 1

One Well Volume (gal):       

Depth to Product (ft): NA

QED Controller Settings:       

Depth to Water (ft): 6.19

Flow Rate (mL/min) 416

Product Thickness (ft): NA

Length of time Purged (min) 30

Depth to Bottom (ft): 22.90

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
1047	0.0	6.45	13.9	6.43	1.234	5.84	-41.1	100.0	
1052	0.55	6.83	14.0	6.38	1.226	4.42	-44.1	71.0	
1057	1.10	7.18	13.9	6.37	1.223	4.02	-44.5	46.3	
1102	1.65	7.69	14.0	6.35	1.219	3.63	-44.6	24.5	
1107	2.20	7.72	14.1	6.33	1.219	3.26	-44.5	16.5	
1112	2.75	7.77	14.0	6.32	1.218	3.00	-44.1	14.9	
1117	3.30	7.83	14.1	6.31	1.216	2.90	-43.8	13.7	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RWS - mws	1125	TCL-VOCs	3 - 40 mL VOA	HCl	<div></div>
		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					22
Duplicate					

Sampled By: LUP

Comments: total + diss. Zn + Cd  
Alk. + Acidity

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: A3 6W Direct Support  
Well Number: RW01-MWI  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.42  
Product Thickness (ft): NA  
Depth to Bottom (ft): 37.62

Project Number: 180227M-L-1  
Date: 5/29/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 341  
Length of time Purged (min): 30  
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
1040	0.0	8.65	18.6	6.23	5.016	5.37	-55.1	38.7	
1045	0.45	8.69	18.6	6.19	5.108	3.84	-64.3	22.0	
1050	0.90	8.67	18.6	6.20	5.330	3.22	-68.0	18.2	
1055	1.35	8.63	18.6	6.25	5.531	2.81	-75.0	14.9	
1100	1.80	8.63	18.7	6.25	5.677	2.57	-85.8	9.02	
1105	2.25	8.65	18.6	6.25	5.764	2.40	-83.5	8.42	
1110	2.70	8.65	18.3	6.26	5.871	2.26	-82.8	7.91	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW01-MWI	1120	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					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

**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: A3 EW Direct Support  
Well Number: RW01-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.62  
Product Thickness (ft): NA  
Depth to Bottom (ft): 19.20

Project Number: 180227M-1-1  
Date: 8/29/19  
One Well Volume (gal):       
QED Controller Settings:       
Flow Rate (mL/min): 416  
Length of time Purged (min): 35  
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
1311	0.0	8.81	19.3	5.88	1.266	5.83	30.0	62.3	very silty
1316	0.55	8.83	18.6	5.49	1.221	4.07	53.7	26.5	during purging
1321	1.10	8.81	18.1	5.40	1.240	3.36	62.7	21.3	
1326	1.65	8.79	18.5	5.34	1.263	2.98	69.3	15.0	
1331	2.20	8.77	18.6	5.30	1.276	2.73	71.8	10.33	
1336	2.75	8.76	18.8	5.24	1.284	2.51	76.8	8.57	
1341	3.30	8.76	18.7	5.21	1.281	2.39	79.5	7.72	
1346	3.85	8.76	18.3	5.20	1.268	2.32	80.3	6.99	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW01-mws	1350	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					N
Duplicate					N

Sampled By: LUP

Comments: total + Diss Zn + Cd  
Auk. + Acid.

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: A3 GW Direct Support  
Well Number: RW02-mwI  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.45  
Product Thickness (ft): NA  
Depth to Bottom (ft): 35

Project Number: 180227M-1-1  
Date: 5/29/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 39.7  
Length of time Purged (min): 40  
Condition of Pad/Cover: poor / Good

## PURGING RECORD

cracked / water in hole

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
851	0.0	9.10	17.7	6.74	5.307	5.76	-115.4	89.5	
856	0.5	9.11	17.9	6.55	6.489	4.20	-103.6	55.3	
901	1.00	9.11	17.7	6.49	6.941	3.57	-97.9	47.8	
906	1.50	9.11	17.7	6.46	7.093	3.24	-94.4	39.2	
911	2.00	9.11	17.7	6.43	7.206	2.90	-90.8	24.1	
916	2.55	9.16	17.7	6.41	7.302	2.76	-89.0	20.1	
921	3.10	9.20	17.7	6.40	7.303	2.61	-87.6	15.8	
926	3.65	9.21	17.6	6.39	7.287	2.53	-86.6	13.6	
931	4.20	9.21	17.6	6.39	7.314	2.42	-86.1		

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW02-mws	935	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					N
Duplicate					N

Sampled By: WLP

Comments: total + DISS Zn + Cd  
Alk + Acid

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: A3 GW direct support  
Well Number: RW02-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.52  
Product Thickness (ft): NA  
Depth to Bottom (ft): 18.24

Project Number: 180227M-1-1  
Date: 5/29/19  
One Well Volume (gal):  
QED Controller Settings: ---  
Flow Rate (mL/min) 227  
Length of time Purged (min) 25  
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
943	0.0	10.37	21.3	6.49	0.956	4.43	-48.7	33.8	
948	0.3	10.41	22.3	6.31	0.837	3.42	-37.7	16.9	
953	0.6	10.47	23.5	6.24	0.940	2.73	-34.1	14.8	
958	0.9	10.50	23.9	6.18	0.965	2.45	-30.3	11.6	
1003	1.20	10.53	23.8	6.14	0.977	2.27	-26.9	10.81	
1008	1.50	10.55	23.8	6.12	0.999	2.16	-25.5	9.44	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW02-mws	1015	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: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acid

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: <u>A3 GW Direct Support</u>	Project Number: <u>180227M-1-1</u>
Well Number: <u>RW03-mwI</u>	Date: <u>5-28-19</u>
Well Diameter (in): <u>2</u>	One Well Volume (gal): <u>      </u>
Depth to Product (ft): <u>NA</u>	QED Controller Settings: <u>      </u>
Depth to Water (ft): <u>9.42</u>	Flow Rate (mL/min) <u>379</u>
Product Thickness (ft): <u>NA</u>	Length of time Purged (min) <u>35</u>
Depth to Bottom (ft): <u>40-69</u>	Condition of Pad/Cover: <u>Good / Good</u>

## 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
929	0.0	9.48	16.7	6.38	8.892	6.11	-72.0	11.01	
934	0.5	9.48	16.7	6.14	8.525	4.38	-49.8	10.43	
939	1.00	9.49	16.7	6.09	8.310	3.77	-41.6	9.75	
944	1.50	9.49	16.7	6.08	8.117	3.37	-38.7	9.22	
949	2.00	9.49	16.7	6.07	7.897	3.02	-35.9	10.92	
954	2.50	9.49	16.7	6.06	7.732	2.83	-34.6	13.3	
959	3.00	9.49	16.7	6.07	7.554	2.66	-33.7	12.3	
1004	3.50	9.49	16.8	6.07	8.072	2.54	-32.9	12.1	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW03-mwI	1010	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					N Y
Duplicate					

Sampled By: LIP      Comments: total + Diss Zn + Cd  
AsK + Acid.

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: A3 G.W. Direct Support

Project Number: 180227M-1-1

Well Number: RW03-mws

Date: 5-28-19

Well Diameter (in): 2

One Well Volume (gal):           

Depth to Product (ft): NA

QED Controller Settings:           

Depth to Water (ft): 8.93

Flow Rate (mL/min) 303

Product Thickness (ft): NA

Length of time Purged (min) 40

Depth to Bottom (ft): 21.25

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
1024	0.0	9.10	16.0	5.48	0.824	4.39	68.8	81.1	
1029	0.4	9.13	16.2	5.36	0.862	2.93	90.4	21.6	
1034	0.8	9.14	16.3	5.36	0.864	2.79	92.2	19.7	
1039	1.20	9.16	16.1	5.35	0.870	2.65	95.0	12.5	
1044	1.60	9.16	16.2	5.29	0.872	2.45	100.9	9.11	
1049	2.00	9.17	16.2	5.26	0.871	2.32	104.7	9.20 6.23	
1054	2.40	9.17	16.2	5.25	0.869	2.22	106.4	4.94	
1059	2.80	9.17	16.1	5.23	0.872	2.13	108.7	4.03	
1105	3.20	9.17	16.2	5.22	0.875	2.05	109.9	3.81	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW03-mws	1110	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: LLP

Comments: total + Diss - Zn + Cd  
Alk. + Acid

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: A3 6W direct support  
Well Number: RW04-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 7.30  
Product Thickness (ft): NA  
Depth to Bottom (ft): 13.24

Project Number: 180227M-1-1  
Date: 5/22/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 220  
Length of time Purged (min): 30  
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
1118	0.10	7.91	14.3	6.90	0.743	6.87	2.4	13.70	
1123	0.40	9.43	14.9	6.82	0.734	5.96	19.3	17.12	
1128	0.70	10.92	15.1	6.85	0.732	5.49	12.1	18.33	
1133	1.10	12.43	15.0	6.96	0.730	4.35	-16.3	19.87	
1138	1.25	12.61	17.2	6.98	0.747	3.66	-16.5	20.00	
1143	1.50	12.87	17.4	6.94	0.747	3.93	-10.4	7.21	
1148	1.75	13.10	17.6	6.93	0.749	4.00	-9.3	6.75	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW04-mws	1205	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					N
Duplicate					N

Sampled By: UP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

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: A3 6W direct support  
Well Number: RW05-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 2.99  
Product Thickness (ft): NA  
Depth to Bottom (ft): 16.90

Project Number: 180227m-1-1  
Date: 5/23/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 227  
Length of time Purged (min): 45  
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
1336	0.0	8.52	19.1	9.12	1.508	5.08	-27.6	24.4	
1341	0.30	8.73	19.3	9.11	1.516	4.33	-30.9	22.8	
1346	0.60	9.10	19.3	9.15	1.531	3.94	-31.2	21.0	
1351	0.90	9.33	19.7	9.17	1.525	3.49	-29.6	17.9	
1356	1.20	9.57	19.2	9.21	1.507	3.42	-25.9	13.4	
1401	1.50	9.70	19.7	9.29	1.515	3.40	-24.2	10.3	
1406	1.80	9.77	20.2	9.36	1.520	3.23	-24.5	7.55	
1411	2.10	9.85	20.1	9.35	1.510	3.04	-22.8	5.04	
1416	2.40	9.91	19.4	9.35	1.507	2.83	-20.8	4.87	
1421	2.70	10.00	20.2	9.35	1.503	2.55	-20.9	4.61	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW05-mws	1425	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					N
Duplicate					N

Sampled By: LEP

Comments: total + Diss Zn + Cd  
Alk + Acid

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: A3 6W direct support  
Well Number: RW06 - MWD  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 10.64  
Product Thickness (ft): NA  
Depth to Bottom (ft): 58

Project Number: 180227m-1-1  
Date: 5/23/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 227  
Length of time Purged (min): 25  
Condition of Pad/Cover: back / good water in hole

## 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
1036	0.0	15.53	17.3	6.64	2.097	5.11	-127.1	8.97	
1041	0.45	17.12	17.4	6.54	2.080	3.82	-117.3	9.60	
1046	0.75	18.20	17.4	6.50	2.071	3.33	-111.7	10.34	
1051	1.00	19.42	17.8	6.48	2.070	3.01	-108.5	10.36	
1056	1.25	20.86	18.2	6.48	2.071	2.73	-106.3	10.34	
1101	1.50	21.44	18.3	6.47	2.065	2.58	-104.9	9.56	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW06-AWD	1105	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					N
Duplicate					N

Sampled By: LUP

Comments: total + diss zn + cd  
Alk. + Acid.

**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: <u>A3 GW direct Support</u>	Project Number: <u>180227m-1-1</u>
Well Number: <u>RW06-MWI</u>	Date: <u>5-23-19</u>
Well Diameter (in): <u>2</u>	One Well Volume (gal): <u>—</u>
Depth to Product (ft): <u>NA</u>	QED Controller Settings: <u>—</u>
Depth to Water (ft): <u>9.47</u>	Flow Rate (mL/min) <u>265</u>
Product Thickness (ft): <u>NA</u>	Length of time Purged (min) <u>20</u>
Depth to Bottom (ft): <u>29.52</u>	Condition of Pad/Cover: <u>Good / Good</u>

## 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
1200	0.0	9.50	17.4	7.74	0.225	6.61	43.6	22.2	
1205	0.4	9.57	17.3	7.37	0.223	5.97	48.2	22.2	
1210	0.8	9.51	17.4	7.29	0.225	5.78	46.3	22.6	
1215	1.20	9.51	17.6	7.25	0.227	5.66	37.5	22.9	
1220	1.60	9.51	17.6	7.16	0.237	5.56	29.2	19.8	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RW06-MWI</u>	<u>1230</u>	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) <b>Field Filtered</b>	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) <b>Field Filtered</b>	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	

Matrix Spike

N

Duplicate

N

Sampled By: UP

Comments: total + diss zn + cd  
Alk. + Acid.

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: A3 GW Direct Support  
Well Number: RW06 - MWS  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 7.12  
Product Thickness (ft): NA  
Depth to Bottom (ft): 9.84

Project Number: 180227m-1-1  
Date: 5/23/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 242  
Length of time Purged (min): 35  
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
1114	0.0	7.30	17.4	8.56	0.543	6.64	-113.1	90.7	
1119	0.35	7.49	16.8	8.66	0.664	6.57	-83.1	77.6	
1124	0.70	7.61	16.7	8.69	0.734	6.50	-41.1	49.1	
1129	1.05	7.83	16.6	8.67	0.772	6.42	-2.6	35.2	
1134	1.305	7.85	16.5	8.70	0.796	6.33	17.1	22.0	
1139	1.65	7.87	16.2	8.64	0.823	6.63	34.3	14.2	
1144	1.95	7.88	16.4	8.63	0.833	6.41	42.4	13.1	
1149	2.25	7.88	16.4	8.68	0.833	6.26	50.8	12.8	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW06-MWS	1155	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					N
Duplicate					N

Sampled By: LUP

Comments: total + diss zn + cd  
Alk. + Acid.

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: A3 610 direct support  
 Well Number: 5/24/19 RW07-mwI  
 Well Diameter (in): 2  
 Depth to Product (ft): NA  
 Depth to Water (ft): 11.49  
 Product Thickness (ft): NA  
 Depth to Bottom (ft): 41.40

Project Number: 180227m-1-1  
 Date: 5/24/19  
 One Well Volume (gal): —  
 QED Controller Settings: —  
 Flow Rate (mL/min): 353  
 Length of time Purged (min): 30  
 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
		<u>11.49</u>							
<u>915</u>	<u>0.0</u>	<u>17.4</u>	<u>17.4</u>	<u>6.10</u>	<u>2.686</u>	<u>5.57</u>	<u>-68.2</u>	<u>27.5</u>	
<u>920</u>	<u>0.5</u>	<u>11.72</u>	<u>17.4</u>	<u>5.94</u>	<u>2.653</u>	<u>4.05</u>	<u>-60.8</u>	<u>24.8</u>	
<u>925</u>	<u>1.00</u>	<u>11.70</u>	<u>17.4</u>	<u>5.88</u>	<u>2.677</u>	<u>3.46</u>	<u>-55.5</u>	<u>22.3</u>	
<u>930</u>	<u>1.45</u>	<u>11.70</u>	<u>17.3</u>	<u>5.79</u>	<u>2.827</u>	<u>2.94</u>	<u>-46.4</u>	<u>25.4</u>	
<u>935</u>	<u>1.90</u>	<u>11.70</u>	<u>17.3</u>	<u>5.74</u>	<u>2.888</u>	<u>2.73</u>	<u>-42.2</u>	<u>16.1</u>	
<u>940</u>	<u>2.35</u>	<u>11.70</u>	<u>17.4</u>	<u>5.70</u>	<u>2.917</u>	<u>2.51</u>	<u>-37.1</u>	<u>17.8</u>	
<u>945</u>	<u>2.80</u>	<u>11.70</u>	<u>17.4</u>	<u>5.68</u>	<u>2.919</u>	<u>2.40</u>	<u>-34.9</u>	<u>17.9</u>	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RW07-mwI</u>	<u>945</u>	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: LLP

Comments: total + Diss Zn + Cd  
Alk. + Acid

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)

Earth Resource Engineers and Consultants

Project Number: 180227m-1-1  
Date: 5/24/19  
One Well Volume (gal): \_\_\_\_\_  
QED Controller Settings: \_\_\_\_\_  
Flow Rate (mL/min) 265  
Length of time Purged (min) 20  
Condition of Pad/Cover: Good / sln too high

1.  $S_u$  too high  
cover doesn't close

MONITORING SAMPLE RECORD

RWOT-muss

1025

### Matrix Spike

Duplicate

Sampled By:

Comments: total + Diss Zn + Cd  
Bik. + Acid.

**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



# Low Flow Sampling Permanent Wells



**ARM Group Inc.**  
Earth Resource Engineers and Consultants

Project Name: A3 GW Direct Support  
Well Number: RW08-mwI  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 11.21  
Product Thickness (ft): NA  
Depth to Bottom (ft): 38.63

Project Number: 180227m-1-1  
Date: 5/24/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 257  
Length of time Purged (min): 30  
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
1240									
<del>1245</del>	0.0	11.73	17.4	6.31	1.295	4.58	-72.8	12.3	
1245	0.35	12.95	17.4	6.26	1.228	3.45	-72.7	11.7	
1250	0.70	14.35	17.5	6.25	1.278	3.06	-73.4	<del>11.7</del>	11.0
1255	1.00	14.73	17.9	6.14	1.478	2.65	-81.6	13.3	
1300	1.35	15.10	17.5	6.13	1.498	2.46	-84.6	10.03	
1305	1.70	15.41	17.5	6.15	1.512	2.30	-88.2	10.37	
1310	2.05	15.68	17.5	6.16	1.499	2.19	-89.6	10.68	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW08-mwI	1320	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					2
Duplicate					2

Sampled By: UP

Comments: total + Diss Zn + Cd  
Alk + Acid

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: A3 fw direct support  
Well Number: RW08-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 9.32  
Product Thickness (ft): NA  
Depth to Bottom (ft): 17.53

Project Number: 180229m-11  
Date: 5-24-19  
One Well Volume (gal):           
QED Controller Settings:           
Flow Rate (mL/min):           
Length of time Purged (min): 40  
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
13457	0.0	9.87	16.7	5.74	0.926	4.62	50.6	51.0	
1352	0.3	10.10	16.8	5.74	0.928	3.88	35.4	36.4	
1357	0.6	10.15	16.9	5.73	0.930	3.75	29.7	22.1	
1402	0.9	10.18	16.9	5.69	0.939	3.54	32.3	16.6	
1407	1.20	10.19	17.1	5.60	0.946	2.64	43.7	12.61	
1412	1.50	10.20	17.3	5.60	0.942	2.48	45.9	5.12	
1417	1.80	10.21	17.3	5.67	0.942	2.25	44.8	3.98	
1422	2.10	10.21	17.2	5.77	0.936	2.07	40.0	1.83	
1427	2.40	10.22	17.1	5.81	0.928	2.01	37.9	0.69	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW08-mws	1440	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: UP

Comments: total + Diss Zn + Cd  
Alk. + Acid

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: <u>A3 GW</u>	Project Number: <u>180227M-1-7</u>
Well Number: <u>RW09-MWI</u>	Date: <u>5/28/19</u>
Well Diameter (in): <u>2</u>	One Well Volume (gal):
Depth to Product (ft): <u>NA</u>	QED Controller Settings:
Depth to Water (ft): <u>11.03</u>	Flow Rate (mL/min) <u>341</u>
Product Thickness (ft): <u>NA</u>	Length of time Purged (min) <u>30</u>
Depth to Bottom (ft): <u>43.05</u>	Condition of Pad/Cover: <u>poor / good</u>

## PURGING RECORD

water in hole

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
1346	0.0	11.46	17.6	6.15	2.049	4.49	-61.2	32.6	
1351	0.45	11.58	17.8	5.84	2.208	3.43	-33.0	25.7	
1356	0.90	11.63	17.9	5.74	2.310	3.03	-27.1	18.2	
1401	1.35	11.65	17.9	5.72	2.346	2.70	-27.1	16.68	
1406	1.80	11.68	17.8	5.72	2.336	2.54	-27.2	10.62	
1411	2.25	11.72	17.6	5.74	2.345	2.39	-28.3	11.26	
1416	2.70	11.73	17.8	5.75	2.367	2.25	-29.8	10.44	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
<u>RW09-MWI</u>	<u>1428</u>	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					<u>Y</u>
Duplicate					<u>N</u>

Sampled By: LLP

Comments: total + Diss. Zn + Cd  
Alk + Acid

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: A3 GW direct support  
 Well Number: RW09-mws  
 Well Diameter (in): 2  
 Depth to Product (ft): NA  
 Depth to Water (ft): 9.28  
 Product Thickness (ft): NA  
 Depth to Bottom (ft): 23.83

Project Number: 180227m-1-1  
 Date: 5-28-19  
 One Well Volume (gal):         
 QED Controller Settings:         
 Flow Rate (mL/min) 303  
 Length of time Purged (min) 15  
 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
1434	0.0	10.03	17.2	6.23	1.299	4.28	0.7	19.8	
1439	0.4		17.6	6.15	1.292	3.03	7.3	17.6	
1444	0.8		17.4	6.14	1.276	2.76	8.7	16.0	
1449	1.20		17.9	6.14	1.276	2.52	9.5	16.2	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW09-mws	1455	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					N
Duplicate					N

Sampled By: LLP

Comments: total + Diss, Zn + Cd  
AK + Acid

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: A-3 GW direct support  
Well Number: RW10-MWT  
Well Diameter (in): 6  
Depth to Product (ft): NA  
Depth to Water (ft): 12.14  
Product Thickness (ft): NA  
Depth to Bottom (ft): 41.70

Project Number: 18022 m-1-1  
Date: 5/24/19  
One Well Volume (gal): ---  
QED Controller Settings: ---  
Flow Rate (mL/min): 303  
Length of time Purged (min): 35  
Condition of Pad/Cover: Good / Good

### PURGING RECORD

Vault broken

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
1030	0.0	12.22	17.3	6.63	1.460	5.21	-75.2	43.2	
1035	0.4	12.28	17.2	6.60	1.432	3.42	-93.1	48.7	
1040	0.8	12.28	17.2	6.61	1.424	2.81	-98.6	53.0	
1045	1.20	12.28	17.1	6.60	1.417	2.49	-101.3	54.2	
1050	1.60	12.28	17.6	6.60	1.423	2.21	-104.0	49.7	
1055	2.00	12.28	17.5	6.59	1.410	2.03	-105.1	48.3	
1100	2.40	12.28	17.5	6.60	1.412	1.96	-106.3	47.1	
1105	2.80	12.28	17.4	6.59	1.403	1.86	-107.1	45.3	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW10-MWT	1120	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: LLP

Comments: total + diss zn + cd  
Alk. + Acid.

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: A3 612 direct support  
 Well Number: RW11-mwI  
 Well Diameter (in): 2  
 Depth to Product (ft): NA  
 Depth to Water (ft): 11.14  
 Product Thickness (ft): NA  
 Depth to Bottom (ft): 31.04

Project Number: 190227m1  
 Date: 5/22/19  
 One Well Volume (gal): —  
 QED Controller Settings: —  
 Flow Rate (mL/min): —  
 Length of time Purged (min): 30  
 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
943	0.0	11.18	17.2	6.30	2.699	6.76	-56.3	27.3	
948	0.45	11.19	17.1	6.02	2.606	4.75	-44.4	17.5	
953	0.90	11.19	17.1	5.99	2.562	3.94	-42.2	11.4	
958	1.35	11.19	17.2	5.98	2.522	3.36	-40.4	9.74	
1003	1.80	11.19	17.2	5.98	2.486	3.02	-39.0	6.98	
1008	2.25	11.19	17.3	5.97	2.470	2.78	-37.6	6.66	
1013	2.70	11.19	17.2	5.97	2.439	2.59	-36.6	6.05	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW11-mwI	1020	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: LLP

Comments: total + diss. Zn + Cd  
Alk + Acid

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: A3 GW direct support  
Well Number: RW11-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.61  
Product Thickness (ft): NA  
Depth to Bottom (ft): 21.10

Project Number: 150227m-1-1  
Date: 5/22/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 329  
Length of time Purged (min): 25  
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
1025	0.0	9.45	17.0	5.72	1.774	3.29	16.4	21.0	
1030	0.35	9.63	17.1	5.72	1.765	2.81	18.5	14.7	
1035	0.70	9.70	17.1	5.73	1.759	2.50	18.9	8.80	
1040	1.05	9.75	17.2	5.74	1.754	2.27	18.7	4.71	
1045	1.40	9.79	17.1	5.74	1.745	2.16	19.2	3.64	
1050	1.75	9.83	17.3	5.75	1.737	2.06	19.0	2.33	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW11 - mws	1100	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					N
Duplicate					N

Sampled By: LLP

Comments:

total + Diss Zn + Cd  
ALK. + Acid.

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: RW12-MWT A3 Direct Supply  
Well Number: RW12-MWT  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 11.14  
Product Thickness (ft): NA  
Depth to Bottom (ft): 27.93

Project Number: 180227M1-1  
Date: 5/20/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 303  
Length of time Purged (min): 30  
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
922	0.0	11.20	18.8	7.03	0.177	6.87	155.9	12.9	
927	0.4	11.20	18.6	5.93	0.126	5.01	166.6	8.80	
932	0.8	11.20	18.6	5.35	1.497	4.35	81.2	4.93	
937	1.20	11.21	18.6	5.35	1.583	3.72	68.1	3.57	
942	1.60	11.21	18.5	5.36	1.549	3.35	69.1	1.99	
947	2.00	11.21	18.6	5.37	1.517	3.07	66.5	1.30	
952	2.40	11.21	18.5	5.36	1.495	2.84	66.2	0.91	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW12-MWF	1000	TCL-VOCs	3 - 40 mL VOA	HCl	
		TPH-GRO	3 - 40 mL VOA	HCl	
		TPH-DRO	2 - 1 L Amber	none	
		TCL-SVOCs	2- 1 L Amber	none	
		Oil & Grease	2- 1 L Amber	HCl	
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (total)	1 - 250 mL Plastic	none	
		Total Cyanide	1 - 250 mL Plastic	NaOH	
		TAL-Metals & Mercury (Dissolved) Field Filtered	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) Field Filtered	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					N
Duplicate					N

Sampled By: WUP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

**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: A3 GW Direct Support  
Well Number: RW13-mwI  
Well Diameter (in): 6  
Depth to Product (ft): NA  
Depth to Water (ft): 11.89  
Product Thickness (ft): NA  
Depth to Bottom (ft): 40.82

Project Number: 190341m-1-1  
Date: 5/21/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 379  
Length of time Purged (min): 25  
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
901	0.0	12.10	16.6	10.12	1.497	8.09	163.3	1.69	
906	0.50	12.18	16.8	10.20	1.501	7.31	143.2	1.12	
911	1.00	12.18	16.6	10.23	1.506	7.13	138.4	0.84	
916	1.50	12.18	16.9	10.23	1.504	6.75	129.6	0.64	
921	2.00	12.18	17.0	10.23	1.504	6.69	127.8	0.72	
926	2.50	12.18	16.9	10.25	1.506	6.57	124.3	0.98	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW13-mw7	930	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	N
Matrix Spike Duplicate					

Sampled By: LUP

Comments: Total + Diss. Zn + Cd  
Alk. + Acid.

**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: A3 6W direct support  
Well Number: RW14-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.13  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.64

Project Number: 180227M-1-1  
Date: 5-20-19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 303  
Length of time Purged (min): 30  
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
1110	0.0	8.50	18.6	5.53	1.780	6.56	148.3	16.7	
1115	0.40	8.87	17.6	5.40	1.530	4.07	153.2	11.4	
1120	0.80	8.88	17.7	5.27	1.585	3.60	156.7	7.61	
1125	1.20	8.88	17.5	5.16	1.617	3.24	161.0	4.56	
1130	1.60	8.88	17.5	5.10	1.618	2.87	164.0	3.62	
1135	2.00	8.88	17.6	5.05	1.622	2.71	165.8	2.15	
1140	2.40	8.88	17.7	5.06	1.615	2.55	165.4	1.85	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW14 - MWS	1150	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					22
Duplicate					

Sampled By: UP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

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: A3 GW direct support  
Well Number: RW15-mwI  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 11.34  
Product Thickness (ft): NA  
Depth to Bottom (ft): 49.45

Project Number: 180227m-1-1  
Date: 5-21-19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 341  
Length of time Purged (min): 40  
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
958	0.0	11.75	17.2	10.47	0.145	6.36	123.2	28.7	
1003	0.45	11.75	17.1	8.30	0.266	3.61	-110.0	36.8	
1008	0.90	11.75	17.2	7.72	0.304	2.91	-125.6	11.6	
1013	1.35	11.75	17.2	7.50	0.317	2.64	-112.6	9.91	
1018	1.80	11.75	17.1	7.31	0.333	2.43	-98.7	7.85	
1023	2.25	11.75	17.1	7.22	0.363	2.29	-87.8	6.32	
1028	2.70	11.75	17.2	7.08	0.425	2.14	-76.0	4.97	
1033	3.15	11.75	17.3	7.01	0.417	2.06	-69.0	4.63	
1038	3.60	11.75	17.3	6.91	0.402	1.98	-58.6	4.19	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW15-mwI	1045	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					N
Duplicate					N

Sampled By: LUP

Comments: total + diss Zn + Cd  
Alk. + Acid

**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: <u>A3 GWS direct supplant</u>	Project Number: <u>180227m-1-1</u>
Well Number: <u>RW15-mws</u>	Date: <u>5/21/19</u>
Well Diameter (in): <u>2</u>	One Well Volume (gal): <u>      </u>
Depth to Product (ft): <u>NA</u>	QED Controller Settings: <u>      </u>
Depth to Water (ft): <u>9.34</u>	Flow Rate (mL/min) <u>303</u>
Product Thickness (ft): <u>NA</u>	Length of time Purged (min) <u>25</u>
Depth to Bottom (ft): <u>20.86</u>	Condition of Pad/Cover: <u>Good/Good</u>

## 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
10591	0.0	9.40	16.6	8.72	0.746	3.20	-105.7	7.15	
1056	0.4	9.41	16.6	8.82	0.792	2.45	-133.4	1.29	
1101	0.8	9.41	16.6	8.80	0.806	2.15	-142.2	0.97	
1106	1.20	9.41	16.7	8.79	0.814	1.96	-147.1	0.80	
1111	1.60	9.41	16.8	8.78	0.813	1.84	-142.1	0.82	
1116	2.00	9.41	16.9	8.78	0.815	1.78	-146.7	0.87	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW15-mws	1125	TCL-VOCs	3 - 40 mL VOA	HCl	
		TPH-GRO	3 - 40 mL VOA	HCl	
		TPH-DRO	2 - 1 L Amber	none	
		TCL-SVOCs	2 - 1 L Amber	none	
		Oil & Grease	2 - 1 L Amber	HCl	
		TAL-Metals & Mercury (total)	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (total)	1 - 250 mL Plastic	none	
		Total Cyanide	1 - 250 mL Plastic	NaOH	
		TAL-Metals & Mercury (Dissolved) Field Filtered	1 - 250 mL Plastic	HNO3	
		Hexavalent Chromium (Dissolved) Field Filtered	1 - 250 mL Plastic	none	
		PCB	2 - 1 L Amber	None	
Matrix Spike					N
Duplicate					N

Sampled By: <u>UP</u>	Comments: <u>total + diss zn + cd</u> <u>Alk. + Acid</u>
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**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)



## Earth Resource Engineers and Consultants

**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

# Low Flow Sampling Permanent Wells



## ARM Group Inc.

Earth Resource Engineers and Consultants

Project Name: A3 tw direct support  
Well Number: RW16-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.21  
Product Thickness (ft): NA  
Depth to Bottom (ft): 22.25

Project Number: 180227m-1-1  
Date: 5/22/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min) 250  
Length of time Purged (min) 30  
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
1408	0.0	8.76	18.1	6.10	1.920	6.26	-134.7	8.14	
1413	0.33	9.13	17.9	11.79	2.087	2.44	-216.7	6.53	
1418	0.66	9.15	17.7	11.82	2.117	2.21	-229.5	5.83	
1423	0.99	9.17	17.9	11.84	2.136	1.90	-242.8	4.01	
1428	1.32	9.18	17.8	11.84	2.142	1.67	-253.3	3.49	
1433	1.65	9.19	17.8	11.84	2.143	1.61	-256.0	2.76	
1438	1.98	9.20	17.8	11.84	2.135	1.52	-260.3	2.47	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW16-mws	1445	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					N
Duplicate					N

Sampled By: WLP

Comments: total + Diss Zn + Cd  
Alk. + Acid.

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: A3 6W Direct Support  
Well Number: RW18-mWI  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 12.17  
Product Thickness (ft): NA  
Depth to Bottom (ft): 33.18

Project Number: 180227m-1-1  
Date: 5/21/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 379  
Length of time Purged (min): 40  
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
1246	0.0	12.38	17.8	5.49	4.789	5.14	13.0	42.4	
1251	0.5	12.38	18.0	5.33	3.860	3.51	34.1	36.1	
1256	1.0	12.37	17.6	5.37	3.330	3.04	33.1	29.0	
1301	1.50	12.38	17.5	5.40	3.070	2.66	32.8	18.16	
1306	2.00	12.38	17.8	5.41	2.875	2.41	34.4	7.88	
1311	2.50	12.38	18.1	5.42	2.749	2.21	35.5	4.32	
1316	3.00	12.38	17.7	5.42	2.601	2.07	35.7	3.62	
1321	3.50	12.38	17.8	5.43	2.550	2.00	36.2	2.49	
1326	4.00	12.38	17.6	5.43	2.494	1.91	37.1	1.90	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW18-mWI	1335	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					N
Duplicate					N

Sampled By: LLP

Comments: Total + Diss Zn + Cd  
Pix. + Acid.

**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: A3 6W Direct Support  
Well Number: RW18-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 7.78  
Product Thickness (ft): NA  
Depth to Bottom (ft): 13.55

Project Number: 180227M-1-1  
Date: 5/21/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 238  
Length of time Purged (min): 45  
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
1347	0.0	7.28	17.6	10.41	0.231	5.34	-172.7	31.9	
1352	0.35	8.33	18.2	11.22	0.474	3.07	-188.1	19.79	
1357	0.70	9.54	18.2	11.22	0.515	2.76	-179.8	7.83	
1402	1.05	10.28	18.2	11.23	0.505	2.34	-155.3	4.23	
1407	1.35	10.86	18.0	11.19	0.490	2.13	-141.2	2.50	
1412	1.65	11.07	18.1	11.26	0.536	1.93	-130.4	2.01	
1417	1.95	11.30	18.1	11.30	0.570	1.82	-131.0	1.16	
1422	2.25	11.64	19.1	11.95	0.683	1.71	-126.4	1.23	
1427	2.55	11.87	19.0	11.52	0.670	1.68	-117.9	1.54	
1432	2.85	12.00	19.0	11.54	0.657	1.63	-110.1	1.93	

### MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW18-mws	1440	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					N
Duplicate					N

Sampled By: LCP

Comments:

total + diss. zn + cd  
Alk. + Acid.

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: R3 GW Direct Support  
Well Number: RW019-MWI  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 12.55  
Product Thickness (ft): NA  
Depth to Bottom (ft): 43.85

Project Number: 180227M-1-1  
Date: 5/29/19  
One Well Volume (gal): —  
QED Controller Settings: —  
Flow Rate (mL/min): 379  
Length of time Purged (min): 25  
Condition of Pad/Cover: None / Good 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
1410	0.0	12.88	21.5	5.28	6.50	3.63	54.3	10.48	
1415	0.5	13.00	21.6	5.24	6.578	2.95	55.7	10.69	
1420	1.0	13.02	21.3	5.23	7.133	2.61	56.6	10.16	
1425	1.5	13.02	21.4	5.23	7.312	2.41	57.1	9.37	
1430	2.0	13.02	21.2	5.23	7.086	2.24	57.5	8.62	
1435	2.5	13.02	21.4	5.23	6.893	2.15	58.1	7.91	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW19-MWT	1440	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: LEP

Comments:

total + Diss Zn + Cd  
MIL + Acid

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: A3 EW Direct Support  
Well Number: RW19-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 8.51  
Product Thickness (ft): NA  
Depth to Bottom (ft): 24.32

Project Number: 150227M-17  
Date: 5/29/19  
One Well Volume (gal):         
QED Controller Settings:         
Flow Rate (mL/min): 379  
Length of time Purged (min): 25  
Condition of Pad/Cover: Good / Good

## PURGING RECORD

None

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
1443	0.0	9.40	21.2	7.13	2.897	3.11	-65.9	12.3	
1448	0.5	9.53	20.9	7.34	2.823	2.39	-97.8	9.80	
1453	1.00	9.60	21.0	7.37	2.830	2.17	-106.4	7.03	
1458	1.50	9.62	20.9	7.39	2.806	1.98	-111.1	5.99	
1503	2.00	9.62	20.7	7.39	2.810	1.90	-113.2	5.41	
1508	2.50	9.62	20.4	7.38	2.793	1.86	-114.7	5.01	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW19-mws	1515	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					N
Duplicate					N

Sampled By: CUP

Comments: total + Diss 2m + cd  
AIK + Acid

**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: A3 GW Direct Support  
Well Number: RW21-mws  
Well Diameter (in): 2  
Depth to Product (ft): NA  
Depth to Water (ft): 12.18  
Product Thickness (ft): NA  
Depth to Bottom (ft): 31.24

Project Number: 180227m-1-1  
Date: 6/7/19  
One Well Volume (gal):       
QED Controller Settings:       
Flow Rate (mL/min): 331  
Length of time Purged (min): 60  
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
915	0.0	12.22	16.9	5.95	3.202	4.98	-15.3	50.7	
920	0.35	12.78	16.9	5.92	3.092	4.10	-16.7	57.5	
925	0.70	13.10	16.9	5.93	2.963	3.59	-18.7	54.5	
930	1.15	13.19	16.5	5.95	2.780	3.17	-20.8	47.3	
935	1.60	13.37	16.4	5.97	2.482	2.99	-144.3	24.7	
940	2.10	13.37	16.6	5.97	2.608	2.74	-36.4	76.8	
945	2.60	13.38	16.5	6.17	2.430	2.55	-71.4	110.0	
950	3.00	13.38	16.6	5.98	2.441	2.43	-35.1	51.4	
955	3.45	13.38	16.8	5.97	2.412	2.32	-32.4	52.5	
1000	3.90	13.27	16.8	5.97	2.351	2.18	-32.8	36.6	
1005	4.35	13.27	16.9	5.97	2.333	2.13	-32.4	28.4	
1010	4.80	13.26	16.9	5.97	2.280	2.03	-31.9	19.4	
1015	5.25	13.26	16.9	5.97	2.259	2.00	-33.6	15.3	

## MONITORING SAMPLE RECORD

Sample ID	Time Collected	Parameter/Order	Container	Perservative	Collected?
RW21-mws	1030	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					N
Duplicate					N

Sampled By: CLP

Comments: total + Diss Zn + Cd  
Alk + Acid

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)

## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/31/19

Technician: L. Perrin

Handheld Serial Number: new

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 22.7 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.00 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 112.3

Reading in calibration solution after calibration is completed: 100.7

Conductivity Cell Constant in GLP\* record after calibration: ✓

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 765.7

Actual Reading before DO% calibration is accepted: 1.423

Reading in DO% calibration environment after calibration is completed: 1.413

ODO gain in GLP record after calibration: ✓ Acceptable range is **0.75 to 1.50**

### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	<u>7.00</u>	<u>7.07</u>	<u>-33.7</u>	-50 mV to 50 mV
4	<u>4.00</u>	<u>3.37</u>	<u>-144.5</u>	+165 to +180 from pH 7 buffer mV value
10	<u>10.00</u>	<u><del>10.00</del> 10.10</u>	<u>-198.9</u>	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM

Calibrate pH

Calibration value 110.0

Accept Calibration

Finish Calibration

Press ESC to Abort

Last Calibrated

01/20/17 00:00:00

Actual Reading

22.8 Ref 10

-198.0 pH mV

10.10 pH

Post Cal Value

10.03 pH

pH

10.8

10.2

9.8

191

Ready for cal point

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 237.0

Reading in calibration solution after calibration is completed: 240.0

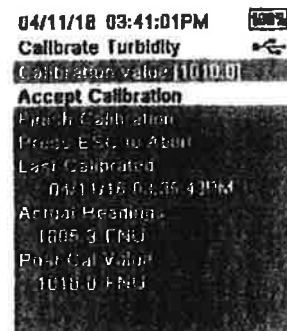
ORP Cal Offset in GLP record after calibration:            Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without adding a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/7/19

Technician: L. Perron

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 20.2 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.001 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 1.489

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 766.0

Actual Reading before DO% calibration is accepted: 98.6

Reading in DO% calibration environment after calibration is completed: 100.8

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	<u>7.00</u>	<u>7.08</u>	<u>-27.3</u>	-50 mV to 50 mV
4	<u>4.00</u>	<u>3.82</u>	<u>147.9</u>	+165 to +180 from pH 7 buffer mV value
10	<u>10.00</u>	<u>9.466</u>	<u>-191.4</u>	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: / Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:30  
Calibrate pH  
Calibration value  
Accept Calibration  
Fresh Calibration  
Fresh H2O to 5.00  
Last Calibrated  
01/10/17 00:00  
Actual Reading  
102.5 pH  
100.0 pH mV  
10.10 pH  
Post Cal Value  
10.03 pH  
10.8  
10.2  
9.8  
101

# When the Environment Demands It

## ORP

Actual Reading in solution before calibration is accepted: 243.8

Reading in calibration solution after calibration is completed: 290.0

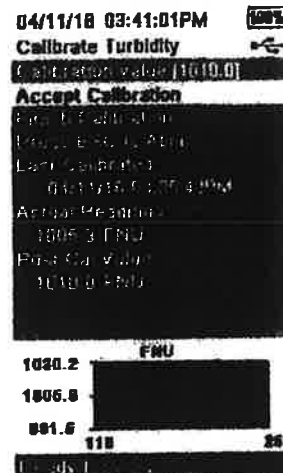
ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

## Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



## Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

## Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

## Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

## Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without adding a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

Tel +1 937.767.7241  
800.897.4151 (US)  
info@ysi.com YSI.com



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## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/8/19

Technician: L. Ferrin

Handheld Serial Number: NEW

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 20.1 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.000 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 1.283

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 766.2

Actual Reading before DO% calibration is accepted: 105.3

Reading in DO% calibration environment after calibration is completed: 100.8

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

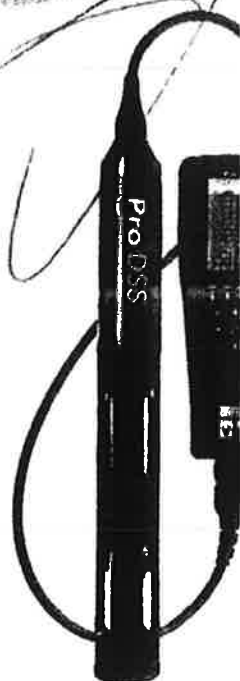
### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.15	-29.1	-50 mV to 50 mV
4	4.00	3.99	142.7	+165 to +180 from pH 7 buffer mV value
10	10.00	9.94	-187.3	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: / Acceptable range is **~ 55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM

Calibrate pH

Calibration value 10.00

Accept Calibration

Finish Calibration

Press ESC to Abort

Last Calibrated

01/01/20 00:00:00

Actual Reading

22.8 Ref 10

-193.0 pH mV

10.10 pH

Post Cal Value

10.03 pH

pH

10.6

10.2

9.8

131

Ready for calibration



## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 238.5

Reading in calibration solution after calibration is completed: 240.0

ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.

04/11/18 03:41:01PM

Calibrate Turbidity

Calibration value (10.10.0)

Accept Calibration

Fourth Calibration

Probe E51, to Abert

Last Calibrated

04/11/18 03:35:43PM

Actual Reading:

1005.3 FNU

Post Cal value

1010.0 FNU

### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

FNU

1030.2

1005.3

981.6

11B 269

Ready for calibration

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/9/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 21.3 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.001 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 1.388

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 766.7

Actual Reading before DO% calibration is accepted: 105.1

Reading in DO% calibration environment after calibration is completed: 101.0

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.15	-30.3	-50 mV to 50 mV
4	4.00	4.396	140.3	+165 to +180 from pH 7 buffer mV value
10	10.00	9.96	-197.2	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.

04/11/16 03:22:39

Calibrate pH

Calibration value

Accept Calibration

Finish Calibration

Press F3 to Abort

Last Calibrated

000100 00 00

Actual Reading

105.1 pH mV

105.1 pH mV

10.13 pH

Post Cal Value

10.03 pH

10.5

10.2

9.9

181

0.00

# When the Environment Demands It

## ORP

Actual Reading in solution before calibration is accepted: 238.1

Reading in calibration solution after calibration is completed: 240.0

ORP Cal Offset in GLP record after calibration:            Acceptable range is **-100 to 50**

## Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



## Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

## Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

## Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

## Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without adding a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

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**Calibration Date** 5/10/19

**Technician:** L. Perrin

**Handheld Serial Number:** new

**Handheld Software Version:** \_\_\_\_\_

**Cable Serial Number:** \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 21.1 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.002 Acceptable value is less than 1  $\mu\text{S/cm}$

Actual Reading in solution before calibration is accepted: 1.414

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 763.0

Actual Reading before DO% calibration is accepted: 97.2

Reading in DO% calibration environment after calibration is completed: 100.4

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.12	29.8	-50 mV to 50 mV
4	4.00	3.93	143.9	+165 to +180 from pH 7 buffer mV value
10	10.00	9.91	-189.7	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60** pH/mV  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:36  
Calibrate pH  
Calibration value  
Accept Calibration  
Fresh Calibration  
ProDSS 626902, 626902  
Last Calibrated  
04/11/18 03:00:00  
Actual Reading  
100.4 pH mV  
100.4 pH mV  
10.00 pH  
Post Cal Value  
10.03 pH  
10.6  
10.2  
9.8  
101

# When the Environment Demands It

## ORP

Actual Reading in solution before calibration is accepted: 238.2

Reading in calibration solution after calibration is completed: 240.0

ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

## Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



## Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

## Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

## Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

## Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without adding a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

# When the Environment Changes

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Calibration Date 5/13/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

## Temperature

Reading when sensor is dry and in room temp air: 19.9 Accurate? ☒ Y ☐ N

## Conductivity

Reading when sensor is dry and in room temp air: 0.003 Acceptable value is less than 1  $\mu$ S/cm

Actual Reading in solution before calibration is accepted: 1.413

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

## Optical Dissolved Oxygen

Barometric pressure: 157.9

Actual Reading before DO% calibration is accepted: 98.0

Reading in DO% calibration environment after calibration is completed: 99.7

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

## pH

		Actual Readings during calibration		
Buffer	Calibration Value	pH	pH mV**	Acceptable pH mV in buffer
7	7.00	7.02	-30.8	-50 mV to 50 mV
4	4.00	3.50	148.7	+165 to +180 from pH 7 buffer mV value
10	10.00	10.10	-198.7	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.

04/11/16 03:22:38

Calibrate pH

Calibration value

Accept Calibration

Final Calibration

From 7.00 to 4.00

Last Calibration

03/07/16 00:00

Actual Reading

22.8 Rel To

195.0 pH mV

10.48 pH

Rel Cal Value

10.03 pH

10.6

10.2

9.8

191

10.48 pH



# When the Environment Demands It

## ORP

Actual Reading in solution before calibration is accepted: 244.8  
 Reading in calibration solution after calibration is completed: 240.0

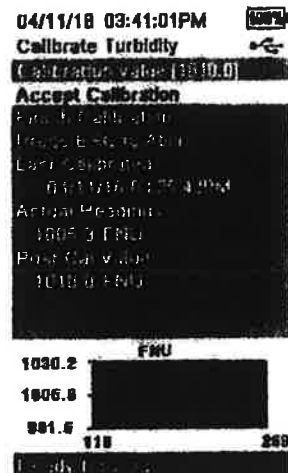
ORP Cal Offset in GLP record after calibration: 4.8 Acceptable range is **-100 to 50**

## Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



## Depth (Completed in Air)

Actual Reading before calibration is accepted: 1030.2  
 Reading in air after calibration is completed: 1006.8

## Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

## Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

## Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without adding a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

Tel +1 937.767.7241  
 800.897.4151 (US)  
 info@ysi.com YSI.com



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## When the Environment Changes

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Calibration Date 5/14/19

Technician: L. Perrin

Handheld Serial Number: new

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 19.9 Accurate? ☒ Y ☐ N

**Conductivity**

Reading when sensor is dry and in room temp air: 0.002 Acceptable value is less than 1  $\mu\text{S/cm}$

Actual Reading in solution before calibration is accepted: ~~100.401.04~~ 1.413

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 758.5

Actual Reading before DO% calibration is accepted: 101.1

Reading in DO% calibration environment after calibration is completed: 99.8

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.14	-32.6	-50 mV to 50 mV
4	4.00	3.99	142.4	+165 to +180 from pH 7 buffer mV value
10	10.00	10.08	-198.8	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: / Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM  
 Calibrate pH  
 Calibration value 10.0  
 Accept Calibration  
 Finish Calibration  
 Press ESC to Abort  
 Last Calibrated  
 01/01/70 00:00:00A  
 Actual Readings  
 22.8 Ref °C  
 -199.0 pH mV  
 10.40 pH  
 Post Cal Value  
 10.03 pH

pH  
 10.5  
 10.2  
 9.8  
 101

Primary Internal pH Buffer

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 237.2

Reading in calibration solution after calibration is completed: 240.0

ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/15/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 19.2 Accurate? ☒ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.002 Acceptable value is less than 1  $\mu\text{S}/\text{cm}$

Actual Reading in solution before calibration is accepted: 1.396

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 761.2

Actual Reading before DO% calibration is accepted: 100.2

Reading in DO% calibration environment after calibration is completed: 100.2

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

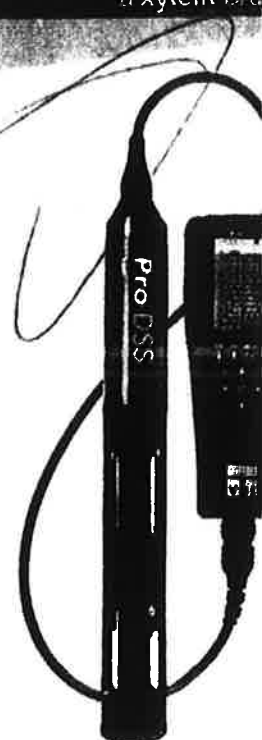
### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.30	-30.5	-50 mV to 50 mV
4	4.00	3.79	146.5	+165 to +180 from pH 7 buffer mV value
10	10.00	10.50	-149.8	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:38PM  
Calibrate pH  
Calibration value (10.0  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
0120:770 00 00:00A  
Actual Readings:  
22.8 Rel TC  
-129.0 pH mV  
10.10 pH  
Post Cal Value  
10.03 pH  
pH  
10.6  
10.2  
9.8  
131  
Ready for cal point 3

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 240.6

Reading in calibration solution after calibration is completed: 240.0

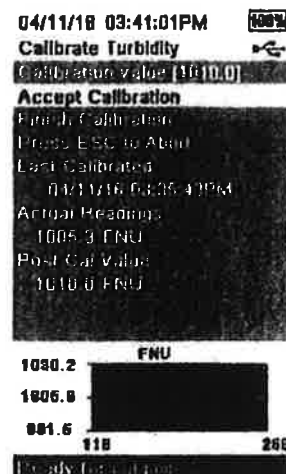
ORP Cal Offset in GLP record after calibration:            Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/16/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 21.6 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.002 Acceptable value is less than 1  $\mu\text{S/cm}$

Actual Reading in solution before calibration is accepted: 1.459

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5** to **6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4** to **6.4**

### Optical Dissolved Oxygen

Barometric pressure: 760.8

Actual Reading before DO% calibration is accepted: 102.3

Reading in DO% calibration environment after calibration is completed: 100.1

ODO gain in GLP record after calibration: / Acceptable range is **0.75** to **1.50**

### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.40	-29.3	-50 mV to 50 mV
4	4.00	3.84	146.4	+165 to +180 from pH 7 buffer mV value
10	10.00	10.40	-201.1	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55** to **60** pH/mV  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM

Calibrate pH

Calibration value 110.0

Accept Calibration

Finish Calibration

Press ESC to Abort

Last Calibrated

01/01/70 00:00:00A

Actual Reading

22.8 Ref °S

195.0 pH mV

10.40 pH

Post-Cal Value

10.03 pH

pH

10.6

10.2

9.8

181

Energy for calibration



## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 236.4

Reading in calibration solution after calibration is completed: 240.0

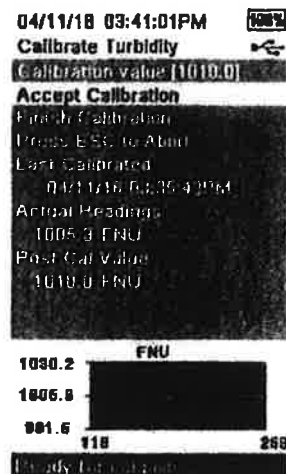
ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

Tel +1 937.767.7241  
800.897.4151 (US)  
info@ysi.com YSI.com



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## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/17/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 21.3 Accurate? ☒ Y ☐ N

**Conductivity**

Reading when sensor is dry and in room temp air: 0.003 Acceptable value is less than 1  $\mu$ S/cm

Actual Reading in solution before calibration is accepted: 1.397-1.505

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 758.0

Actual Reading before DO% calibration is accepted: 99.7

Reading in DO% calibration environment after calibration is completed: 99.7

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

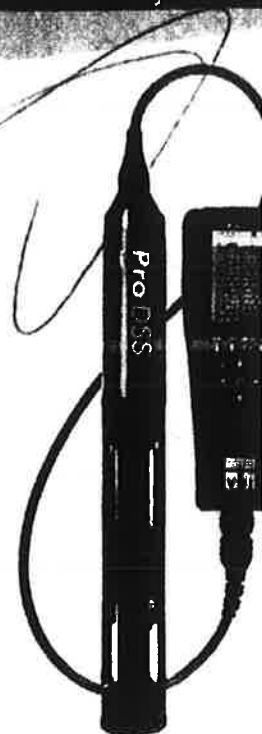
**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.22	-31.8	-50 mV to 50 mV
4	4.00	4.00	142.8	+165 to +180 from pH 7 buffer mV value
10	10.00	9.98	-191.6	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM  
Calibrate pH  
Calibration value (10.0)  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01/01/70 00:00:00A  
Actual Readings  
22.8 Rel 10  
-199.0 pH mV  
10.10 pH  
Last Cal Value  
10.03 pH

pH  
10.6  
10.2  
9.8  
121

Do not forget to print!

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 242.0

Reading in calibration solution after calibration is completed: 240.0

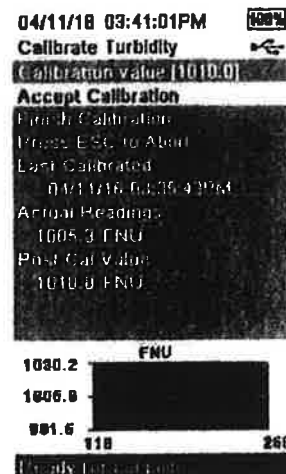
ORP Cal Offset in GLP record after calibration: 2.0 Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the *YSI Solution Expiration Dates* document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date

5/20/19

Technician:

L. Perrin

Handheld Serial Number:

New

Handheld Software Version:

Cable Serial Number:

**Temperature**

Reading when sensor is dry and in room temp air:

19.6

Accurate?

Y

N

**Conductivity**

Reading when sensor is dry and in room temp air:

0.005

Acceptable value is less than 1  $\mu\text{S}/\text{cm}$ 

Actual Reading in solution before calibration is accepted:

1.251

Reading in calibration solution after calibration is completed:

1.413

Conductivity Cell Constant in GLP\* record after calibration:

Acceptable range for ProDSS conductivity/temperature sensors (626902) is 4.5 to 6.5

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is 4.4 to 6.4

**Optical Dissolved Oxygen**

Barometric pressure:

759.1

Actual Reading before DO% calibration is accepted:

102.1

Reading in DO% calibration environment after calibration is completed:

99.9

ODO gain in GLP record after calibration:

Acceptable range is 0.75 to 1.50

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.19	-37.0	-50 mV to 50 mV
4	4.00	3.96	140.9	+165 to +180 from pH 7 buffer mV value
10	10.00	9.95	-193.2	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration:

Acceptable range is ~ 55 to 60 pH/mV  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM

Calibrate pH

Calibration value (10.0)

Accept Calibration

Finish Calibration

Press ESC to Abort

Last Calibrated

01/01/70 60.0000A

Actual Readings

22.8 Ref TC

-199.0 pH mV

10.10 pH

Post Cal Value

10.03 pH

pH

10.6

10.2

9.8

131

Ready for output 3

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 240.3

Reading in calibration solution after calibration is completed: 240.0

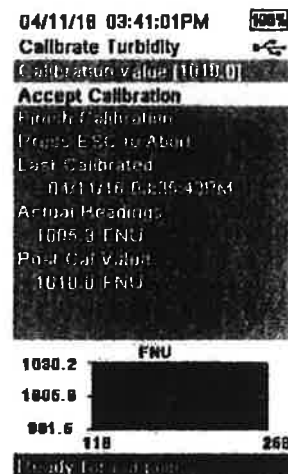
ORP Cal Offset in GLP record after calibration:        Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:       

Reading in air after calibration is completed:       

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/21/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 20.6 Accurate? ☒ Y ☐ N

**Conductivity**

Reading when sensor is dry and in room temp air: 0.000 Acceptable value is less than 1  $\mu\text{S}/\text{cm}$

Actual Reading in solution before calibration is accepted: 1.383

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 7462.2

Actual Reading before DO% calibration is accepted: 101.5

Reading in DO% calibration environment after calibration is completed: 100.3

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.16	-33.9	-50 mV to 50 mV
4	4.00	3.90	142.3	+165 to +180 from pH 7 buffer mV value
10	10.00	9.93	-201.7	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file. This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:38PM  
Calibrate pH  
Calibration value (10.0)  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01/01/70 00:00:00A  
Actual Readings  
22.8 Ref 10  
-199.0 pH mV  
10.40 pH  
Post Cal Value  
10.03 pH  
pH  
10.6  
10.2  
9.8  
191  
Display format set to 3



## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 238.4

Reading in calibration solution after calibration is completed: 240.0

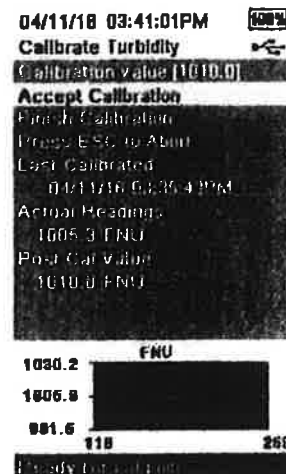
ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment Demands It

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Calibration Date 5/22/19

Technician: L. Perin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 21.1 Accurate? ☒ Y ☐ N

**Conductivity**

Reading when sensor is dry and in room temp air: 0.004 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 1.577

Reading in calibration solution after calibration is completed: 1.913

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 768.8

Actual Reading before DO% calibration is accepted: 101.5

Reading in DO% calibration environment after calibration is completed: 101.2

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.11	-30.4	-50 mV to 50 mV
4	4.00	3.93	142.1	+165 to +180 from pH 7 buffer mV value
10	10.00	9.88	203.2	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM  
Calibrate pH  
Calibration value 10.0  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01/01/77 00:00:00A  
Actual Readings  
22.8 Rel 10  
199.0 pH mV  
10.40 pH  
Post Cal Value  
10.03 pH  
pH  
10.6  
10.2  
9.8  
181  
Ready for calibration

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 241.4

Reading in calibration solution after calibration is completed: 240.0

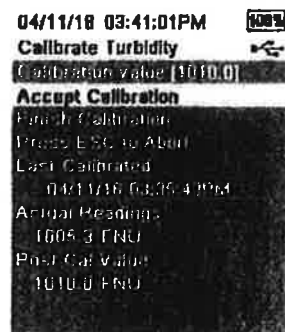
ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: ✓

Reading in air after calibration is completed: ✓

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/23/19

Technician: L. Perron

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 0.004 Accurate? ☒ Y ☐ N

**Conductivity**

Reading when sensor is dry and in room temp air: 21.2 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 1.409

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 766.5

Actual Reading before DO% calibration is accepted: 101.8

Reading in DO% calibration environment after calibration is completed: 100.8

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.25	-36.5	-50 mV to 50 mV
4	4.00	4.00	138.8	+165 to +180 from pH 7 buffer mV value
10	10.00	9.94	-199.2	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:38PM  
Calibrate pH  
Calibration value (10.0)  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01/01/70 00:00:00A  
Actual Readings  
22.8 Ref TC  
199.0 pH mV  
10.40 pH  
Post Cal Value  
10.03 pH  
pH  
10.6  
10.2  
9.8  
131  
Ready for use (pH 7)

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 235.8

Reading in calibration solution after calibration is completed: 240.0

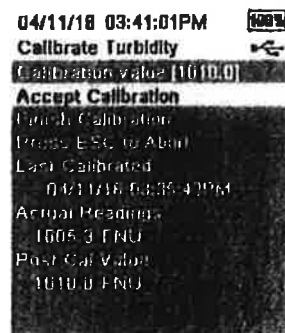
ORP Cal Offset in GLP record after calibration: 4.2 Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/24/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 21.9

Accurate? ☒ Y ☐ N

**Conductivity**

Reading when sensor is dry and in room temp air: 28.9

Acceptable value is less than 1  $\mu\text{S}/\text{cm}$

Actual Reading in solution before calibration is accepted: 1.390

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 761.9

Actual Reading before DO% calibration is accepted: 98.9

Reading in DO% calibration environment after calibration is completed: 100.3

ODO gain in GLP record after calibration: /

Acceptable range is **0.75 to 1.50**

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.17	-35.7	-50 mV to 50 mV
4	4.00	3.94	138.1	+165 to +180 from pH 7 buffer mV value
10	10.00	9.94	-200.8	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_

Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:38PM

Calibrate pH

Calibration value (10.0)

Accept Calibration

Finish Calibration

Press ESC to Abort

Last Calibrated

01/01/70 00:00:00A

Actual Readings

22.8 Ref 10

-199.0 pH mV

10.40 pH

Post Cal Value

10.03 pH

10.8

10.2

9.8

131

For only for cal point 3



## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 240.2

Reading in calibration solution after calibration is completed: 240.0

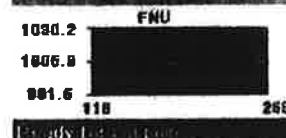
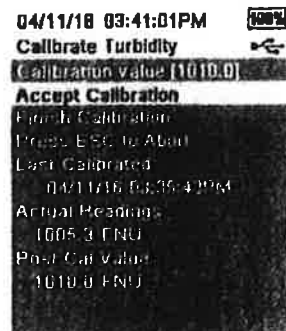
ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment is Controlled

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the *YSI Solution Expiration Dates* document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/20/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 21.0 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.001 Acceptable value is less than 1  $\mu\text{S}/\text{cm}$

Actual Reading in solution before calibration is accepted: 98.9

Reading in calibration solution after calibration is completed: 99.8

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5** to **6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4** to **6.4**

### Optical Dissolved Oxygen

Barometric pressure: 758.4

Actual Reading before DO% calibration is accepted: 1.247

Reading in DO% calibration environment after calibration is completed: 1.413

ODO gain in GLP record after calibration: / Acceptable range is **0.75** to **1.50**

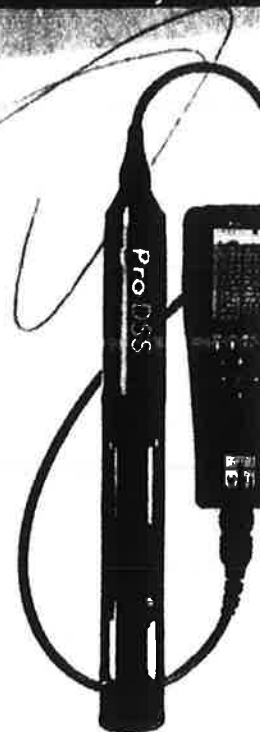
### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.16	-35.5	-50 mV to 50 mV
4	4.00	3.91	139.3	+165 to +180 from pH 7 buffer mV value
10	10.00	9.88	-200.7	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: 10.01 Acceptable range is ~ **55** to **60** pH/mV  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM  
Calibrate pH  
Calibration value 10.0  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01201770 00-00-00A  
Actual Reading  
22.8 ReC °C  
-199.0 pH mV  
10.10 pH  
Post Cal Value  
10.03 pH  
pH  
10.6  
10.2  
9.8  
181  
Ready for calibration

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 240.1

Reading in calibration solution after calibration is completed: 240.0

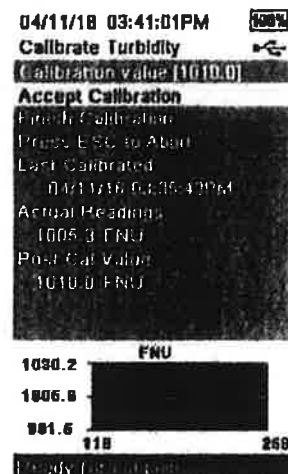
ORP Cal Offset in GLP record after calibration:            Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment Changes

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/29/09

Technician: L. Perron

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

### Temperature

Reading when sensor is dry and in room temp air: 20.0 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.004 Acceptable value is less than 1  $\mu$ S/cm

Actual Reading in solution before calibration is accepted: 1.596

Reading in calibration solution after calibration is completed: 1.913

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 756.0

Actual Reading before DO% calibration is accepted: 96.9

Reading in DO% calibration environment after calibration is completed: 99.5

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.16	-37.1	-50 mV to 50 mV
4	4.00	3.94	139.6	+165 to +180 from pH 7 buffer mV value
10	10.00	9.85	-210.8	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:39PM

Calibrate pH

Calibration value [10.0]

Accept Calibration

Finish Calibration

Press ESC to Abort

Last Calibrated

01/10/17 00:00:00A

Actual Readings

22.8 Ref °C

128.0 pH mV

10.40 pH

Post Cal Value

10.03 pH

10.6

10.2

9.8

131

Ready for calibration

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 240.5

Reading in calibration solution after calibration is completed: 240.0

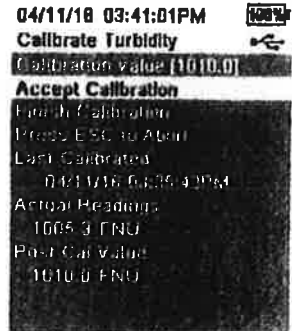
ORP Cal Offset in GLP record after calibration: ✓ Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted: \_\_\_\_\_

Reading in air after calibration is completed: \_\_\_\_\_

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the *YSI Solution Expiration Dates* document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/30/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: 17E102519

### Temperature

Reading when sensor is dry and in room temp air: 24.9 Accurate? ☒ Y ☐ N

### Conductivity

Reading when sensor is dry and in room temp air: 0.002 Acceptable value is less than **1  $\mu$ S/cm**

Actual Reading in solution before calibration is accepted: 1.439

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5 to 6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4 to 6.4**

### Optical Dissolved Oxygen

Barometric pressure: 30.568

Actual Reading before DO% calibration is accepted: 99.9

Reading in DO% calibration environment after calibration is completed: 99.6

ODO gain in GLP record after calibration: / Acceptable range is **0.75 to 1.50**

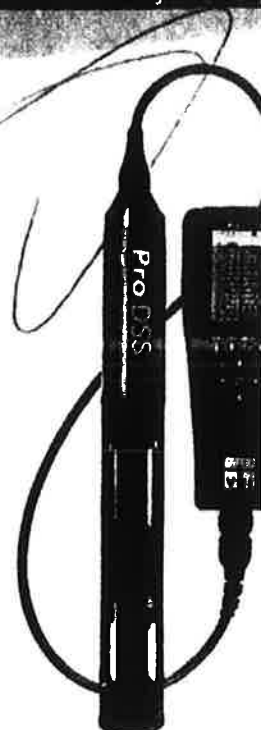
### pH

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.18	<del>37.1</del> -36.3	-50 mV to 50 mV
4	4.00	4.00	137.4	+165 to +180 from pH 7 buffer mV value
10	10.00	9.87	-212.4	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55 to 60 pH/mV**  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM  
Calibrate pH  
Calibration value 10.0  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01/01/70 00:00:00A  
Actual Readings  
22.8 Ref 70  
-199.0 pH mV  
10.40 pH  
Post Cal Value  
10.03 pH  
pH  
10.5  
10.2  
9.8  
131  
Press Esc at any time



## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 231.1

Reading in calibration solution after calibration is completed: 240.0

ORP Cal Offset in GLP record after calibration:            Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

Tel +1 937.767.7241  
800.897.4151 (US)  
info@ysi.com YSI.com



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## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date 5/31/19

Technician: L. Perrin

Handheld Serial Number: New

Handheld Software Version: \_\_\_\_\_

Cable Serial Number: \_\_\_\_\_

**Temperature**

Reading when sensor is dry and in room temp air: 18.5 Accurate? Y N

**Conductivity**

Reading when sensor is dry and in room temp air: 0.003 Acceptable value is less than 1  $\mu\text{S}/\text{cm}$

Actual Reading in solution before calibration is accepted: 1.405

Reading in calibration solution after calibration is completed: 1.413

Conductivity Cell Constant in GLP\* record after calibration: /

Acceptable range for ProDSS conductivity/temperature sensors (626902) is **4.5** to **6.5**

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is **4.4** to **6.4**

**Optical Dissolved Oxygen**

Barometric pressure: 757.5

Actual Reading before DO% calibration is accepted: 98.9

Reading in DO% calibration environment after calibration is completed: 99.7

ODO gain in GLP record after calibration: / Acceptable range is **0.75** to **1.50**

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	<u>7.00</u>	<u>7.19</u>	<u>-36.8</u>	-50 mV to 50 mV
4	<u>4.00</u>	<u>3.90</u>	<u>136.3</u>	+165 to +180 from pH 7 buffer mV value
10	<u>10.00</u>	<u>9.95</u>	<u>-212.1</u>	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration: \_\_\_\_\_ Acceptable range is ~ **55** to **60** pH/mV  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/16 03:22:38PM  
Calibrate pH  
Calibration value 10.0  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01/01/70 00:00:00A  
Actual Readings  
22.8 Ref 10  
-199.0 pH mV  
10.40 pH  
Post Cal Value  
10.03 pH  
pH  
10.6  
10.2  
9.8  
131  
Ready for use at pH 7

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted:

248.4

Reading in calibration solution after calibration is completed:

240.0

ORP Cal Offset in GLP record after calibration:

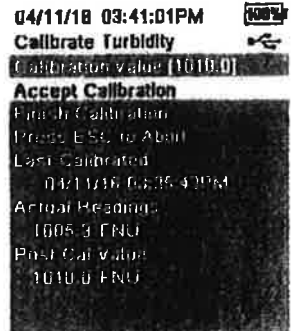
Acceptable range is -100 to 50

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is -10 to 10 FNU

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:

Reading in air after calibration is completed:

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.



## When the Environment Demands It

This calibration worksheet can help document your calibration and track the performance of your sensors. Please follow the detailed calibration procedures in the ProDSS manual or your facility's standard operating procedure (SOP) to ensure all calibrations are as accurate and as consistent as possible.

Refer to the YSI Solution Expiration Dates document to ensure your calibration solutions are fresh. In addition to using fresh standards, never accept an out-of-range or questionable calibration results.

Calibration Date

6/7/19

Technician:

L. Perrin

Handheld Serial Number:

New

Handheld Software Version:

Cable Serial Number:

**Temperature**

Reading when sensor is dry and in room temp air:

17.9

Accurate?

☒ Y ☐ N**Conductivity**Reading when sensor is dry and in room temp air: 0.002 Acceptable value is less than 1  $\mu\text{S}/\text{cm}$ 

Actual Reading in solution before calibration is accepted:

1.404

Reading in calibration solution after calibration is completed:

1.413

Conductivity Cell Constant in GLP\* record after calibration:

Acceptable range for ProDSS conductivity/temperature sensors (626902) is 4.5 to 6.5

Acceptable range for integral (i.e. built-in) sensors on ODO/CT assemblies is 4.4 to 6.4

**Optical Dissolved Oxygen**

Barometric pressure:

759.5

Actual Reading before DO% calibration is accepted:

102.5

Reading in DO% calibration environment after calibration is completed:

99.9

ODO gain in GLP record after calibration:

Acceptable range is 0.75 to 1.50

**pH**

Buffer	Calibration Value	Actual Readings during calibration		Acceptable pH mV in buffer
		pH	pH mV**	
7	7.00	7.15	-34.3	-50 mV to 50 mV
4	4.00	3.84	140.5	+165 to +180 from pH 7 buffer mV value
10	10.00	10.00	-201.3	-165 to -180 from pH 7 buffer mV value

pH slope in GLP record after calibration:

Acceptable range is ~ 55 to 60 pH/mV  
(Ideal is 59.16 mV/pH)

\*GLP stands for Good Laboratory Practice file This calibration record contains important information about the calibration result.

\*\*The pH mV at the time of calibration (Sensor Value) can also be seen in the final pH GLP record.



04/11/18 03:22:38PM  
Calibrate pH  
Calibration value (10.0)  
Accept Calibration  
Finish Calibration  
Press ESC to Abort  
Last Calibrated  
01201770 00:00:00A  
Actual Readings  
22.8 Ref °C  
-198.0 pH mV  
10.10 pH  
Post Cal Value  
10.03 pH

pH  
10.8  
10.2  
9.8  
181

Factory for calibration

## When the Environment Demands It

### ORP

Actual Reading in solution before calibration is accepted: 240.9

Reading in calibration solution after calibration is completed: 240.0

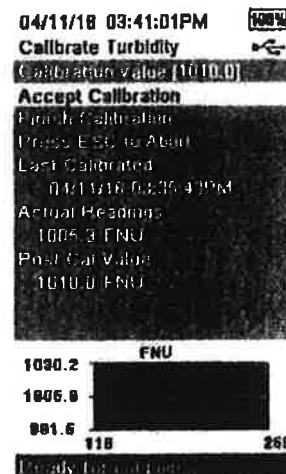
ORP Cal Offset in GLP record after calibration:            Acceptable range is **-100 to 50**

### Turbidity

Calibration value (FNU)*	Actual Reading during calibration
0	
12.4*	
124*	
1010	

Acceptable range for **Actual Reading** during calibration of the first point is **-10 to 10 FNU**

**\*Note:** The turbidity sensor can be calibrated to 3 points. Either 12.4 or 124 FNU standard can be used for the second point, but not both. Other calibration values can be used when calibrating.



### Depth (Completed in Air)

Actual Reading before calibration is accepted:           

Reading in air after calibration is completed:           

### Ammonium

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			-20 mV to 20 mV
2nd point: 100 mg/L			+90 to +130 from mV value in 1 mg/L standard

### Nitrate

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 1 mg/L			180 mV to 220 mV
2nd point: 100 mg/L			-90 to -130 from mV value in 1 mg/L standard

### Chloride

Concentration** (i.e. Calibration Value)	Actual Readings during calibration		Acceptable mV when the sensor is new
	mg/L	mV***	
1st point: 10 mg/L			205 mV to 245 mV
2nd point: 1,000 mg/L			-80 to -130 from mV value in 10 mg/L standard

\*\*Other standard concentrations can be used. A 2 point calibration without chilling a third calibration solution is extremely accurate and is the preferred method. However, if there is a large temperature variation during sampling, a chilled third calibration point is recommended.

\*\*\*The mV at the time of calibration (Sensor Value) for each point can also be seen in the GLP record after a calibration is complete.

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## **APPENDIX E**

### **Pore Water Sampling Photograph Log**

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Pore Water Sampling  
Rod and Wire Mill Area  
Sparrows Point, Maryland



Photo 1: View of RW-013-PW-1 after attempting a 9 inch sample in the Rod and Wire Mill area.  
Black mud can be observed on the screen filter.



Photo 2: View of RW-023-PW after attempting both a 9 inch and 3 foot sample in the Rod and Wire Mill area.

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## **APPENDIX F**

### **QA/QC Tracking Log**

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## QA/QC Tracking Log

Trip  
Blank:

<u>Date:</u>	<u>Sample IDs</u>	
5/3/2019	1) RW23-MWI	
	2) RW23-MWS	
	3) RWM-MWI	
	4) RWM-MWS	
	5) RWN-MWS	
5/7/2019	6) RWJ-MWI	
	7) RWJ-MWS	<u>Duplicate:</u> RWJ-MWS
	8) RWK-MWI	<u>Date:</u> 5/7/2019
	9) RWK-MWS	<u>MS/MSD:</u> RWK-MWS
	10) RWL-MWS	<u>Date:</u> 5/7/2019
5/8/2019	11) RWL-MWI	<u>Field Blank:</u>
	12) RW24-MWI	<u>Date:</u> 5/9/2019
	13) RW24-MWS	<u>Eq. Blank:</u> -
	14) RW25-MWI	<u>Date:</u> -
	15) RW25-MWS	
5/9/2019	16) RWI-MWI	
	17) RWI-MWS	
	18) RWH-MWI	
	19) RWH-MWS	
	20) RW21-MWI	

5/10/2019	1) RWR-MWI	
	2) RWR-MWS	
	3) RWO-MWI	
	4) RWO-MWS	
	5) RWG-MWI	
5/13/2019	6) RWG-MWS	
	7) RW05R-MWI	<u>Duplicate:</u> RWR-MWS
	8) RWE-MWI	<u>Date:</u> 5/10/2019
	9) RWE-MWS	<u>MS/MSD:</u> RWO-MWI
	10) RWD-MWI	<u>Date:</u> 5/10/2019
5/14/2019	11) RWD-MWS	<u>Field Blank:</u>
	12) RW22R-MWI	<u>Date:</u> 5/14/2019
	13) RWB-MWI	<u>Eq. Blank:</u> -
	14) RWB-MWS	<u>Date:</u> -
	15) RWA-MWI	
5/15/2019	16) RWA-MWS	
	17) RW22R-MWS	
	18) RWF-MWI	
	19) RWF-MWS	
	20) RWQ-MWI	

5/16/2019

Trip  
Blank:

<u>Date:</u>	<u>Sample IDs</u>	
5/17/2019	1) RWS-MWI	
	2) RWS-MWS	
	3) RWQ-MWS	
	4) RWQ-MWI	
	5) RW12-MWI	
5/20/2019	6) RW12-MWS	
	7) RW14-MWS	<u>Duplicate:</u> RWP-MWI
	8) RW13-MWI	<u>Date:</u> 5/17/2019
	9) RW15-MWI	<u>MS/MSD:</u> RWQ-MWS
	10) RW15-MWS	<u>Date:</u> 5/17/2019
5/21/2019	11) RW18-MWI	<u>Field Blank:</u>
	12) RW18-MWS	<u>Date:</u> 5/17/2019
	13) RW11-MWI	<u>Eq. Blank:</u> -
	14) RW11-MWS	<u>Date:</u> -
	15) RW04-MWS	
5/22/2019	16) RW16-MWI	
	17) RW16-MWS	
	18) RW06-MWD	
	19) RW06-MWS	
	20) RW06-MWI	

5/23/2019	1) RW05-MWS	
	2) RW07-MWI	
	3) RW07-MWS	
	4) RW10-MWI	
	5) RW08-MWI	
5/24/2019	6) RW08-MWS	
	7) RW03-MWI	<u>Duplicate:</u> RW03-MWI
	8) RW03-MWS	<u>Date:</u> 5/28/2019
	9) RW09-MWI	<u>MS/MSD:</u> RW09-MWI
	10) RW09-MWS	<u>Date:</u> 5/28/2019
5/28/2019	11) RW02-MWI	<u>Field Blank:</u>
	12) RW02-MWS	<u>Date:</u> 5/29/2019
	13) RW01-MWI	<u>Eq. Blank:</u> -
	14) RW01-MWS	<u>Date:</u> -
	15) RW19-MWI	
5/29/2019	16) RW19-MWS	
	17) RW21-MWS	
	18)	
	19)	
	20)	

6/7/2019



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## **APPENDIX G**

### **Evaluation of Data Completeness**

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**EVALUATION OF DATA COMPLETENESS**  
**Percentage of Non-Rejected Results vs. Total Results**

Parameter	Matrix	Unit	Number of Validated Results	Detections	Number of Rejected Results	Number of Non-rejected Results	Completeness
Cadmium	Groundwater	ug/L	76	55	0	76	100%
Zinc	Groundwater	ug/L	76	76	0	76	100%
Cadmium Dissolved	Groundwater	ug/L	76	54	0	76	100%
Zinc Dissolved	Groundwater	ug/L	76	71	0	76	100%
Acidity	Groundwater	mg/L	76	51	0	76	100%
Alkalinity	Groundwater	mg/L	76	76	0	76	100%
Cadmium	Pore Water	ug/L	26	7	0	26	100%
Zinc	Pore Water	ug/L	26	11	0	26	100%
Hardness	Pore Water	ug/L	26	26	0	26	100%
Zinc	Surface Water	ug/L	7	3	0	7	100%
Hardness	Surface Water	ug/L	7	7	0	7	100%

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## **APPENDIX H**

### **1997 Cadmium and Zinc Concentrations**


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**SPARROWS POINT PLANT  
FORMER ROD AND WIRE SLUDGE BIN AREA**

BW-3  - LOCATION OF SHALLOW WELLS  
 10----- - CONTOUR OF EQUAL CADMIUM CONCENTRATION IN mg/L

**SOURCE: REVISED FIGURE 4 OF MAY 1987 CLOSURE PLAN.**

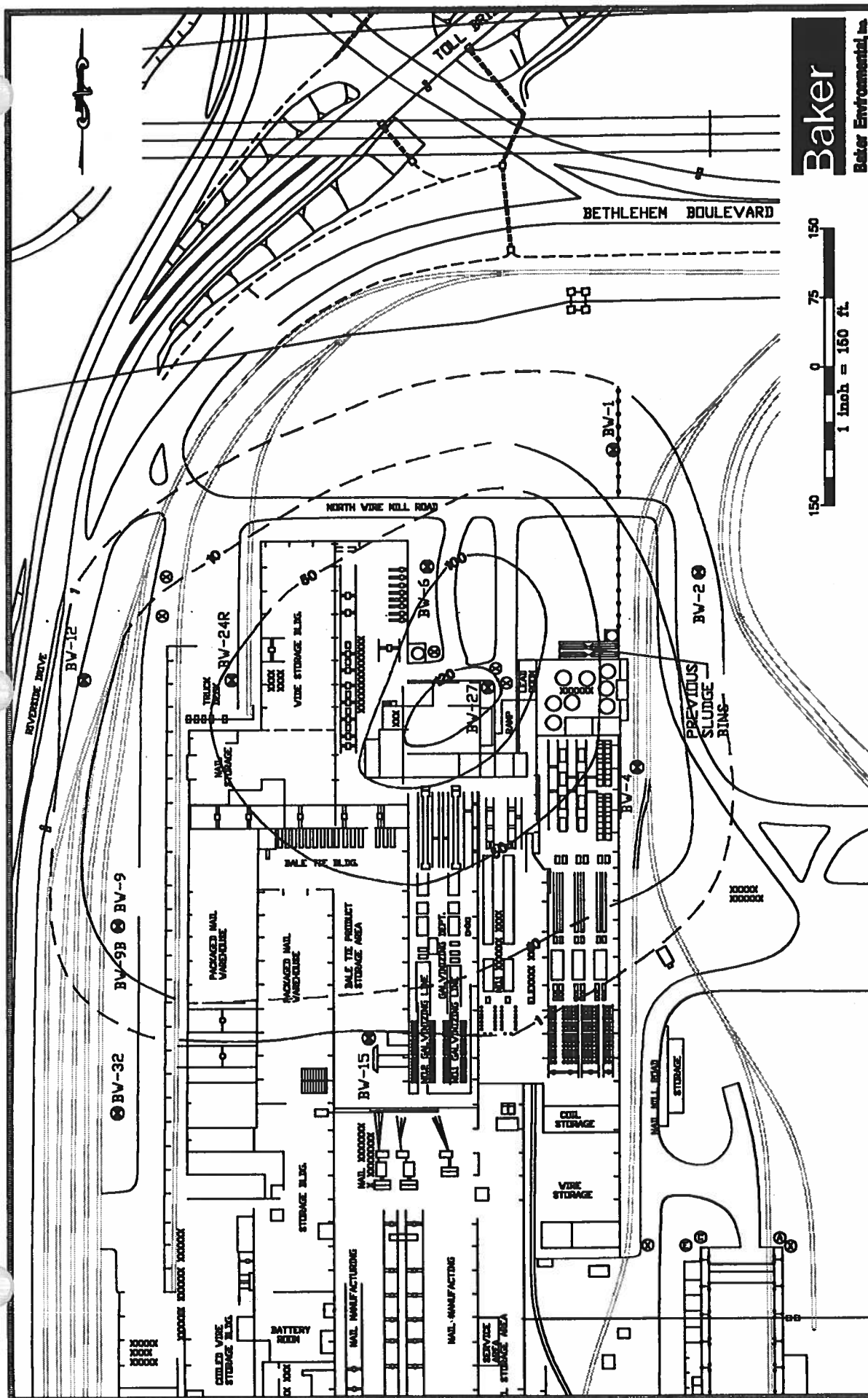




FIGURE 3  
EXTENT OF CADMIUM IN INTERMEDIATE  
DEPTH GROUNDWATER IN 1985-1986

SPARROWS POINT PLANT  
FORMER ROD AND WIRE SLUDGE BIN AREA

## LEGEND

-  - INTERMEDIATE WELL  
 - INTERPRETED CONTOUR OF EQUAL CADMIUM CONCENTRATION IN mg/L


**SOURCE: REVISED FIGURE 5 OF MAY 1987 CLOSURE PLAN.**



**FIGURE 1  
EXTENT OF CADMIUM IN SHALLOW  
GROUNDWATER IN 1987**

SPARROWS POINT PLANT  
FORMER ROD AND WIRE SLUDGE BIN AREA

### LEGEND

- BW-3  - LOCATION OF SHALLOW WELLS  
 10----- - CONTOUR OF EQUAL CADMIUM CONCENTRATION IN mg/L

**SOURCE: REVISED FIGURE 4 OF MAY 1987 CLOSURE PLAN.**





**SOURCE: REVISED FIGURE 5 OF MAY 1987 CLOSURE PLAN.**

22849FD4

**RESULTS OF GROUNDWATER SAMPLING**  
**MAY 1997 MONITORING WELLS**  
**BETHLEHEM STEEL - SPARROWS POINT**  
**ROD AND WIRE MILL SLUDGE BIN AREA**

Well	Sample Date	Groundwater Elevation	pH (S.U.)	Specific Conductance (umhos/cm @ 25°C)	Cadmium (mg/l)	Zinc (mg/l)
<b>Shallow Wells</b>						
88	5-6-97	8.50	3.90	3548	49	1100
89	5-7-97	8.71	5.86	1125	0.95	44
90	5-6-97	8.57	4.20	1110	8.1	140
91	5-6-97	7.54	6.45	1490	1.2	28
92	5-6-97	8.45	5.45	2320	13	330
93	5-8-97	9.78	4.38	1840	7.9	330
94	5-6-97	8.60	6.50	484	0.53	5.7
95	5-6-97	7.92	6.70	393	0.02	0.20
96	5-6-97	8.14	6.90	1243	0.08/0.08*	2.7/2.6*
97	5-6-97	8.23	4.16	5390	10.0	1200
BW-3	5-6-97	8.10	5.97	1041	0.52	27
BW-7	5-8-97	8.66	10.25	326	<0.005	<0.02
BW-26	5-8-97	9.42	6.85	321	0.02	7.5
<b>Intermediate Depth Wells</b>						
BW-1	5-6-97	-0.61	5.55	2525	0.56	320
BW-2	5-6-97	-0.88	5.32	8380	1.5	2300
BW-4	5-6-97	-1.11	5.42	2790	0.93	380
BW-6	5-8-97	-1.50	4.94	4176	19	690
BW-9	5-8-97	-0.78	6.00	4697	33.0	360
BW-12	5-8-97	-0.78	5.67	1400	0.11	5.2
BW-15	5-8-97	-0.14	3.88	2792	<0.005	9.5
BW-32	5-8-97	-0.56	6.70	5000	2.9	26

\* Duplicate sample results

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## **APPENDIX I**

### **Select Figures from Previous Offshore Studies**

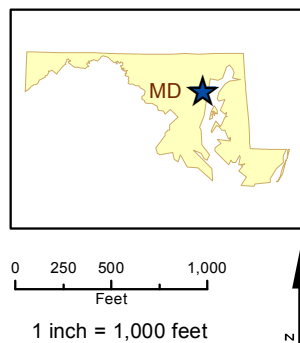
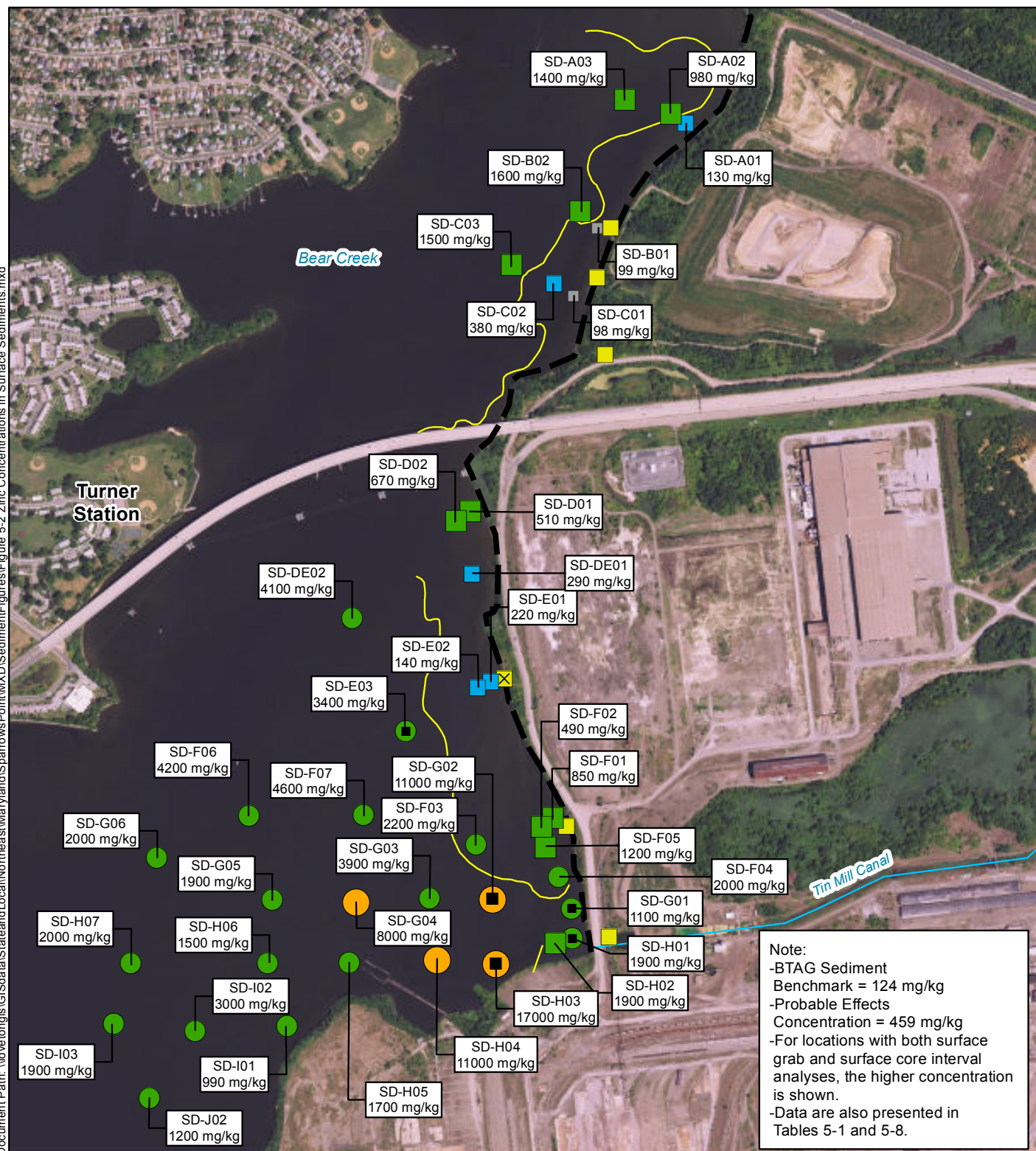
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**Figure 5-2**  
**Zinc Concentrations in Surface Sediment**  
Phase I Northwest Shoreline  
Baltimore, Maryland  
Map Date: January 2016  
Image Source: ESRI 2011  
Projection: NAD 1983 StatePlane Maryland FIPS 1900 (US Feet)

